

KG

11366

v.1027

C LXXV

175



12280

12281

12296

12280

Star Measures

	d	x	r	d	y	i
1	20382		20250	19320	19038	
15.9	11288		19408	11110	17226	
7.8	92		00	04	22	
	39		52	10	38	
	<u>15.9099</u>		<u>15.9053</u>	<u>7.8203</u>	<u>7.8186</u>	
2	20289	20690	19248	19778		
22.8	11688	19292	9450	19546		
23.9	88	88	52	50		
	80	92	58	74		
	<u>22.8594</u>	<u>22.8600</u>	<u>23.9797</u>	<u>23.9776</u>		
3	19882	20030	20070	20006		
31.7	12630	17290	18730	11318		
6.1	22	82	36	10		
	78	28	58	00		
	<u>31.7253</u>	<u>31.7257</u>	<u>6.1335</u>	<u>6.1313</u>		

Moon Measures

1		19702	18850
22.3		11782	16779
19.8		88	70
-7		02	50
		<u>14.7917</u>	<u>14.7922</u>
2		20322	18830
22		11920	17232
19.9		18	30
		20	28
		<u>14.8902</u>	<u>14.8902</u>
3		19542	19660
21		17852	17358
15.6		58	50
		48	58
		<u>15.7690</u>	<u>15.7696</u>

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Star Measures

	d	1	2	d	4
1	20382	20250	19340	19038	
15.9	11288	19408	11110	17226	
7.8	92	00	09	22	
	39	52	10	38	
	<u>15.9099</u>	<u>15.9053</u>	<u>7.8203</u>	<u>7.8186</u>	

2	20289	20690	19298	19778	
22.4	11688	19292	9450	19596	
23.9	88	88	52	50	
	80	92	86	79	
	<u>22.8599</u>	<u>22.8600</u>	<u>23.9797</u>	<u>23.9776</u>	

3	19882	20030	20070	20006	
31.7	12630	17290	18730	11318	
6.1	22	82	36	10	
	18	28	58	00	
	<u>31.7253</u>	<u>31.7257</u>	<u>6.1335</u>	<u>6.1313</u>	

Moon Measures

1	19702	18850	
22.3	11782	16779	
19.8	88	70	
-7	02	50	
	<u>19.7917</u>	<u>19.7922</u>	

2	19736	19718	20322	18830	
22	11732	15372	11920	17232	
19.9	72	28	18	30	
	18	18	20	28	
	<u>19.7900</u>	<u>19.8902</u>	<u>19.8902</u>	<u>19.8902</u>	

3	19592	19660	
21	19852	19358	
15.6	58	50	
	98	58	
	<u>15.9690</u>	<u>15.9696</u>	

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Moon Measure

2

<u>4</u>	19786	19358
20.7	12852	16288
16	62	82
	82	58
	<u>20.6926</u>	<u>20.6926</u>

<u>5</u>	19840	20310
20.6	14011	16118
16.6	11	10
-X	40	18
	<u>20.5829</u>	<u>20.5801</u>

<u>6</u>		18660	19632	19920
21		16840	11357	18170
17.8		30	6856	72
		60	28	20
		<u>17.8175</u>	<u>17.8273</u>	<u>17.8221</u>

rem.
remeasured.

<u>7</u>	19730	19688
21.2	18041	11370
18	49	62
	30	92
	<u>21.1685</u>	<u>21.1675</u>

<u>8</u>		20310	20576
22		15812	15077
18.4		19	58
		12	80
		<u>18.4798</u>	<u>18.4782</u>

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Moon Measure

2

<u>4</u>	19786	19358
20.7	12852	16288
16	62	82
-x	82	58
	<u>20.6926</u>	<u>20.6926</u>

<u>5</u>	19890	20310
20.6	14011	16718
16.6	11	10
-x	40	18
	<u>20.5829</u>	<u>20.5801</u>

<u>6</u>	18660	19088	19920
21	16890	11358	18170
17.8	30	58	72
	60	28	20
	<u>17.8175</u>	<u>17.8273</u>	<u>17.8221</u>

min

unplanned.

<u>7</u>	19730	19688
21.2	18091	11370
18	99	62
	30	92
	<u>21.1685</u>	<u>21.1675</u>

<u>8</u>	20310	20576
22	15812	15088
18.9	19	58
	12	80
	<u>18.9498</u>	<u>18.9782</u>

12280 Times Etc.

3

Feb 1, 17.

Exp. to Stars	7	40		7	52	
" " Moon	7	46	03.7	7	46	03.6
Clock fast		13	31.3			

H. Sid Time	7	32	32.2	$\delta - \alpha = + 2^h 24^m$
H. Long	4	44	31.05	
G. Sid T.	12	17	03.25	
Sid T. M. H.	20	44	28.92	
Interval	15	32	34.33	
Reduction		2	32.78	
G. M. T.	15	30	01.55	

From Naut Alman.	R. A.	Dec.
Moon 15 ^h	5 07	38.24 + 23 40 43.6
Motion in 1 ^m		2.2450 + 0.338
" 30.0258	1	07.71 10.0
Tabular Place	5 08	45.65 25 40 53.6

Moon's Age 10 days

	Parallax	54	49.96
	Semid.	17	58.1
	R.		898.1
	aug		-13.3
	Lat 5-		
9.34	R.		910.1
13.10	R.		1.9509
13	all		-936
	11+9/R		1.8573
	R2		3.7495
a = -503.7			
+ 27			
- 479.7			

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Times Etc.

3

Feb 1, '77

Exp. to Stars	7	90		7	52	
" Moon	7	96	03.7	7	96	03.6
clock fast		13	31.3			

H. Sid Time	7	32	32.2	6.12 + 2" 29"
H. Long	9	99	31.05	
G Sid T	12	17	03.25	
Sid T M. H.	20	99	28.92	
Interval	15	32	39.33	
Reduction		2	32.78	
G M. T	13	30	01.55	

From Naut Alman.	R. A.	Dec.
Moon 15 ^h	5° 07	38.29 + 25° 40 93.6
Motions in 1 ^m		2.2950 + 0.338
" 30.0258	1	07.71 90.0
Antular Place	5° 08	45.65 25 40 53.6

Moon's Age 10 days

	Parallax	5.9	99.96
	Semi-d	1.7	58.1
898.1	R.		898.1
12.1	ang		12.1
-0.3	Lat 5-		-0.3
909.9	R		910.7
1.9505	R		1.9505
-93.6	all		-93.6
1.8569	11+9/R		1.857
3.4480	R2		3.449

934	13.20
a = -503.7	
+ 2.7	
- 479.7	

S	η	AS	-5.3S	+8 η	-1"
-6.51	-10.71	-26	+35	+9	-8 = +1
+0.81	+6.28	+0	-4	= -4	+5 = +1
+10.09	-12.53	+63	-53	+10	-10 = 0"
+0.36	-1.43		-2		-1 = -4 = -0.01"

A η	-3.6 η	+1.8S	+15"
-41	+38	= -3	-12 = -15
+6	-23	= -17	+2 = -15
-78	+45	= -33	+18 = -15
	+5		+1 = +21 = +1.0"

12280 Standard Coordinates									
Cape No 737 - mag 5.5					Cape No 745 - mag 6.8				
Cape No 757 - mag 6.9									
α	3	02	00.99	5	06	10.05	3	11	26.77
δ			00.96	PM	-0.05	10.06	PM	0	26.72
ϵ			00.95			9.99			26.38
Mean	5	02	00.97	5	06	10.03	5	11	26.71
Prec		+1	02.08		+1	03.18		+1	02.08
α	5	03	03.05	5	07	13.21	5	12	28.79
δ	5	06	75	5	06	73	5	06	73
$\delta - \delta$	-3		41.95	+		28.21	+	5	43.79
$\sin(\delta - \delta)$			-221.97			+28.21			+343.75
\log	2.34	627	n	1.45	040	v	2.53	586	v
\cos	9.96	020	v	9.95	233	v	9.96	099	v
\sin	0.81	368	n	9.90	997	v	1.00	409	v
δ	-6.51	15	v	+0.81	28	v	+10.09	47	v
δ		-25	v		+1	v		+63	v
δ	15	9860	v	2281	29	-15	32	1010	v
δ	15	9051	v	2285	97	v	31	7255	v
$\delta - \delta$	+	9191	v	+	768	+15	-	3755	v
δ	+27	07	58.5	+26	20	10.5	+23	57	06.5
δ			59.3	P.M.	-1.6	10.9	P.M.	-1.7	07.2
δ			58.8			10.3			06.3
Mean	+27	07	58.9	+26	20	10.6	+23	57	06.7
Prec		+1	27.6		+1	18.6		+1	10.9
δ	+27	09	23.5	+26	21	29.2	+23	55	17.6
δ	+25	32	70	+25	32	70	+25	32	70
$\delta - \delta$	-1	23	16.5	+	48	79.2	-1	37	22.7
$\delta - \delta$			-4997.5			+2929.7			-5897.0
\log	3.69	875	n	3.76	678	v	3.76	671	n
\sin	0.02	990	n	0.79	793	v	1.09	786	n
\log	9.65	18	v	9.69	50	v	9.67	70	v
δ	16	277	v	9.81	99	v	2.00	82	v
δ	8.33	26	v	6.56	83	v	8.70	86	v
δ	-10.7	128	v	6.27	96	v	+12.5	274	v
δ	0.0	215	v	0.00	09	v	0.05	11	v
δ	07.3	087	v	27.28	00	-32	5.52	37	-2.8
δ	7.8	197	v	23.97	87	v	6.13	27	v
$\delta - \delta$	+5	107	v	-30	16	+32	+60	87	+2.8

12280 Standard Coordinates 7									
Cape No 737 mag 5.5 Cape No 795 mag 6.5 Cape No 757 mag 6.9									
α	5	02	00.99	5	06	10.05	5	11	26.99
δ			00.96			PM = 0.05 10.06			PM = 0 26.92
ϵ			00.95			18.99			26.38
Mean	5	02	00.97	5	06	10.03	5	11	26.91
Pre		+1	02.08		+1	03.18		+1	02.08
α	5	03	03.05	5	07	13.21	5	12	28.99
A	5	06	95	5	06	95	5	06	95
$\alpha - A$		-3	91.95		+	28.21		+5	93.99
(Sum (F.A))			-221.99			+28.21			+393.95
Log "	2.39	629	4		195	090		253	586
Log	9.96	020			9.95	233		9.96	099
" δ	0.81	368	n		990	997		100	909
δ	-6.51	15			+0.81	28		+10.09	47
δ		-25			+	1		+	65
δ	15	986	0		228	129		32	1010
δ	15	905	1		228	597		31	7255
$\delta - \delta$	+	919	1		+	968		-	3755
C	+27	07	58.5	+26	20	10.5	+23	57	06
L			59.3			PM -1.6 10.9			P.M. = -1.7 07
E			58.8			10.3			06
Mean	+27	07	58.9	+26	20	10.6	+23	57	06
Pre		+1	27.6		+1	18.6		+1	10
δ	+27	09	23.5	+26	21	29.2	+23	55	17
D	+25	32	90	+25	32	90	+25	32	90
$\delta - D$	-1	23	16.5	+	98	99.2	-1	37	22
(and) D			-99975			+29299			-5899
Log	3.69	875	n		3.76	678		3.76	671
δ	0.02	990	n		0.79	793		1.09	786
Log (and)	9.65	18			9.69	50		9.67	70
δ	16	279			9.81	99		200	82
δ	8	332	6		6.56	83		8.70	86
δ	-10.7	128			6.27	96		-12.5	279
δ	0.0	215			0.00	09		0.05	11
δ	07.3	087			29.28	00		55.2	37
δ	7.8	197			23.97	87		6.13	28
$\delta - \delta$	+5.1	07			-3.0	16		+2.8	47

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Plate Center & Constants

5

γ	γ	α	δ	
15.9051	7.8194			
22.8597	23.9784	5 07	13.2	+26 21 29.2
31.7255	6.1327			
22	1.8		-28.4	-48 49.7
-8.597	-5.9784	5 06	44.8	+25 32 39.8
33	490"			
-28.4	-2929.4			

Plate Center

A 5 06 45
 D +25 32 40
 +3.77 -12302

X-Y	500A		+12.77	
+491	+7953	= +12184	+77	= 12273 +59 = +12302 0
+483	+11430	= +11913	+305	= 12278 +85 = 12303 +1
-3755	+15863	= +12108	+77	= 12185 +117 = 12302 0
22.4370	+11218		+211	+83 = 223580
22.4365	+11218			22.3575

Y-Y	500Y		-9.9X	+5Y	-8899
+5107	+3910	= +9017	-157	= 8860 +39	= +8899 0
-2984	+11989	= +9005	-226	= 8779 +120	= 8899 0
+6115	+3066	= +9181	-319	= 8867 +31	= 8898 -1
16.6457	+8323		-222	+83	= 16.5772
16.6456	+8323				16.5771

Tables $a = +1.3$ $e = +0.3$ $a-e = 0$ $b+d = -1.3$ $\omega_2 = -503.7 = -5050 = +1.3 = -2.8$ $0-C = -504.0 = -505.3 = +1.3 = -1.5$

12280	Plate Center	Constants					5"
1	7	x	j				
15.9057	7.8179						
22.8497	23.9784	5° 07	13.2	+26	21	29.2	
31.7255	6.1329						
2	18						
-8597	-5.9789	5° 06	-28.4	-48	97.7		
33	990"						
-28.4	-2929.4						

Plate Center { A 5° 06 9
D +25° 32 9
+377 -1230

X-9	500A	+12.77					
+9191	+7953	+12194	+77	12293	+59	+12302	
+483	+11930	+11913	+305	12218	+85	12303	
-3755	+15863	+12108	+77	12185	+117	12302	
22.4370	+11218	+211			+83	22.351	
22.4365	+11218					22.357	

7-11	5007	-991		+57	-889		
+5107	+3910	+9017	-157	8860	+39	+8899	
-2989	+11989	+9005	-226	8779	+120	8899	
+6115	+3066	+9181	-319	8867	+31	8898	
16.6957	+8323	-222			+83	16.577	
16.6956	+8323					16.577	

Tables a = +.3 e = +3 a-e = 0 b+d = -1.3
 c+b = -503.7 -505 = +1.3 -2.8

$A = +1.5$ $B = -.2$

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Moon's Center

6

	X	X - X ₀	ΔX	(X - X ₀) ²	(X - X ₀) + (Y - Y ₀) ²	O - C
1	22.7380	0.0000	-0	0.0000	3.4414	-81
2	22.0000	-0.7380	-1	0.1919	3.4564	+69
3	21.0000	-1.7380	-2	2.0684	3.4554	+59
4	20.6926	-1.7454	-3	3.0460	3.4646	+151
5	20.5815	-1.8565	3	3.4465	3.4465	-30
6	21.0000	-1.7380	+2	2.0672	3.4542	+77
7	21.1680	-1.2700	+2	1.6124	3.4430	-65
8	22.0000	-0.7380	+1	0.1919	3.4388	-107

$$P = (3.4495) \\ 3.4480 \text{ corr'd}$$

	Y	Y - Y ₀	ΔY	(Y - Y ₀) ²	
1	17.7919	-1.8551	+0	3.4414	180°
2	17.8402	-1.8068	+0	3.2645	194°
3	15.7693	-1.1777	+0	1.3870	234
4	16.0000	-0.6470	+0	0.4186	250
5	16.6470	0.0000	0	0.0000	270
6	17.8247	+1.1777	-0	1.3870	309
7	18.0000	+1.3530	-0	1.8306	314
8	18.4490	+1.8020	-0	3.2472	346 166°

Approx. Center

X = 21

Y = 15.7693

X = 22

Y = 17.8402

17.8247

18.4490

33.2940

33.2872

Y₀ 16.6470

Y₀ 16.6476

Y_{min} 17.7919

Y_{min} 17.7919

R 1.8551

R 1.8527

X_{min} 20.5815

X₀ 22.7375

Center

X₀ 22.7380

Y₀ 16.6470

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Moon's Center

6

	x	x - x ₀	Δx	(x - x ₀) ²	(x - x ₀) + (y - y ₀) ²	U - C
1	22.7380	0.0000	0	0.0000	3.491.7	-81
2	22.0000	-0.7380	1	0.1919	3.4567	+69
3	21.0000	-1.7380	2	2.0689	3.4559	+59
4	20.6926	-1.7954	3	3.0960	3.4696	+151
5	20.5815	-1.8565	3	3.4965	3.4965	-30
6	21.0000	-1.7380	2	2.0672	3.4592	+97
7	21.1680	-1.2700	2	1.6129	3.4930	-65
8	22.0000	-0.7380	1	0.1910	3.4388	-107

R = (3.4995)
3.4980 corr'd

y	y - y ₀	Δy	(y - y ₀) ²	
1	19.7919	-1.8551	0	3.4917
2	19.8902	-1.8068	0	3.2695
3	15.9693	-1.1777	0	1.3870
4	16.0000	-0.6770	0	0.9186
5	16.6970	0.0000	0	0.0000
6	17.8297	+1.1777	0	1.3870
7	18.0000	+1.3530	0	1.8306
8	18.9990	+1.8020	0	3.2472
				180°
				198°
				231°
				250°
				270°
				309°
				318°
				344° 166°

Approx. Center

x = 21

y = 15.9693

x = 22

y = 19.890

17.8297

18.989

33.2970

33.287

y₀ 16.6970y₀ 16.695y_{min} 19.7919y_{min} 19.791

R 1.8551

R 18.52

x_{min} 20.5815y₀ 22.7375

Center

{ x₀ 22.7380{ y₀ 16.6970

Formation of Normals.

1	0.00	0.0	+ 150.0
2	+ 0.80	- 30.7	- 125.0
3	+ 2.56	- 85.0	- 105.0
4	+ 1.14	- 267.0	- 98.0
5	0.00	+ 55.8	0.0
6	- 1.70	- 67.6	+ 55.4
7	- 1.71	+ 82.5	- 87.7
8	- 0.79	+ 47.0	- 193.0
	<u>+ 4.30</u>	<u>+ 185.3</u>	<u>+ 205.4</u>
	<u>- 7.28</u>	<u>- 447.0</u>	<u>- 608.7</u>
	+ 0.30	- 261.7	- 403.3
		- 130.0	- 26.4
		- 391.7	- 429.7

	a	b	c	O-C corr
a = -5	+ 0	+ 2	- 5	- 123
	+ 2	+ 2	- 3	+ 17
b = -1	+ 7	+ 2	+ 2	- 17
	+ 9	+ 1	+ 3	+ 98
c = -7	+ 9	0	+ 2	- 69
	+ 7	- 1	- 1	+ 72
	+ 6	- 1	- 3	- 52
	+ 2	- 2	- 7	- 61

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Conditional Equations

+15 = corr

1	0.00	-1.83	= -81	0	+ 52	= +32	- 133	-118
2	-0.44	-1.81	= +69	+ 193	+ 51	= +64	+ 05	+ 20
3	-1.44	-1.78	= +59	+ 43	+ 50	= +93	- 94	- 19
4	-1.75	-0.65	= +151	+ 53	+ 18	= +71	+ 80	+ 95
5	-1.86	0.00	= -30	+ 56	0	= +56	- 86	- 71
6	-1.44	+ 1.18	= +47	+ 44	- 33	= -11	+ 58	+ 73
7	-1.27	+ 1.35	= -65	+ 39	- 38	= -11	- 67	- 49
8	-0.44	+ 1.80	= -107	+ 13	- 51	= -38	- 69	- 54
	-8.64	-1.76					+ 143	- 386

$$+12.62 + 0.30 = (-261.7) - 391.7 - 8.64$$

$$+10.30 + 1.497 = (-403.3) - 429.7 - 1.76$$

$$+ [] + 0.01 = (-6.2) - 9.3$$

$$+14.96 = (-397.1) - 420.7 \quad k = (-2.6.5) - 0.12 \Delta$$

$$= -28.1$$

$$+12.62 = (-261.7 + 7.9 = -253.8) \quad a = (-20.1) - 0.68 \Delta$$

$$= -391.7 + 8.4 = -383.3$$

$$\text{arc} = 166$$

$$\frac{P}{m} = .26 \quad \Delta R = -0.7$$

$$\frac{\Sigma K}{m} = -15.4 \quad \text{corr } 15 + 0.1$$

$$\frac{-15.4}{.26} = -59.3 \quad \text{True } \Delta R = -0.8$$

$$R = 1.86$$

$$-2RC = -0.37$$

$$\Delta h = +0.04 \quad \Delta S = 0.0$$

$$\Delta a = +0.25 \quad \Delta \alpha = +0.01$$

12250

Conditional Equations

+15 = Corr

0-C 7-C

1	0.00	+183	-81	0	+52	=+92	-133	=118
2	.049	-181	+69	+13	+51	=+64	+05	+20
3	-1.77	-178	+59	+43	+30	=+73	-97	-19
4	-1.75	-065	+151	+53	+18	=+71	+89	+95
5	-1.86	000	-30	+54	0	=+54	-86	-71
6	-1.77	+118	+47	+77	-33	=-12	+58	+73
7	-1.27	+135	-63	+28	-38	=-11	-67	-49
8	-0.97	+180	-107	+10	-57	=-37	-67	-54
	-8.69	-1.76					+173	-386-311

Average = +61+188

$$+12.62 + 0.30 = (-261.7) - 391.7 + 8.64$$

$$+10.30 + 17.97 = (-703.3) - 729.7 - 1.76$$

$$+LJ + 0.01 = (-6.2) - 9.3$$

-0.120

$$+17.96 = (-397.1) - 720.9 \quad k = (-26.5)$$

= -28.1

$$+12.62 = (-261.7 + 7.9 = -253.8) \quad a = (-20.1)$$

= -30.3

$$= -391.7 + 8.4 = -383.3$$

-0.680

$$\text{arc} = 166$$

$$P_n = .26$$

$$\Delta R = 0.7$$

$$\frac{P_n}{n} = -15.4$$

$$\text{corr} = +0.1$$

$$\frac{-15.4}{.26} = -59.3$$

$$\text{Time } \Delta R = 0.8$$

$$R = 1.86$$

$$-2RC = -0.37$$

$$\Delta k = +0.04$$

$$\Delta S = 0.0$$

$$\Delta a = +0.25$$

$$\Delta x = +0.01$$

12280 Moon's Mean Position

8

X_0 22.4380^v Y_0 16.6870^v
 $-10 -15$ $-13 -14$
 22.4370 16.6857^v
 22.4365^v 16.6856^v

From Plate Constants

X 22.3580^v Y 16.5792^v

Z +0.3580^v h -1.7258^v

$\log Z$ 9.55388^v $\log \tan \delta$ 9.6752^v 25° 20'
 $\log \sec$ 9.95600^v Z 29.1078^v
 8.50727^v 7.0537^v
 1.09067^v 5.8364^v

$\alpha - A$ +0 12.32^v η +0.0001^v

A 5' 06 75.00^v $\log h_0$ 0.15409^v
 7.33115^v

α_0 5' 06 57.32^v 2.82297 h -66.5.2^v

Red +2.76^v $S-D$ -11 05.2^v

α' 5' 06 59.78^v D +25° 32 40.0^v

S_0 +25 21 34.8^v

Red +6.6^v

δ' +25 21 41.4^v

12280 Morris Mean Position

8

$$\lambda \quad 22.9380''$$

$$-10 - 65$$

$$\gamma \quad 16.6870''$$

$$-13 - 19$$

$$22.9370$$

$$16.6457$$

$$22.9365$$

$$16.6956$$

From Plate Constants

$$\lambda \quad 22.3580''$$

$$\gamma \quad 16.5792''$$

$$\zeta \quad +0.3580''$$

$$\eta \quad -1.9258''$$

$$\log \zeta \quad 9.55388''$$

$$\log \tan \delta \quad 9.6752'' \quad 25.0 \quad 20'$$

$$\log \delta \quad 9.95600''$$

$$\zeta \quad 9.1078''$$

$$8.50727''$$

$$\eta \quad 7.0537''$$

$$1.09067''$$

$$5.8364''$$

$$\lambda - A \quad +0 \quad 12.32'' \quad \eta \quad +0.0001''$$

$$A \quad 5' \quad 06 \quad 95.00'' \quad \log h_0 \quad 0.15909''$$

$$7.33115''$$

$$\gamma_0 \quad 5' \quad 06 \quad 57.32''$$

$$2.82297'' \quad \eta \quad -66.5.2''$$

$$\text{Red} \quad +2.76'' \quad \delta - D \quad -11 \quad 05.2''$$

$$\gamma' \quad 5' \quad 06 \quad 59.78'' \quad D \quad +25' \quad 32 \quad 90.0''$$

$$\delta_0 \quad +20 \quad 21 \quad 39.5''$$

$$\text{Red} \quad +6.6''$$

$$\delta' \quad +25' \quad 21 \quad 41.9''$$

$$\begin{array}{rclcl}
 5-07 & 47.50 & +38 & 23 & 29.83 \\
 & 44.74 & & & 17.50 \\
 & +2.76 & & & +10.33
 \end{array}$$

$$\begin{array}{rclcl}
 5-10 & 37.96 & -08 & 17 & 50.76 \\
 & 32.89 & & & 47.84 \\
 & +2.07 & & & -2.92
 \end{array}$$

$$\begin{array}{rclcl}
 5-13 & 20.87 & +70 & 01 & 45.95 \\
 & 18.02 & & & 35.62 \\
 & +2.85 & & & +10.33
 \end{array}$$

2.50

6.67

40

35

30

25

20

15

10

+5

+0

-5

73 11 9 5 3-5⁴

Feb 1 '17 7^h 5^m

$$4 + 12 + 25 + 4 = 36 \quad 21.0 \text{ s} + 25 \quad 21 \quad 37.8$$

H. 21 18.8°

2 5 07.04

2 2 7 7 7 7

$$G + \alpha \quad 3 \quad 5 \quad 4 \quad 4 \quad 5$$

58° 36.0

log. Ans 9.9560

-0.74304

$$x = 0.69902$$

$\log_{10} \cos(\alpha + \delta) 9.7168^\circ$

0,9696"

11. sin 9.93 12°

$\tan \delta = 9.67572$

8, 8, 2, 3, 9, ✓

$\log \Sigma m_i = 9.63$ ✓

1. $\lambda_{\text{H}\alpha}$ 9.9050

h 12996

9.7728²

0.500 0.044 0.4

8.8239

$\log g' = 0.6814^v$

g 9.39 54v

long h' 0,8323

" h 9.9358 "

$\Delta + 1.375^{\circ}$

9. + 0.248

$22 + 08634$

+ 2.756 ✓

$91 + 4.802^{\circ}$

6.790×10^{-4}

$$n = 50,004$$

$+ 6,592 \checkmark$

12280 Reduction to Apparent Place

9

Feb 17 7^h 5^m

$$H + L \quad 2 \quad 25.4 = 36^{\circ} 24' 0'' S + 25 \quad 21 \quad 39.8''$$

$$H \quad 21 \quad 18.8''$$

$$L \quad 5 \quad 07.0''$$

$$C \quad 22 \quad 97.9$$

$$C + L \quad 3 \quad 54.2 = 58^{\circ} 36' 0''$$

$$\log \cos d \quad 9.9560''$$

$$L \quad -0.7930''$$

$$L' = 0.6990''$$

$$\log \cos (C + L) \quad 9.7168''$$

$$g \quad 0.9696''$$

$$\sin \quad 9.9312''$$

$$\tan d \quad 9.6737''$$

$$8.8239''$$

$$\log \sin d \quad 9.6317''$$

$$\cos (H + L) \quad 9.9052''$$

$$L \quad 1.2996''$$

$$\sin \quad 9.7729''$$

$$\sec d \quad 0.0940''$$

$$8.8239''$$

$$\log g' \quad 0.6814''$$

$$g \quad 9.3954''$$

$$\log h' \quad 0.8323''$$

$$h \quad 9.9359''$$

$$f \quad +1.395''$$

$$g \quad +0.298''$$

$$h \quad +0.863''$$

$$+2.756''$$

$$g' \quad +9.802''$$

$$h' \quad +6.790''$$

$$L' \quad -5.000''$$

$$+6.592''$$

12280

Lunar Parallax.

10

δ^1 5 06 59.78^v
 δ 7 32 32.20^v
 $\delta - \delta^1 + 2$ 25 32.72^v
 δ 36 23 06.30^v
 $\delta(T\delta)$ 13 21.05^v
 δ 36 09 45.3^v

T_1 57 49.96^v
 $\log \phi \delta^1$ 9.86913^v
 $\log \phi \delta$ 8.20275^v
 $\log \phi \delta^1 - \log \phi \delta$ 9.77321^v
 $\log \phi \delta - \log \phi \delta^1$ 0.04517^v
 $\log \phi \delta - \log \phi \delta^1$ 7.87026^v

$\log \phi \delta - \log \phi \delta^1$ 9.95727^v
 $\log \phi \delta - \log \phi \delta^1$ 0.00000^v
 $\log \phi \delta - \log \phi \delta^1$ 0.09298^v
 $\log \phi \delta - \log \phi \delta^1$ 0.05021^v

$\delta - \delta^1 + 26$ 42.11^v
 $= + 1$ 46.81^v

δ 48 18 16.8^v

$\delta + 25$ 21 41.7^v

$\delta - \delta$ 22 56 35.4^v

$\log \phi \delta - \log \phi \delta^1$ 9.82670^v
 $\log \phi \delta - \log \phi \delta^1$ 8.20275^v
 $\log \phi \delta - \log \phi \delta^1$ 9.59086^v
 $\log \phi \delta - \log \phi \delta^1$ 0.12686^v
 $\log \phi \delta - \log \phi \delta^1$ 7.74687^v

$\delta - \delta^1$ 19 11.6^v $0.0 = \text{corr}$

$\delta + 25$ 40 53.0^v δ^1 5 08 46.59^v -0.02 corr p.o.

$\log \phi \delta + 25$ 40 53.6^v $\log \phi \delta^1$ 5 08 45.63^v

$\delta - \delta^1$ -0.6^v $\delta - \delta^1$ +0.92^v

curr. +0.9^v curr. -0.01^v

2nd Cor. Ry. 0.0

$\delta + 25$ 40 53.9

$\alpha = 5^h 08^m 46.56$

$\delta - \delta^1$ +0.91

$\delta - \delta^1$ +0.3

12250

Lunar Parallax

10

$\sqrt{1} \quad 5' \quad 06 \quad 59.78$
 $+ \quad 7 \quad 32 \quad 32.20$
 $19 - \delta' + 2 \quad 23' \quad 32.72$
 $- \quad 36'' \quad 23' \quad 06.20$
 $\frac{1}{2}(1-1) \quad 13 \quad 21.05$
 $\quad 36 \quad 09 \quad 75.3$

$T_1 \quad 59' \quad 49.96$
 $\log \phi 4' \quad 9.86913$
 $\quad 8.20275$
 $\quad 9.79321$
 $\quad 0.09317$
 $\quad 789026$

9.95727
 0.00000
 9.09284
 0.05027

$\delta - \delta' \quad 126 \quad 92.11$
 $= \quad 11 \quad 46.81$

$\delta \quad 98 \quad 18 \quad 40.5$

$\delta + 25' \quad 21 \quad 71.4$

$\delta - \delta \quad 22 \quad 56 \quad 95.9$

9.82690
 8.20275
 9.59086
 0.12686
 77.4687

0.0 Corr

$\delta - \delta' \quad 19 \quad 11.6$

-0.02 Comp

$\delta + 25' \quad 40 \quad 53.0 \quad \delta \quad 5' \quad 08 \quad 46.59$

$\text{Ephed} + 25' \quad 40 \quad 53.6 \quad \text{Ephed} \quad 5' \quad 08 \quad 45.65$

$0 - C \quad -0.4 \quad 0 - C \quad +0.92$

$\text{Curv.} \quad +0.9 \quad \text{Curv.} \quad -0.01$

$\text{Ind. Ad. Ry.} \quad 0.0$

$\delta + 25' \quad 40 \quad 53.9$

$\alpha = 5' \quad 08 \quad 46.56$

$0 - C \quad +0.91$

$\quad 1 \quad 2 \quad +0.3$

1
15
7

2
2
2

3
3
6

1
2
1
7

2
1
1

2
1
1

12281

Star Measures

11

	d	α	d	α
L	19848	19654	1940.1	20078
15.6	11450	18350	12698	1847073
7.8	46	4849	98	76
	40	42	00	80
	<u>17.8394</u>	<u>15.6698</u>	<u>15.6703</u>	<u>7.8395</u>
2	19348	20634	13254	14799
22.6	13128	16854	13236	14798
27	30	5253	3234	96
	44	32		
	<u>22.6217</u>	<u>22.6221</u>	<u>24.0020</u>	<u>23.9998</u>
3	20476	20466	19088	20488
31.5	1555558	1538184	17508	1203332
6.2	6158	8784	14	32
	75	64	78	70
	<u>31.4918</u>	<u>31.4920</u>	<u>6.1576</u>	<u>6.1562</u>

Moon Measures

L	20284	20250	19082	20120
22.7	15292	15234	11366	17850
17.8	92	34	66	4045
7.8	84	50	79	22
	<u>22.4992</u>	<u>22.4984</u>	<u>14.7714</u>	<u>14.7724</u>
2			19744	19284
22			10410	1862622
17.9			0809	18
			42	9288
			<u>14.9333</u>	<u>14.9338</u>
3	19091	15446		
21.1	1850199	7475		
16	9899			
	100	74903		
	<u>21.0592</u>	<u>21.0572</u>		

12281

Star Measures

11

	λ	λ	λ	λ
L	19898	19654	1940.1	20078
15.6	11450	16350	12698	1897073
1.8	46	79879	798	76
	40	42	00	80
	<u>27.8399</u>	<u>15.6698</u>	<u>15.6703</u>	<u>7.8395</u>
2	19398	20639	13259	19799
23.6	13128	16854	1323639	1979897
29	30.	2253	3239	96
	49	32		
	<u>22.6217</u>	<u>22.6221</u>	<u>24.0020</u>	<u>23.9998</u>
3	20476	20466	19088	20988
31.5	1555558	1538189	17508	1203332
6.2	61	8789	19	32
	75	69	78	70
	<u>31.4918</u>	<u>31.4920</u>	<u>6.1576</u>	<u>6.1562</u>

Moon Measures

L	20284	20250	19082	20120
22.7	15292	15239	11362	17850
19.8	92	39	66	9075
20.4	84	50	79	22
	<u>22.9992</u>	<u>22.9984</u>	<u>19.7719</u>	<u>19.7729</u>
2			19747	19289
2.2			10410	186262
17.9			0809	18
			92	9288
			<u>19.9333</u>	<u>19.9338</u>

3	19091	15976	
21.1	1850199	7975	
16	9899		
	100	79903	
	<u>21.0592</u>	<u>21.0572</u>	

12281

Moon Measures

12

$$\begin{array}{r}
 \text{d} \quad \text{x} \quad \text{r} \\
 4 \quad 20584 \\
 20.9 \quad 10958 \\
 16.5 \quad 5054 \\
 -x \quad 80 \\
 \hline
 20.9626
 \end{array}$$

$$\begin{array}{r}
 19994 \\
 19630.1 \\
 32 \\
 10002 \\
 \hline
 20.9637
 \end{array}$$

$$\begin{array}{r}
 5 \quad 13522 \\
 21.1 \quad 13464 \\
 17 \quad 35861 \\
 \hline
 21.0061
 \end{array}$$

$$\begin{array}{r}
 14032 \\
 14092 \\
 88 \\
 \hline
 21.0058
 \end{array}$$

$$\begin{array}{r}
 6 \quad 20008 \\
 21.6 \quad 13990 \\
 18 \quad 1400296 \\
 \quad 06 \\
 \hline
 21.6011
 \end{array}$$

$$\begin{array}{r}
 19638 \\
 15630 \\
 2427 \\
 42 \\
 \hline
 21.5988
 \end{array}$$

$$\begin{array}{r}
 7 \\
 22 \\
 18.3
 \end{array}$$

$$\begin{array}{r}
 19504 \\
 16820 \\
 1819 \\
 08 \\
 \hline
 18.2686
 \end{array}$$

$$\begin{array}{r}
 18702 \\
 1138463 \\
 62 \\
 04 \\
 \hline
 18.2660
 \end{array}$$

$$\begin{array}{r}
 8 \quad 19582 \quad 18122 \\
 22.8 \quad 13350 \quad 14338 \\
 18.4 \quad 50 \quad 3838 \\
 20 \quad 92 \quad 28 \\
 \hline
 22.6238 \quad 22.6214
 \end{array}$$

$$\begin{array}{r}
 20072 \\
 156009.5 \\
 3909.5 \\
 82 \\
 \hline
 18.4781
 \end{array}$$

$$\begin{array}{r}
 18888 \\
 1335653 \\
 50 \\
 80 \\
 \hline
 18.4770
 \end{array}$$

12281

Moon Measures

12

$\frac{2}{20.9}$ 20587
 10958
 16.5 5054
 -x 80
20.9626

$\frac{2}{20.9}$ 19994
 19630
 3231
 10002
20.9637

$\frac{5}{21.1}$ 13522
 13464
 17 5861

19032
 19092
 88

21.006121.0058

$\frac{6}{21.6}$ 20008
 13990
 18 96
 14002
 06
21.6011

19638
 15630
 2421
 72
21.5988

$\frac{7}{22}$
 18.3

19509
 16820
 1819
 08
18.2686

18702
 11384
 62
 04
18.2660

$\frac{8}{22.8}$ 19582 18122
 13350 14338
 18.9 50 3838
 22. 92 28
22.6238 226204

20072 18888
 15600 13356
 59095 53
 82 80
18.4781 18.4770

12281

Times Etc.

13

Feb. 1

Epp. to Stars	7	54	00.0	8	06	00.0	v
... Moon	7	59	33.6	7	59	33.8	v
Clock fast		13	31.3				v

H. Sid. Time	7	46	02.4	-	8-4	+2 ^h	37 ^m	-
H. Long	4	47	31.05	v				
G. Sid. T.	12	30	33.45	v				
G. Sid. J. M. Moon	20	47	28.92	v				
Interval	15	4.6	04.33	v				
Red.		2	37.99	v				
G. M. T.	15	43	29.54	v				

15.7249

From Naut Alm.	R. A.	Dec.
Moon 15 ^h	5-07	38.24 +25 40 43.6
Moon in m		2.2442 + .320
" 43.4923	1	37.64 +13.9
Tabular Place	5-09	15.88 +25 40 57.5

Moon's Age 10 days

Parallel 54' 49.71

Semi-d. 17 58.0

R 898.0

Aug 12.7

Dr. 5 -0.3

R 910.4

R 1.9516

a/R -934

(1+a)/R 1.8582

R 3.4529

939 = 12.75

898.0

17.8

-0.3

909.5

1.9496

-933

1.8563

3.4458

a = -502.8

24

-478.8

12281
Feb. 1

Times Etc

13

Exp. - Stars	7	59	00.0	8	06	00.0
... Moon	7	59	33.6	7	59	33.8
Clock fast		1.3	31.3			

H. High Time	7	96	02.4	-	8-1 = +2 ^h 37 ^m -
H. Long	9	99	31.05	-	
G. Lid 1	12	30	33.45	-	
Seed J. H. Moon	20	99	28.92	-	
Interval	15	46	04.53	-	
Red.		2	39.99	-	
G. H. T.	15	93	29.54	-	

From West Alm	R. A	Dec.
Moon 15 ^h 5 ^m 07	38.29	+25° 40' 43.6"
Motions in 1 st	2.2992"	+ .320"
" " 43.7923	37.69	+13.9"
Sabular Place 5 ^m 07	15.88"	+25° 40' 37.5"

Mirons Age	10 days
Parallax	5.4" 49.71
Speed	1.8 58.0
R	898.0

939 = 12.75	898.0	Aug	12.7
	11.8	Inv 5	-0.3
	-0.3	R	910.4
	909.5	R	1.9516
	1.9496	apl	-939
	-933	(1+a)R	1.8582
a = -50.28	1.8563	R ²	3.4529
29	3.4458		
<hr/>			
-478.8			

12281

Plate Center & Constants

17

x	15.6700	22.6219	31.4919
y	15.4860	22.8117	32.1010
$x-y$	+ 1840	- 1895	- 6091

η	7.8397	27.0009	6.1569
η	7.3087	27.2768	5.5209
$\eta - \eta$	+ 5307	- 2759	+ 6360

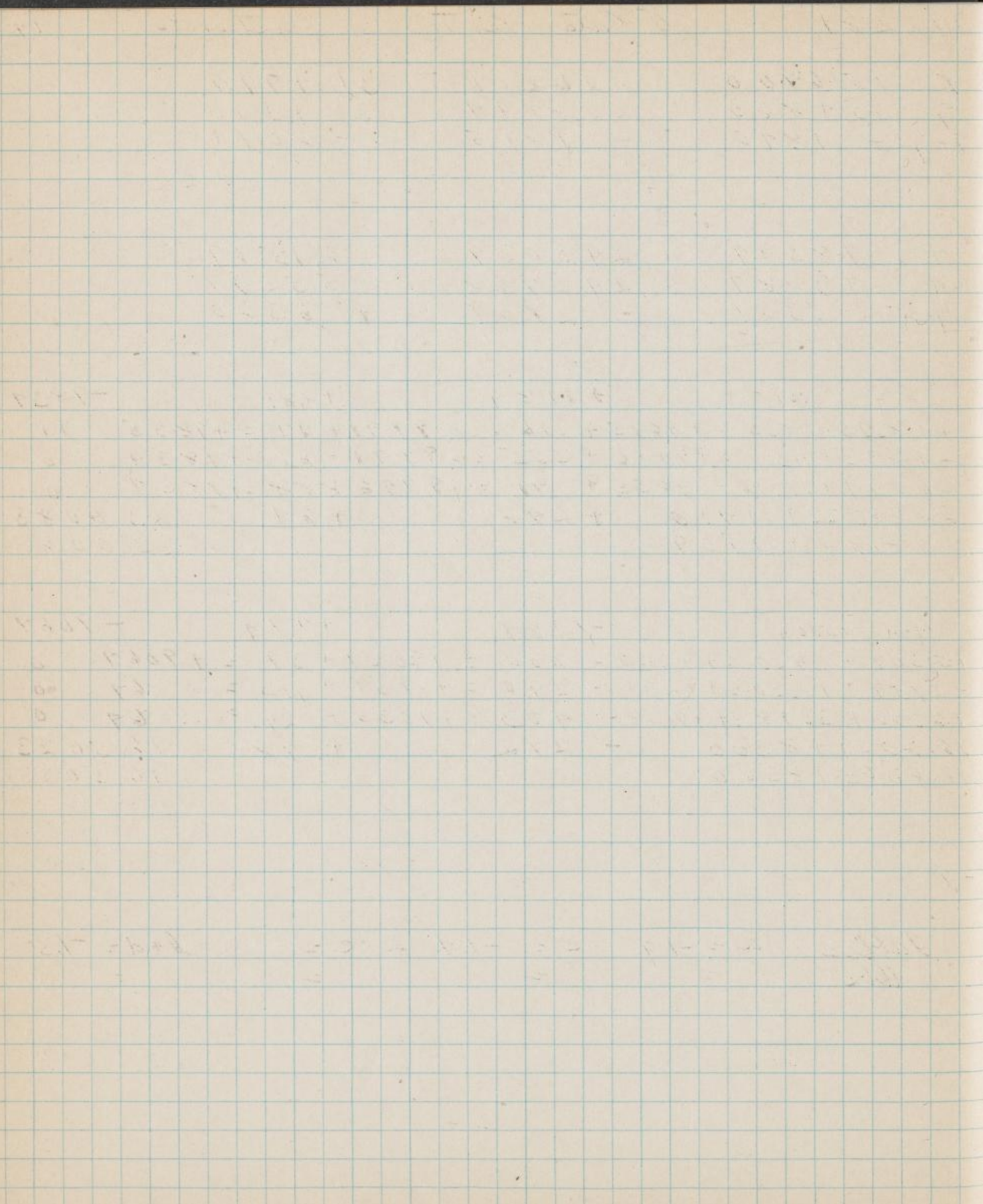
$x - y$	$+500x$	$+14.8y$	$+2.8x$	-9837	
$+1840$	$+7835$	$= +9675$	$+11.6$	$= +9791 + 47 = +9838$	$+1$
-1895	$+11311$	$= +9716 + 355$	$= +9771 + 63$	$= +9834$	0
-6091	$+15776$	$= +9655 + 91$	$= +9746 + 88$	$= +9834$	0
22.8202	$+11410$	$+276$	$+67$	23.0088	\checkmark
22.8180	$+11409$			23.0065	\checkmark

$\eta - \eta$	+500y	-12.8x	+7.7y	-9067	
+5307	+3920	= +9227 - 200	= +9027 + 37	= +9067	0
-2759	+12000	= +9241 - 290	= +8951 + 113	= 67	0
+6360	+3078	= +9738 - 403	= +9035 + 29	= 67	0
16.6001	+8300	- 292	+ 78	16.5023	✓
16.6003	+8300			16.5025	✓

-9

Table
Obs $a = -1.9$ $e = -1.4$ $a-e = -0.5$ $b+d = -1.5$
 $= -502.8$ $= -504.4$ $= +1.9$ $= -2.0$

$0-C$ -500.9 -503.3 $+2.4$ -0.5



12281

Plate Center & Constants

17

x	15.6700	22.6219	31.7919
y	15.4860	22.8129	32.1010
x-y	+1890	-1895	-6091

x	7.8394	29.0009	6.1569
y	7.3087	29.2768	5.5209
x-y	+5307	-2759	+6360

x-y	+500x	+19.8y	+48x	-9859	
+1890	+7535	= +9675 + 11.6	= +9791 + 97	= +9835	+1
-1895	+11311	= +9916 + 355	= +9771 + 63	= +9839	0
-6091	+15776	= +9655 + 91	= +9796 + 88	= +9839	0
22.8202	+11910	+246	+64	23.0088	
22.8180	+11909			23.0065	

x-y	+500y	-12.8x	+9.7y	-9067	
+5307	+3920	= +9227 - 200	= +9027 + 37	= +9067	0
-2759	+12000	= +9291 - 290	= +8951 + 113	= 67	0
+6360	+3078	= +9938 - 903	= +9035 + 29	= 69	0
16.6001	+8300	-292	+78	16.5023	
16.6003	+8300			16.5025	

-7

Tables a = -1.9 c = -1.9 a-c = b+d = -1.5
 Obs = = = =

A +1.6
B = -.4

12281

Morris Center

15-

	x	$(x-x_0)$	Δx	$(x-x_0)^2$	$(x-x_0)(y-y_0)^2$	$1-z$
1	22.4988	-0.3212	-3	0.1033	3.4449	-80 - 4
2	22.0000	-0.8200	-3	0.6729	3.4498	-31 + 40
3	21.0582	-1.4618	-1	3.1042	3.9672	+113 +184
4	20.9631	-1.8569	0	3.4480	3.4480	-49 +22
5	21.0059	-1.8141	+1	3.2906	3.4506	-23 +48
6	21.6000	-1.2200	+2	1.4879	3.4476	-5.3 +18
7	22.0000	-0.8200	+3	0.6719	3.4515	-14 +57
8	22.6226	-0.1974	+3	0.0388	3.4527	-2 +69

$$P = (3.4458 \text{ carried})$$

$$R = (3.4529)$$

	y	$(y-y_0)$	Δy	$(y-y_0)^2$	L	\checkmark
1	14.7719	-1.8281	+1	3.3416	190	
2	14.9335	-1.6665	+1	2.7769	206	
3	16.0000	-0.6000	+0	0.3600	251	
4	16.6000	+0.0000	0	0.0000	270	
5	17.0000	+0.4000	-0	0.1600	282	
6	18.0000	+1.4000	-1	1.9597	319	
7	18.2673	+1.6673	-1	2.7796	334	
8	18.4475	+1.8475	-1	3.4129	354	167

Approx Center

$$x = 22.0 \quad y = 14.9335$$

$$18.2673$$

$$3.32008$$

$$y_0 = 16.6000$$

$$x_{\text{min}} = 20.9631$$

$$R = 1.8582$$

$$2.28213$$

$$x_0$$

$$\text{Center} \begin{cases} x_0 = 22.8200 \\ y_0 = 16.6000 \end{cases}$$

12281

Moving Center

13

	x	$(x-x_0)$	Δx	$(x-x_0)^2$	$(x-x_0)(y-y_0)$	$(y-y_0)^2$
1	22.4988	-0.3212	-3	0.1033	3.4449	-80-9
2	22.0000	-0.8200	-3	0.6729	3.4498	-31-40
3	21.0582	-0.7618	-1	3.1042	3.9692	+113-184
4	20.9631	-1.8569	0	3.4480	3.4480	-99-22
5	21.0059	-1.8191	+1	3.2406	3.4506	-23-48
6	21.6000	-1.2200	+2	1.9879	3.4476	-53-19
7	22.0000	-0.8200	+3	0.6719	3.9515	-19-57
8	22.6226	-0.1974	+3	0.0388	3.4527	-2-69

3.4458 *corr'd*
 $R = (3.4529)$

	y	$(y-y_0)$	Δy	$(y-y_0)^2$	L
1	19.7719	-1.8281	-1	3.3416	190
2	19.9335	-1.6665	+1	2.7764	206
3	16.0000	-0.6000	+0	0.3600	251
4	16.6000	+0.0000	0	0.0000	270
5	17.0000	+0.4000	-0	0.1600	282
6	18.0000	+1.4000	-1	1.9597	319
7	18.2673	+1.6673	-1	2.7796	339
8	18.9975	+1.8475	-1	3.4129	354 169

Approx Center

$$x = 22.0 \quad y = 19.9335$$

$$18.2673$$

$$3.32008$$

$$y_0 = 16.6009$$

$$x_{\text{min}} = 20.9631$$

$$R = 18.582$$

$$22.8213$$

$$x_0$$

$$\text{Center} \begin{cases} x_0 = 22.8200 \\ y_0 = 16.6000 \end{cases}$$

Formation of Normals.

			3765
1	+ 0.60	+ 25.5	+ 176.5
2	+ 1.37	+ 25.5	+ 52.0
3	+ 1.76	- 199.0	- 68.0
4	0.0	+ 91.0	0.0
5	- 0.72	+ 41.5	- 9.0
6	- 1.71	+ 65.0	- 74.0
7	- 1.37	+ 11.5	- 23.5
8	- 0.37	+ 0.5	- 3.5
	<u>+ 3.43</u>	<u>+ 260.5</u>	<u>+ 198.5</u>
	- 4.14	- 199.0	- 178.0
	<u>- 0.71</u>	<u>+ 61.5</u>	<u>+ 20.5</u>
		- 62.55	+ 85.5
		<u>- 56.0</u>	<u>+ 106.0</u>

cor. 0-c

	a	b	c	
a - -5	+ 2	- 2	- 7	- 19
	+ 4	- 2	- 5	+ 11
b - +1	+ 9	- 1	+ 1	+ 118
	+ 9	0	+ 2	- 50
c - -7	+ 9	+ 0	+ 2	- 24
	+ 6	+ 1	0	- 37
	+ 4	+ 2	- 1	+ 14
	+ 1	+ 2	- 4	+ 48

12281

Conditional Equations

16

X		+71 Corr		0-C	0-C
1	-0.32 - 1.83 = -80	+12 - 9 = +3	-83 - 12		
2	-0.82 - 1.67 = -31	+33 - 9 = +24	-33 + 16		
3	-1.76 - 0.60 = +113	+70 - 3 = +67	+76 + 117		
4	-1.86 - 0.00 = -99	+74 0 = +74	-123 - 52		
5	-1.81 + 0.40 = -23	+72 + 2 = +74	-97 - 26		
6	-1.22 + 1.40 = -53	+98 + 7 = +105	-108 - 37		
7	-0.82 + 1.67 = +85	+33 + 9 = +42	-56 + 15		
8	-0.20 + 1.85 = +1.65	+8 + 9 = +17	-19 + 52		
	-8.81 + 12.2		+200 - 127		

$$12.81 - 0.74 = (+61.5) - 564.0 - 8.81$$

$$-0.74 + 14.79 = (+20.5) + 106.0 + 1.22$$

$$+ [] - 0.04 = (+3.5) - 32.6 \quad +0.08\Delta$$

$$+ 14.75 = (+27.0) + 7.37 - (+1.6) = +5.1$$

$$12.81 = (+61.5 + 1.2 = +62.7) \quad a = (+7.9) = -39.7$$

$$12.81 = -564.0 + 54.3 = -509.7 \quad -0.68\Delta$$

$$\text{arc} = 164$$

$$\frac{P}{n} = .25$$

$$\Delta R = +0.4$$

$$\frac{\Sigma K}{n} = +9.1$$

$$\text{corr} = +0.1$$

$$\frac{+9.1}{.25} = +36.4$$

$$\text{True } \Delta R = +0.3$$

$$R = 186$$

$$-2R_c = -0.37$$

$$\Delta A = +0.03$$

$$\Delta S = -0.0$$

$$\Delta a = +0.25$$

$$\Delta \alpha = +0.01$$

12281

Conditional Equations

16

K	+71 corr		0-C	0-C
1	-0.32 - 1.83 = -80	+12 - 8 = +3	-85	-12
2	-0.82 - 1.67 = -31	+33 - 9 = +24	-35	+16
3	-1.76 - 0.60 = +113	+70 - 3 = +67	+96	+117
4	-1.86 - 0.00 = -99	+74 - 0 = +74	-123	-52
5	-1.81 + 0.90 = -23	+72 + 2 = +74	-97	-26
6	-1.22 + 1.40 = -53	+98 + 1 = +99	-108	-37
7	-0.82 + 1.67 = -19	+33 + 9 = +42	-56	+15
8	-0.20 + 1.85 = -2	+8 + 8 = +16	-19	+52
	-8.81 + 12.2		+200	-127

or 41

$$12.81 - 0.79 = (+61.5) - 569.0 - 8.81$$

$$-0.79 + 19.79 = (+20.5) + 106.0 + 1.22$$

$$+13 - 0.04 = (+3.5) - 32.6$$

+0.082

$$+19.75 = (+29.0) + 73.9 - (+1.6) = +51.1$$

$$12.81 = (+61.5 + 1.2 = +62.7) \quad a = (+4.9) = -39.7$$

$$2.81 = -569.0 + 59.3 = -509.7$$

-0.682

arc = 164

$$\frac{P}{n} = .25$$

$$\Delta R = +0.4$$

$$\frac{2K}{n} = +9.17$$

$$\cos \delta = +0.1$$

$$\frac{+9.17}{.25} = +36.7$$

$$\tan \Delta R = +0.3$$

$$R = 1.86$$

$$-2Rc = -0.37$$

$$\Delta t = +0.03$$

$$\Delta S = -0.0$$

$$\Delta a = +0.25$$

$$\Delta a = +0.01$$

12281

Mavis Mean Position

17

$$x_0 = 22.8200''$$

$$+2 - 20''$$

$$y_0 = 16.6000''$$

$$+X + 3''$$

$$22.8202$$

$$16.6001$$

$$22.8180''$$

$$16.6003''$$

From Plate Constants

$$x \ 23.0088''$$

$$y \ 16.5023''$$

$$z \ 1.0088''$$

$$n \ -1.4977''$$

$$\log z \ 0.00380''$$

$$\log \cos \ 9.95603''$$

$$8.30724''$$

$$1.54053''$$

$$\log \tan \delta \ 9.6756'' \ 25^{\circ} 21'$$

$$\log z^2 \ 0.0076''$$

$$7.0539''$$

$$6.7366''$$

$$\delta - A \quad + 37.72''$$

$$n_1 \ +0.0005''$$

$$A \ 5^{\circ} 06' 45.00''$$

$$n_0 \ 1.4982''$$

$$x_0 \ 5^{\circ} 07' 19.72''$$

$$\log n \ 0.17557''$$

$$7.33115''$$

$$\text{Red} \quad +2.46''$$

$$2.84442'' \ n = -698.9''$$

$$\delta' \ 5^{\circ} 07' 22.18''$$

$$S-D \quad -11 \ 38.9''$$

$$D \ +25 \ 32 \ 40.0''$$

$$S_0 \ 25 \ 21 \ 01.1''$$

$$\text{Red} \quad +6.6''$$

$$S' \ 25 \ 21 \ 7.7''$$

12281

Mavis Mean Position

17

$$x_0 = 22.8200''$$

$$+ \Delta - 20$$

$$y_0 = 16.6000''$$

$$+ \Delta + 3$$

$$22.8202$$

$$16.6001$$

$$22.8180$$

$$16.6003$$

From Plate Constants

$$\lambda \quad 23.0088$$

$$\gamma \quad 16.5023$$

$$\beta \quad 1.0088$$

$$\eta \quad -1.4977$$

$$\log \gamma \quad 0.00380$$

$$\log \delta \quad 9.95603$$

$$8.50729$$

$$1.54053$$

$$\log \lambda \quad 9.6756 \quad 25.0$$

$$\log \gamma \quad 0.0076$$

$$7.0539$$

$$6.7366$$

$$\lambda - A \quad + 39.72$$

$$\eta \quad +0.0005$$

$$A \quad 5^{\circ} 06' 45.00$$

$$\eta_0 \quad 1.4982$$

$$x_0 \quad 5^{\circ} 07' 19.72$$

$$\log \mu \quad 0.17557 \quad \eta$$

$$7.33115$$

$$\text{Red} \quad +2.46''$$

$$2.84442 \quad \eta \quad -0.698$$

$$\lambda' \quad 5^{\circ} 07' 22.18$$

$$S-D \quad -11 \quad 38.9$$

$$D \quad +25 \quad 32 \quad 40.0$$

$$S_0 \quad 25 \quad 21 \quad 01.1$$

$$\text{Red} \quad +6.6''$$

$$\lambda' \quad 25 \quad 21 \quad 7.7$$

12281

Lunar Parallax

18

$$\begin{array}{rcl}
 \alpha' & 5 & 07 \quad 22.18'' \\
 \delta & 7 & 46 \quad 02.7'' \\
 \phi - \alpha' + 2 & 38 & 40.22'' \\
 = & 39 & 40 \quad 03.8'' \\
 \frac{1}{2}(\delta - \alpha') + 17 & & 21.9'' \\
 & 39 & 25 \quad 7.1''
 \end{array}$$

$$\begin{array}{r}
 9.86913'' \\
 8.20271'' \\
 9.80505'' \\
 0.04518'' \\
 7.92207''
 \end{array}$$

$$\begin{array}{r}
 9.95727'' \\
 0.00000'' \\
 0.11274'' \\
 0.06944''
 \end{array}$$

$$\begin{array}{r}
 \delta - \alpha' + 28 \quad 43.87'' \\
 = \quad +1 \quad 57.92''
 \end{array}$$

$$\delta \quad 49 \quad 33 \quad 33.6$$

$$\delta \quad +25 \quad 21 \quad 07.7''$$

$$\delta - \delta \quad 24 \quad 12 \quad 28.9''$$

$$\begin{array}{r}
 9.82680'' \\
 8.20271'' \\
 9.61286'' \\
 0.11857'' \\
 7.76049'' \quad + 0.1'' = \text{corr}
 \end{array}$$

$$\delta - \delta' \quad 19 \quad 48.3 \quad - .08'' = \text{corr } 19$$

$$\delta \quad +25 \quad 40 \quad 56.4 \quad \alpha \quad 5 \quad 09 \quad 17.02$$

$$\text{Ann. Eph } \delta + 25 \quad 40 \quad 57.5'' \quad \text{Eph } \alpha \quad 5 \quad 09 \quad 15.88''$$

$$\text{b.c.} \quad - 1.7 \quad \text{b.c.} \quad + 1.17''$$

$$\text{curr} \quad + 0.9'' \quad \text{curr} \quad - 0.01''$$

$$\text{2nd Ued. Ref} \quad 0.0$$

$$\alpha \quad 5 \quad 09 \quad 17.01$$

$$\delta \quad +25 \quad 40 \quad 57.0$$

$$\text{b.c.} \quad + 1.13$$

$$\text{b.c.} \quad - 0.5''$$

12251

Lunar Parallax

15

$\alpha' 5.07 \quad 22.18$
 $\delta 7.46 \quad 02.4$
 $\delta - \alpha' + 2.38 \quad 90.22$
 $= 39.40 \quad 03.30$
 $\frac{1}{2}(1-x) + 19 \quad 21.9$
 $39.25 \quad 7.51$

 $\pi \quad 59' 49.71''$

9.86913
 8.20271
 9.80505
 0.09518
 7.92217

9.95727
 0.00000
 0.11214
 0.04792

$\alpha - \alpha' + 28 \quad 43.89$
 $= +1.91.92$

 $\delta \quad 49 \quad 33 \quad 33.6$
 $\delta + 25 \quad 21 \quad 07.7$
 $\delta - \alpha \quad 24 \quad 12 \quad 25.9$

9.82690
 8.20271
 9.61285
 0.11857
 7.76047

 $+ 0.1 - \text{km}$
 $\delta - \alpha' \quad 19 \quad 58.3$
 $- 0.8 - \text{km}$
 $\delta + 25 \quad 40 \quad 56.4 \quad \alpha \quad 5 \quad 09 \quad 17.02$
 $\text{Ann Eph. } \delta + 25 \quad 40 \quad 57.5 \quad \text{Eph. } \alpha \quad 5 \quad 09 \quad 15.88$
 $\text{O-C} \quad + 1.7 \quad \text{O-C} \quad + 1.17$
 $\text{curr} \quad + \quad 0.9 \quad \text{curr} \quad - 0.01$
 $\text{Irid. And. Ref.} \quad 0.0$
 $\alpha \quad 5 \quad 09 \quad 17.01$
 $\delta + 25 \quad 40 \quad 57.0$
 $\text{O-C} \quad + 1.13$
 $\text{O-C} \quad - 0.5$

12281 Reduction to Apparent Place

$$\begin{array}{rcl}
 & 3^h & 28.5^m \\
 H + \lambda & 2 & 25.9 \\
 H & 21 & 18.5 \\
 \lambda & 5 & 07.4 \\
 C & 22 & 47.4 \\
 G + \lambda & 3 & 54.8 \\
 + 58^0 & & 72.0
 \end{array}$$

$$\begin{array}{rcl}
 & 7^h & 7.8 \\
 S + & 25^s & 21 \\
 \log \cos \delta & & 9.9560 \\
 \log \sin \delta & & 0.7436 \\
 \log \tan \delta & & 0.6996
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos (C+H) & & 9.7156 \\
 \log \sin & & 0.9649 \\
 \log \tan & & 9.9317 \\
 \log \sec & & 9.6756 \\
 \log \csc & & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log \sin \delta & & 9.6316 \\
 \log \cos (H+\lambda) & & 9.9053 \\
 \log \tan & & 1.2946 \\
 \log \sin (H+\lambda) & & 9.7741 \\
 \log \sec \delta & & 0.0440 \\
 \log \csc \delta & & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log q & & 0.6805 \\
 \log g & & 9.3961
 \end{array}$$

$$\begin{array}{rcl}
 \log h & & 0.8315 \\
 \log k & & 9.9366
 \end{array}$$

$$\begin{array}{rcl}
 f & + & 1.375 \\
 g & + & 0.279 \\
 h & + & 0.864 \\
 & + & 2.458
 \end{array}$$

$$\begin{array}{rcl}
 q' & + & 4.792 \\
 h' & + & 6.789 \\
 i & - & 5.007 \\
 & + & 6.569
 \end{array}$$

12281 Reduction to Apparent Place
 $\Delta \alpha$ 28.5"
 $H + \Delta$ 2 25.9
 H 21 18.5
 K 5 07.9
 C 22 97.9
 $G + K$ 3 54.8
 $+ 58''$ 92.0

$\Delta \delta$ 7.8"
 $\delta + 25''$ 21
 $\log \cos \delta$ 9.9560
 \dots -0.7926
 \dots -0.6996

$\log \cos (CH)$ 9.7156
 q 9.9699
 \sin 9.9317
 $\tan \delta$ 1.6756
 8.8239

$\log \sin \delta$ 9.6216
 \dots $\cos (H + K)$ 9.9058
 \dots h 1.2946
 \dots $\sin (H + K)$ 9.9991
 \dots $\sec \delta$ 0.0490
 8.8239

$\log q$ 9.6805
 \dots q 9.3961

$\log h$ 9.93545
 $\log h$ 9.93166

f + 1.342
 g + 0.228
 h + 5.863
 $+ 2.958$

q' + 4.792
 h' + 6.989
 \dots -2.247
 $+ 6.569$

1
16
3
3
21
23
3
24
2
2
15
3
2
10

12296

21

Star Measures

L	1 6000	1 8528	1 6500	1 6186
162	1 4370	1 0150	1 1652	1 1030
55'	70	54	48	30
	00	28	00	86
	<u>1 61630</u>	<u>1 61624</u>	<u>5 4850</u>	<u>5 4844</u>

3	1 7078	1 7640	1 7835	1 7120
21.6	1 2198	1 2520	1 0240	1 4710
23.8	00	22	42	14
	78	40	35	20
	<u>21.4879</u>	<u>21.4881</u>	<u>23.7594</u>	<u>23.7592</u>

3	1 7504	1 6004	1 6168	1 6593
24.4	1 3640	9 870	9 492	1 3270
23.7	40	74	92	72
	04	04	68	93
	<u>34.3864</u>	<u>34.3868</u>	<u>23.6676</u>	<u>23.6678</u>

Moon Measures

L	1 8904	1 6252
23	1 7592	7 5495
151	02	53
	04	52
	<u>15.1307</u>	<u>15.1299</u>

3	1 6253	1 6048
22	9 0707	1 3212
15.8	76	20
	53	48
	<u>15.7180</u>	<u>15.7168</u>

3	1 6510	1 7576
21.8	8 5232	1 5550
16.0	31	54
	10	76
	<u>21.7984</u>	<u>21.7976</u>

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21

Star Measures

L	16000	18528	16500	16186
162	14370	10150	11652	19030
55	70	54	48	30
	00	28	00	86
	<u>161830</u>	<u>161624</u>	<u>54850</u>	<u>54844</u>

3	17078	17640	19835	17120
1.6	12198	12520	10240	14710
23.8	00	22	42	14
	78	40	35	20
	<u>214879</u>	<u>214881</u>	<u>237594</u>	<u>237592</u>

2	17504	16004	16168	16593
44	13640	9870	9492	13270
23.7	40	74	92	72
	04	04	68	93
	<u>343864</u>	<u>343868</u>	<u>236676</u>	<u>236678</u>

Moon Measures

L	18904	16252
23	17592	75495
151	02	53
	04	52
	<u>151307</u>	<u>151299</u>

2	18253	16048
22	9070	13212
158	70	20
	53	48
	<u>157180</u>	<u>157168</u>

3	16510	17576
218	8523	15550
160	31	54
	10	76
	<u>217984</u>	<u>217976</u>

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Moon Measures.

22

4 16525 16950
 21.6 1115855 1233531
 16.9 52 27
 25 50
21.5370 21.5381

5 16570 16898
 21.9 7792 1568688
 18.0 92 90
 70 98
21.8778 21.8790

6 16570
 22 1547068
 18.1 62
 60
18.1492

16960 16353
 1547066 7843
 62 43
 60 53
18.1494 18.1490

7
 23.1
 18.8

16422 16910
 905348 1426671
 43 76
 22 10
18.7374 18.7361

8
 23.3
 18.8

16098 16572
 836265 14297
 68 77
 98 72
18.7733 18.7725

2296

Moon Measures.

22

4	165°25'	169°50'
1.6	111°58'55"	123°35'31"
6.9	52	27
	25"	50
	<u>21.5370</u>	<u>21.5981</u>

5	165°70'	168°98'
1.9	77°92'	156°26'88"
8.0	92	90
	70	98
	<u>21.8778</u>	<u>21.8790</u>

1	164°20'
2	154°70'55"
0.1	62
	60
	<u>18.1492</u>

169°60'	163°53'
154°70'88"	78°43'
62	43
60	53
<u>18.1494</u>	<u>18.1490</u>

164°22'	169°10'
90°53'48"	142°66'71"
43	76
22	10
<u>18.7374</u>	<u>18.7361</u>

160°98'	165°72'
83°62'05"	142°47'
68	77
98	72
<u>18.7733</u>	<u>18.7725</u>

12296

Times Etc.

23.

Date Feb 3. 1917

Exp. to Stars	05	50		0.6	02	
" " Moon	05	56	15.5	05	56	15.9
Clock fast.		13	34.6			
H. Sid. Time	05	42	41.1	✓	" 0 - - 1 ^h 08 ^m	
H. Long.	04	44	31.05			
G. Sid. Time	10	27	12.15	✓		
" " " M.M.	20	52	22.13	✓		
Interval	13	34	50.12	✓		
Red		02	13.49	✓		
G. M.T.	13	32	36.63	✓	13 ^h 54 35 ^m	✓

From Naut. Alman.

R.A.

Dec.

Moon 13	06	48	48.42	✓ +23	46	21.9	✓
Motion 1 ^m			2.1349	✓		- 5.209	✓
" 32.6105	✓	01	09.62	✓	- 02	- 49.4	✓
Lakular Place	06	49	58.04	✓ +23	43	32.0	✓

Moon's Age 12d.

934" = 14.4

$$\begin{array}{r}
 a = -50.5.8 \\
 + 24.0 \\
 \hline
 -478.8
 \end{array}$$

Parallax

Semi-diam

R

Aug

Feb 3

R

R

a R

11 + a R

R 2

54	11.8
14	47.8
	887.8
	13.0
	-0.5
	900.3
	1.9299
	-9.24
	1.8375
	3.3764

12296

Times Etc.

23.

Date Feb 3 1917

Exp. to Stars	05	50		06	02
" " Moon	05	56	15.5	05	56 15.9

Clock fast		13	34.6		
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H Sid Time	05	42	41.1	"E--1 ^h 08 ^m
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H Gang	04	44	31.05	
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G Sid Time	10	27	12.15	
------------	----	----	-------	--

" " " M.N	20	52	22.13	
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Interval	13	34	50.12	
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Red		02	13.49	
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G. M.T	13	32	36.63	13 ^h 54 ^m 35 ^s
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Transit Mount Alt

R A

Dec.

Moon 13	06	48	48.42	+23	46	21.9
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Moon 1			2.1349			5.209
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" 32.6115"		01	09.62		02	+49.9
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Lakular Place	06	49	58.04	+23	43	32.0
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Moon's Age 12d.

434" = 14.4

Parallax 54 17.8

Semi-diam 14 47.8

R 887.8

Avg 13.0

Dist 3 -0.5

R 900.3

R 1929.9

G.R -9.24

H+H.R 1.8375

R2 337.64

a: -503.8

+24.0

-478.8

12296.

Plate Constants.

24

$$\begin{array}{r} \chi \quad 16.1627 \\ \xi \quad 16.1831 \\ \chi - \xi \quad - \quad 0204 \end{array}$$

$$\begin{array}{r} 21.4880 \\ 21.6974 \\ - \quad 2094 \end{array}$$

$$\begin{array}{r} 34.3866 \\ 35.2451 \\ - \quad 8584 \end{array}$$

$$\begin{array}{r} \eta \quad 5.4847 \\ \eta \quad 4.3653 \\ \chi - \eta \quad + 1.1194 \end{array}$$

$$\begin{array}{r} 23.7593 \\ 23.5817 \\ + 1776 \end{array}$$

$$\begin{array}{r} 23.6677 \\ 23.5398 \\ + 1279 \end{array}$$

$$\chi - \xi + 500 \chi$$

$$- 43.18$$

$$+ 28 \chi - 7686$$

$$- 0204 + 8081 = 7877 - 236 = 7641 + 45 = 7686$$

$$- 2094 + 10744 = 8650 - 1024 = 7626 + 60 = 7686$$

$$- .8584 + 17193 = 8609 - 1020 = 7589 + 96 = 7685$$

$$233765 + 11688 = 730 + 65 = 237102$$

$$\begin{array}{r} \chi - \eta \quad + 42.2 \chi \quad + 3 \chi - 14635 \\ + 1.1194 + 2742 = 13936 + 682 = 14618 + 16 = 14634 \\ + 1776 + 11880 = 13656 + 907 = 14563 + 71 = 14634 \\ + 1279 + 11834 = 13113 + 1451 = 14564 + 71 = 14635 \\ 16.9341 + 8467 = 986 + 51 = 164210 \end{array}$$

$$\begin{array}{r} \text{Table } a = +0.6 \quad c = +0.4 \quad a - c = +0.2 \quad b + d = -0.2 \\ - 502.8 \quad - 503.0 \quad + 0.2 \quad + 0.9 \\ - 503.4 \quad - 503.4 \quad 0 \quad + 1.1 \end{array}$$

12296.

Plate Constants.

24

$$\begin{array}{r} \chi \quad 16 \ 16 \ 27 \\ \underline{\quad 3 \quad 16 \ 18 \ 31} \\ 1-\eta \quad - \quad 02 \ 04 \end{array}$$

$$\begin{array}{r} 21 \ 48 \ 80 \\ \underline{21 \ 69 \ 74} \\ - \quad 20 \ 94 \end{array}$$

$$\begin{array}{r} 34 \ 38 \ 66 \\ \underline{35 \ 24 \ 50} \\ - \quad 85 \ 84 \end{array}$$

$$\begin{array}{r} \chi \quad 5 \ 48 \ 47 \\ \underline{\quad \eta \quad 4 \ 36 \ 53} \\ 1-\eta \quad +1 \ 11 \ 94 \end{array}$$

$$\begin{array}{r} 23 \ 75 \ 93 \\ \underline{23 \ 58 \ 17} \\ + \quad 17 \ 76 \end{array}$$

$$\begin{array}{r} 23 \ 66 \ 77 \\ \underline{23 \ 53 \ 98} \\ + \quad 12 \ 79 \end{array}$$

$$\begin{array}{rcl} -S + 5.00 \chi & & -43.1\chi & +28.1 -76 \\ 0.204 + 80.81 & = & 78.77 - 236 & = 76.41 + 45 = 76 \\ 20.94 + 107.44 & = & 86.50 - 10.24 & = 76.26 + 60 = 76 \\ 8.584 + 171.93 & = & 86.09 - 10.20 & = 75.89 + 96 = 76 \\ 23.3765 + 116.88 & & -730 & + 65 = 23.102 \end{array}$$

$$\begin{array}{rcl} 1-\eta & & +42.2\chi & +3\chi -14635 \\ 4.1194 + 27.42 & = & 13.936 + 65.2 & = 1 + 681 + 16 = 14634 \\ -17.76 + 118.80 & = & 136.56 + 9.07 & = 145.63 + 71 = 14634 \\ +12.79 + 118.34 & = & 131.13 + 14.51 & = 145.64 + 71 = 14635 \\ 16.9341 + 84.67 & & +986 & +51 = 164210 \end{array}$$

$$\begin{array}{rclcl} \text{after } a = +0.6 & c = +0.4 & a-c = +0.2 & b+d = -0. \\ -502.8 & -503.0 & +0.2 & +0. \end{array}$$

12296

Mean Center

25

1	23.0000	-0.3760	0.1414	33814	+	50
2	22.0000	-1.3760	1.8934	33711	-	53
3	21.7962	-1.5798	2.4958	33663	-	101
4	21.5376	-1.8384	3.3797	33797	+	33
5	21.8784	-1.4976	2.2428	33813	+	49
6	22.0000	-1.3760	1.8934	33730	-	34
7	23.0000	-0.3760	0.1414	33814	+	50
8	23.3760	-0.0000	0.0000	33852	+	88
				33764		

1	15.1330	-1.8000	3.2400	192
2	15.7174	-1.2156	1.4777	228
3	16.0000	-0.9330	0.8705	239
4	16.9330	-0.0000	0.0000	270
5	18.0000	+1.0670	1.1385	306
6	18.1492	+1.2162	1.4796	312
7	18.7330	+1.8000	3.2401	348
8	18.7729	+1.8399	33852	360

Range 168

V = 22

y = 15.7174

18.1492

33.8666

y₀ 16.9333

y max 18.7729

R 1.8396

com R 1.8375

X min 21.5376

23.3751

Mean Center {

X₀ 23.3760

Y₀ 16.9330

12296

Moon Center

25

1	23 0000	-03760	0.1414	33814	+50
2	22 0000	-1.3760	1.8934	33711	-53
3	21.7962	-1.5798	2.4958	33663	-101
4	21.5376	-1.8384	3.3797	33747	+33
5	21.8784	-1.4976	2.2428	33813	+49
6	22 0000	-1.3760	1.8934	33730	-34
7	23 0000	-03760	0.1414	33814	+50
8	23.3760	-0 0000	0 0000	33852	+88
				3.3764	

1	15.1330	-18000	2400	892
2	15.7174	-1.2156	1.4777	228
3	16 0000	-09330	0.8705	239
4	16.9330	-0 0000	0.1000	270
5	18 0000	+10670	1.1385	316
6	18.1492	+12162	1.4796	312
7	18.7330	+12011	3.2401	348
8	18.7729	+18399	33852	-360

Range 16.8

V = 22 Y = 15.7174

18.1492

33.8666

Y₀ 16.9333Y_{max} 18.7729

R 1.8396

Cm R 1.8375

X_{min} 21.5376

23.3751

Moon Center

X₀ 23.3760

Y₀ 16.9330

12296

Moon's Mean Position

26

$$\begin{array}{r} X_0 \quad 23.3760 \\ + \quad 5 \\ \hline 23.3765^{\vee} \end{array}$$

$$\begin{array}{r} y_0 \quad 16.9330 \\ + \quad 11 \\ \hline 16.9341^{\vee} \end{array}$$

$$\begin{array}{r} 23.7102^{\vee} \\ 22 \\ + 1.7102 \end{array}$$

From Plate Constants

$$\begin{array}{r} 16.4210^{\vee} \\ 18 \\ \hline -1.5790 \end{array}$$

$$\begin{array}{r} \log S_0 \quad 0.23305^{\vee} \\ \log \cos \delta_0 \quad 996265^{\vee} \\ \quad 850724 \\ \sin \alpha - A \quad 1.76316^{\vee} \end{array}$$

$$\begin{array}{r} \log \tan \delta \quad 9.6366^{\vee} \\ \log S_0^2 \quad 0.4661^{\vee} \\ \quad 7.0534 \\ \log n_1 \quad 7.1561^{\vee} \end{array}$$

$$\alpha - A \quad + \quad 57.96^{\vee}$$

$$\begin{array}{r} n_1 \quad +0.0014 \\ n_0 \quad -1.5804 \end{array}$$

$$A \quad 06 \quad 49 \quad 49.46$$

$$\alpha_0 \quad 06 \quad 50 \quad 47.42^{\vee}$$

$$\begin{array}{r} \log n_0 \quad 0.19877^{\vee} \\ \quad 7.33115^{\vee} \end{array}$$

$$\text{Red} \quad 2.86$$

$$\log \tan \delta - \delta \quad 2.86762^{\vee}$$

$$\alpha' \quad 06 \quad 50 \quad 50.28^{\vee}$$

$$\begin{array}{r} \delta - \theta \quad -737.3^{\vee} \\ \quad -12 \quad 17.3^{\vee} \\ \delta \quad +23 \quad 37 \quad 43.0 \end{array}$$

$$\delta_0 \quad +23 \quad 25 \quad 25.7^{\vee}$$

$$\text{Red} \quad -0.5$$

$$\delta' \quad +23 \quad 25 \quad 25.2$$

12296

Means Means Position

26

$$\begin{array}{r} X_0 \quad 23.3760 \\ + \quad 5 \\ \hline 23.3765 \end{array}$$

$$\begin{array}{r} y_0 \quad 16.9330 \\ + \quad 11 \\ \hline 16.9341 \end{array}$$

From Plate Constants

$$\begin{array}{r} 23.7102 \\ 22 \\ \hline + 1.7102 \end{array}$$

$$\begin{array}{r} 16.4210 \\ 18 \\ \hline - 1.5790 \end{array}$$

$$\begin{array}{r} \log S_0 \quad 0.23305 \\ \log m_0 \quad 9.96265 \\ 8.50724 \\ \log x-4 \quad 1.76316 \end{array}$$

$$\begin{array}{r} \log \tan \delta \quad 9.6366 \\ \log S_0 \quad 0.4661 \\ 7.0539 \\ \log m_1 \quad 7.1561 \end{array}$$

$$x = A \quad + \quad 57.46$$

$$\begin{array}{r} m_1 \quad +0.0014 \\ m_0 \quad -1.5804 \end{array}$$

$$A \quad 06 \quad 49 \quad 49.46$$

$$x_0 \quad 06 \quad 50 \quad 47.42$$

$$\begin{array}{r} \log m_1 \quad 0.19877 \\ 7.33115 \end{array}$$

$$\text{Red} \quad 286$$

$$\log \tan \delta - 2$$

$$x' \quad 06 \quad 50 \quad 50.28$$

$$\begin{array}{r} S-R \quad -7373 \\ -12 \quad 17.3 \\ E \quad +23 \quad 27 \quad 4.3 \end{array}$$

$$S_0 \quad +23 \quad 25 \quad 25.7$$

$$\text{Red} \quad -0$$

$$S' \quad +23 \quad 25 \quad 25$$

Formation of Normals.

1	+ 0.68	- 19.0	- 90.0
2	+ 1.67	+ 73.2	+ 64.2
3	+ 1.49	+ 161.7	+ 94.0
4	+ 0.00	- 60.8	- 0.0
5	- 1.61	- 73.5	+ 52.4
6	- 1.68	+ 47.0	- 41.4
7	- 0.68	- 19.0	+ 90.0
8	- 0.00	- 0.0	+ 161.8
	+ 3.84	+ 281.9	+ 462.4
	- 3.97	- 172.3	- 131.4
	- 0.13	+ 109.6	+ 331.0

	a	b	c	d - e	
a	- 46	+ 18	- 16	- 64	+ 29
		+ 64	- 11	- 13	- 26
b	+ 9	+ 74	- 8	0	- 65
		+ 85	0	+ 19	+ 69
c	- 66	+ 69	+ 10	+ 13	+ 52
		+ 64	+ 11	+ 9	- 39
		+ 18	+ 16	- 32	- 19
		+ 0	+ 17	- 49	- 12

12296

Conditional Equations

27

							O-C	
1	-0.38	-1.80	= +50	-3	-40	= -43	+93	9
2	-1.38	-1.21	= -53	-13	-27	= -40	-13	
3	-1.60	-0.93	= -101	-15	-21	= -36	-65	
4	-1.84	-0.00	= +32	-17	0	= -17	+50	
5	-1.50	+1.07	= +49	-14	+24	= +10	+39	
6	-1.38	+1.22	= -34	-13	+27	= +14	-48	
7	-0.38	+1.80	= +50	-3	+40	= +37	+13	
8	-0.00	+1.84	= +88	0	+41	= +41	+47	

+242 - 126

or 46

$$+12.19 = +10.13 = +109.6 \quad -8.46$$

$$-0.13 + 14.83 = +331.0 \quad +1.99$$

$$+ () - .01 = + 1.2$$

+ 0.13 Δ

$$+14.82 = +332.2$$

$$b = +22.4^{\circ}$$

$$+12.19 = +109.6 + 1.2 = +110.8 \quad a = +19.1^{\circ}$$

-0.69 Δ

arc 168

$$\frac{P}{\pi} = .27^{\circ}$$

$$\frac{\Sigma r}{\pi} = +14.5^{\circ}$$

$$\frac{+14.5^{\circ}}{27} = +53.7^{\circ}$$

$$\Delta R = +0.7^{\circ}$$

Cover +0.9

$$\text{True } \Delta R = -0.2$$

$$R = 1.84^{\circ}$$

$$-2RC = -3.30^{\circ}$$

$$\Delta t = -0.43 \quad \Delta \delta = -0.2$$

$$\Delta \alpha = +0.28 \quad \Delta \alpha = +0.08$$

12296

Conditional Equations

27

O-C

1	-0.38	-1.80	= +50	-3	-4.0	= -43	+93.59
2	-1.38	-1.21	= -53	-13	-27	= -41	-13.5
3	-1.60	-0.93	= -101	-16	-21	= -36	-65.5
4	-1.84	-0.00	= +32	-17	0	= -17	+50.5
5	-1.50	+1.07	= +49	-14	+24	= +10	+39.5
6	-1.38	+1.22	= -34	-13	+27	= +14	-48.5
7	-0.38	+1.80	= +50	-3	+40	= +37	+13.5
8	-0.00	+1.84	= +88	0	+41	= +41	+47.5
						+242	-126

W.

$$+12.19 - 0.13 = +109.6$$

$$-8.46$$

$$-0.13 + 14.53 = +331.0$$

$$+1.99$$

$$+1.1 - 0.1 = +1.2$$

$$+0.13 \Delta$$

$$+14.82 = +332.2$$

$$1.2 = +22.4$$

$$+12.19 = +109.6 + 1.2 = +110.8$$

$$1.2 = +19.2$$

$$-0.69 \Delta$$

arc 168

$$\frac{P}{\lambda} = .27$$

$$\frac{\lambda}{\lambda} = +14.5$$

$$\frac{+14.5}{.27} = +53.7$$

$$\Delta R = +0.1$$

$$\text{corr} = +0.9$$

$$\text{True } \Delta R = -0.2$$

$$R = 1.64$$

$$-2RC = -3.30$$

$$\Delta t = -0.43 \quad \Delta \delta = -0.2$$

$$\Delta \alpha = +0.28 \quad \Delta \lambda = +0.08$$

12296

Reduction to Apparent Place

28

$$H + \alpha' \quad 4 \quad 0.17 \quad 60^\circ \quad 25.5' \quad \delta_0 \quad +23^\circ \quad 25.4'$$

$$H \quad 21 \quad 10.9$$

$$\alpha_0 \quad 06 \quad 50.8$$

$$G \quad 22 \quad 47.8$$

$$G + \alpha' \quad 5 \quad 38.6$$

$$84 \quad 39.0 \quad \log(11) \quad 0.7210m$$

$$\cos G + \alpha_0 \quad 8.9696$$

$$g \quad 0.9727$$

$$\sin G + \alpha_0 \quad 9.9981$$

$$\tan \delta_0 \quad 9.6367$$

$$8.8239$$

$$\log g' \quad 9.9423$$

$$g \quad 9.4314$$

$$l \quad +1.362$$

$$g \quad +0.270$$

$$h \quad +1.226$$

$$Red \quad +2.858$$

$$\log \cos i, \quad 9.9626$$

$$\log i \quad 0.7584m$$

$$\log(11) \quad 0.7210m$$

$$\sin \delta_0 \quad 9.5994$$

$$\cos H + \alpha_0 \quad 9.6933$$

$$h \quad 1.2934$$

$$\sin H + \alpha_0 \quad 9.9338$$

$$\sec \delta_0 \quad 0.0374$$

$$8.8239$$

$$\log h' \quad 0.5861$$

$$h \quad 0.0885$$

$$g' \quad +0.875$$

$$h' \quad +3.856$$

$$i \quad -5.261$$

$$Red \quad -0.530$$

12296

Reduction to Apparent Place

28

$$H + x' \quad 4 \quad 0.17 \quad 60^\circ \quad 25.5' \quad \delta_0 \quad +23^\circ \quad 25.4'$$

$$H \quad 21 \quad 10.9$$

$$\alpha_0 \quad 06 \quad 50.8$$

$$G \quad 22 \quad 47.8$$

$$G + x' \quad 5 \quad 38.6 \quad 84 \quad 39.0 \quad \log III \quad 0.7210$$

$$\cos C + x_0 \quad 89696$$

$$G \quad 0.9727$$

$$\sin C + x_0 \quad 99981$$

$$\tan \delta_0 \quad 96367$$

$$88239$$

$$\log q' \quad 9.9423$$

$$q \quad 9.4314$$

$$J \quad +1.362$$

$$G \quad +0.270$$

$$h \quad +1.226$$

$$R_A \quad +2.858$$

$$\log \cos \delta_0 \quad 9.9626$$

$$\log I \quad 0.7584$$

$$\log III \quad 0.7210$$

$$\sin \delta_0 \quad 9.5994$$

$$\cos H + x_0 \quad 96933$$

$$h \quad 1.2934$$

$$\sin H + x_0 \quad 99338$$

$$\sec \delta_0 \quad 0.1374$$

$$88239$$

$$\log R' \quad 0.5861$$

$$h \quad 0.0885$$

$$g' \quad +0.875$$

$$h' \quad +3.856$$

$$i \quad -5.261$$

$$R_i \quad -0.530$$

12296

Lunar Parallax.

29

α' 06 50 50.28 ✓
 θ 05 42 41.1 ✓
 $\theta - \alpha'$ - 1 08 09.18 ✓
 $=$ - 170 02 17.70 ✓
 $\frac{1}{2} \alpha - \alpha'$ 06 25.00
 $\theta - \alpha' - \frac{1}{2} \alpha - \alpha' - 16$ 55 52.80

Π 54 11.8 ✓
 $\log \sin \Pi$ 9.86913
 $\sin \theta - \alpha'$ 8.19768 ✓
 $\sec \delta'$ 9.46688 ✓
 $\sin \alpha \alpha'$ 0.03835 ✓
 $\sin \alpha \alpha'$ 7.57204 ✓

$\cos \frac{1}{2} \alpha - \alpha'$ 9.95727
 $\sec \theta - \alpha'$ 0.00000
 $\log \tan \gamma$ 0.01924 ✓
 $\log \tan \gamma$ 9.97651 ✓

$\alpha \alpha'$ - 12 50 ✓
 $=$ - 51.533

γ 43 27 04.8 ✓
 δ 23 25 25.2 ✓
 $\gamma - \delta$ 20 01 39.6 ✓

$\log \sin \Pi$ 9.82640
 $\sin \gamma - \delta'$ 8.19768 ✓
 $\cos \gamma$ 9.53463 ✓
 $\sin (\delta - \delta')$ 0.16258 ✓
 $\sin (\delta - \delta')$ 7.72129

$\delta - \delta'$ + 18 05.7 ✓

δ 23 43 30.9 ✓

$\gamma - \delta$ + 23 43 32.0 ✓

$\delta - \epsilon$ - 1.1 ✓

curr + 0.7 ✓

2nd Clid. Ref 0.0

δ + 23 43 31.6
 $\delta - \epsilon$ - 0.4

α 06 49 58.95 ✓

$\gamma - \alpha$ 06 49 58.04 ✓

$\delta - \epsilon$ + 0.915

curr. - 0.03 ✓

α 06 49 58.92

$\delta - \epsilon$ + 0.88

12296

Lunar Parallax

29

α' 06 50 50.28
 θ 05 42 41.0
 $\theta - \alpha'$ -1 08 09.18
 γ -170 02 17.70
 $\frac{1}{2} \alpha - \alpha'$ 06 25.00
 $\theta - \alpha' - \frac{1}{2} \alpha - \alpha' = 16$ 53 52.70

π 54 11.8
 $\log \pi$ 9.86913
 $\sin \theta - \alpha'$ 9.46688
 $\sin \theta$ 003835
 $\sin \alpha - \alpha'$ 7.57204

$\cos \frac{1}{2} \alpha - \alpha'$ 9.95727
 $\sin \theta - \alpha'$ 0.00000
 $\log \tan \gamma$ 0.01924
 $\log \tan \gamma$ 9.97651

$\alpha - \alpha'$ -1 2 50
 $=$ - 51.533

γ 43 27 09.8
 δ' 23 25 25.2
 $\gamma - \delta'$ 20 01 39.6

$\log \sin \pi$ 9.82640
 $\sin \gamma - \delta'$ 8.19768
 $\cos \gamma$ 9.53463
 $\sin (\theta - \delta')$ 0.16258
 $\sin (\theta - \delta')$ 7.72129

$\delta - \delta'$ 18 05.7

δ 23 43 30.9

$\gamma - \delta$ +23 43 32.0

$\delta - \epsilon$ -1.1

$\cos \gamma$ +0.7

2nd Obs. Ref 0.0

δ +23 43 31.6
 $\delta - \epsilon$ -0.9

α 06 49 58.95

$\gamma - \alpha$ 06 49 58.04

$\delta - \alpha$ +0.91

$\cos \gamma$ -0.03

α 06 49 58.92

$\delta - \alpha$ +0.88

10^3	151303	167174
	187367	181497
	338670	338666
y_0	169335	169333
y_{max}	187739	187729
R	18394	18396
$\text{conv } R$	18375	
x_m	<u>215376</u>	
	233751	

Handwritten calculations on graph paper:

Top left:
$$\begin{array}{r} 262 \\ 222 \\ \hline 1601 \end{array}$$

Top right:
$$\begin{array}{r} 200 \\ 200 \\ \hline 400 \end{array}$$

Bottom left:
$$\begin{array}{r} 200 \\ 200 \\ \hline 400 \end{array}$$

Bottom right:
$$\begin{array}{r} 200 \\ 200 \\ \hline 400 \end{array}$$

