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KG
11366
v.985

CXXXII

132

Plate	Date	Page
9198	Sept. 21 '15	1
9249	Sept. 23 '15	11
9250	"	21

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Harvard Lunar Plates
Measures and Reductions

Martha C. Burton.

9/'16

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9/95

Star Measures, 1

	d	x	r	d	r
1	17247		19926	18986	19126
17.3	13566	71	13622	17512	10086	79
10.1	7676		2629	12	7279
	78		30	96	80
	17.3677		17.3694	10.0974	10.0940
2	18160		19240	16948	19622
24+	17766	66	9660	14520	12052	58
30.3	66		6060	1417	64
	70		40	50	86
	24.0398		24.0420	30.2432	30.2912
3	17720		16960	16450	16198
32.1	16492	00	8206	11838	10772	75
19.6	508		0003	4240	78
	22		66	58	202
	32.1220		32.1236	19.4614	19.4574

Moon Measures

1		17590	16500
22.6		16176	7916	09
14.2		43	892
–		40	06
		92	
		14.1478	14.1398
2		16616	16438
22		14886	86106
17.3		88	02
		90	37
		24	
		14.2130	14.2172
3		16668	16378
21		7890	15778	89
14.9		86	200
		82	82
		70	
		14.8788	14.8810

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1915

Star Measures.

	1	2	4	
	17249	19926	18986	19126
1	13566	13622	17512	13686
1.3	7611	2629	12	72
0.1	78	30	76	40
	17.3677	11.6994	10.0974	10.2940
	18160	19240	16948	17622
1	17766	17660	19320	12032
0.3	66 66	60 60	1417	64
	70	40	50	86
	24.0394	1.0920	30.2432	30.2912
3	17720	16960	16950	11198
32.1	16492	12206	11838	10772
19.6	3088 00	0003	7270	78
	22	66	58	202
	32.1220	32.1236	19.7617	19.9578

Moon Measures

		17390	16200
2.6		16176 43	7916 09
8.2		70	392
		92	06
		14.1795	14.1395
2		16616	16938
22		14786 88	12610 06
19.2		70	02
		29	37
		14.2130	14.2172
3		16668	16378
21		17890 86	15478 89
19.9		52	200
		70	42
		14.8729	14.8810

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Moon Measures

4	20 5 5 2	20290
20.9	11450	19712
15	8849	0006
	62	319
	20.9112	20.9117
5	19602	19270
20.7	13767 62	15118 15
16	606	12
-x	596	90
	20.5836	20.5836
6	19640	19252
20.7	11477 81	17447 33
17	88	22
	32	62
	20.8166	20.8180
7	16090	19788
21	8764 43	17026
17.2	22	3229
	100	80
	17.2646	17.2738

slant

18596	17508		
15836 24	10207 0R		
12	00		
08	22		
17.2774	17.2680		

8	19762	18982
22	10378 38	18366 74
17.9	28	82
	80	9010
	17.9770	17.9390

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7193

Moon Measures

4	20 5 5 2	2 0 2 9 0
20.9	1 1 4 5 0	1 9 7 1 2
13	9 8 79	0 0 06
	6 2	3 1 7
	20 9 1 1 2	20.9 1 1 7
5	1 7 6 0 2	1 9 2 7 0
20.7	1 3 7 6 7 62	1 5 1 1 8 13
16	6 0	1 2
- x	5 9 6	9 0
	20 5 8 3 6	20.5 8 3 6
6	1 9 6 9 0	1 9 2 5 2
20.7	1 1 9 7 9 81	1 7 9 4 4 33
17	8 8	2 2
	3 2	6 2
	20.8 1 6 6	20.8 1 8 0
7	1 6 0 9 0	1 9 7 8 8
21	8 7 6 4 93	17 2 6
17.2	2 2	3 2 29
Slant	1 0 0	8 9
	17.2 6 4 6	17.2 7 5 8

	1 8 5 4 6	1 7 5 0 7
	1 5 8 3 6 27	1 0 2 0 7 0 2
	1 2	0 0
	0 8	2 2
	17.2 7 7 9	17.2 6 8 0

8	1 9 7 6 2	1 8 9 8 2
22	1 0 3 9 8 38	1 5 3 6 67
17.9	2 8	8 2
	8 0	1 0 1 0
	17 9 9 7 0	17.9 3 9 0

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9195 Times & Etc.

Sept. 21-'15

Exp. to Stars	21	42		21	57	
" " Moon	21	47	30.2	21	47	30.4
Clock fast		2	20.8			
M. Sid Time	21	45	09.5	α =	1h	06
M. Long.	4	44	31.05			
G. Sid "	26	29	40.55			
Sid T. M. N.	11	57	7.45			
Interval	14	32	33.10			
Reduction		2	22.95			
G. M. T.	14	30	10.15			

From Naut. Alm.,			R. A.		Dec.
Moon 14h	22	50	07.46	− 5	02 42.9
Motion m/m			19861		+ 15.125
" 30.1692			59.92	+ 7	36.3
Tabular Place	22	51	07.38	− 4	55 06.6

Moon's Age 13 days

Parallax	57 15.68
Semid.	15 37.7
R.	937.7
Aug.	10.2
Sem. 3	− 0.3
R.	947.6
R.	2.0313
ak.	− 967
0+a)R.	1.9346
R	3.7427

934 = 10.2 −

q = −499.9

24

− 475.9

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9.19 5" Jones & Etc.

Sept. 21-'15"

Exp to Stars	21	42		- 21	59	
" Moon	21	97	30.2 -	21	97	30.4 -
Clock fast		2	20.8 -			
M. Sid Time	21	45	09.3" -	4-X = -	1h	06
M. Long	4	44	31.0" -			
G. Sid "	26	29	40.3" -			
Sid T. M. N.	11	57	7.93 -			
Interval	14	32	32.10 -			
Reduction		2	22.95" -			
G. M. T.	14	30	10.15" -			

From Naut Alm. R.A. Dec.

Moon 14h	22	50	07.76"	- 5	02	42.9 "
Mo Moon in 1h			1.9861 "		+ 15	.123" -
" .30.1692			59.92 "	+ 7	36	3 "
Sidereal Hour	22	51	07.38"	- 4	55	06.6 "

Moon's Age 13 days

Parallax	57 15.68"
Semid.	15 37.7
	937.7
Aug.	10.2
Dec 3	- 0.3
	947.6
	2.0313
	- 967
(1+4)k	1.7346
k =	3.7721

934 = 10.2 -

4 = -499.7

29

-4759

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9195 Plate Constants. 4

x	17.3684	24.0407	32.1228
ξ	17.9079	24.9646	33.8218
$x-\xi$	− 5365	− 9239	− 12990

y	10.0957	30.2422	19.8594
η	9.7713	30.5878	19.2347
$y-\eta$	+ 6544	− 3456	+ 2247

$x-\xi$	$+500x$	$+2684$	$+17x$	-3589	
− 5365	+ 8684 = + 3319	+ 2771 = +3590	+ 2 = + 3588	= −1	
− 9239	+ 12020 = + 2781	+ 8710 = +3591	+ 2 = + 89	= 0	
− 12990	+ 16061 = + 3071	+ 5226 = +3592	+ 3 = + 89	= 0	
22.5186	+ 11259	+ 431	− 2 =	23.3285	

$y-\eta$	$+500y$	$-28.9x$	$+7.7y$	-11133	
+ 6544	+ 5048 = +11592	− 502 = + 11090	+ 44 = +11134	= +1	
− 3456	+ 15121 = +11665	− 695 = + 10970	+ 133 = + 33	0	
+ 2247	+ 9730 = +11977	− 929 = + 11048	+ 85 = + 33	0	
16.0775	+ 8039	− 651	+ 71 =	15.7101	

Tables	$a = +.4$	$e = -3.4$	$q-e = +3.8$	$f+d = +2.$
Obs.	$= -799.9$	$= -504.4$	$= +8.5$	$= +2.1$
O-C	− 5003	− 5010		+ 0.1

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1915.5 Plate Constants

x	17.3684	29.0907	32.1228
y	17.9079	27.9676	33.1218
x-y	− .5395	+ .9239	−1.2990

q	10.0957	30.2922	19.9599
n	9.9913	30.3878	19.2397
q-n	+.1044	− .0956	+.7202

x-y	+.020x	+.284	−.1x	−.39	
−.5395	+.0084	= +.3319	+.271	= +.3590	−.2 = +.3588	= −1
−.9239	+.1202	= +.2781	+.870	= +.3651	−.2 = +.0089	= 0
−1.2990	+.1606	= +.3071	+.326	= +.3392	−.3 = +.0089	= 0
22.2186	+1.1259		+.431		−.2 = 23.3284	

q-n	+.020q	−.28.9x		+.7.7q	−.111.3
+.0644	+.0045	= +.1139	−.002	= +.1109	+.004 = +.1139	= +1
−.0956	+.1121	= +.1165	−.006	= +.1100	+.013 = +.0033	0
+.7202	−.0720	= +.1977	−.029	= +.1648	+.085 = +.0033	0
16.0773	+.8039		−.651		+.071 = 15.7101	

Tables $a = +.4$ $e = -3.9$ $a-e = +3.5$ $1+d = +2$

Obs. $= -899.9$ $= -504.4$ $= +9.5$ $= +2.$

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A = − 2
B = + 3. 2



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9195

5

Moores Center

	x	x-x0	Δx	(x-x0)²	(x-x0)²+(y-y0)²	O-C
1	22.5180	0.0000	+4	0.0000	3.7493	+66
2	22.0000	-0.5180	+4	0.2679	3.7405	-22
3	21.0000	-1.5180	+2	2.3037	3.7406	-21
4	20.9113	-1.6067	+2	2.5808	3.7436	+8
5	20.5836	-1.9344	0	3.7419	3.7419	-8
6	20.8173	-1.7007	-2	2.8937	3.7437	+10
7	21.0000	-1.5180	-2	2.3049	3.7331	-96
8	22.0000	-0.5180	-4	0.2687	3.7436	+9

C = 3.7427

	y	y-y0	Δy	(y-y0)²	∠
1	-14.1423	-1.9357	-6	3.7493	+180°
2	14.2151	-1.8629	-6	3.4726	195°
3	14.8794	-1.1983	-4	1.4369	231°
4	15.6000	-1.0780	-3	1.1627	235 236
5	16.0780	0.0000	0	0.0000	+270°
6	17.0000	+0.9220	+3	0.8506	298°
7	17.2727	+1.1947	+4	1.4282	309°
8	17.9415	+1.8635	+6	3.4749	345°

165°

Approx Center

x = 22 y = 14.2151
+ 17.9415
32.1566
y0 = 16.0783
ymin = 14.1823
R = 1.9360
xmin = 20.5836
x0 = 22.5180

Moores Center x0 = 22.5180
y0 = 16.0780

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5

Moons Center

	x	x - x0	Δx	(x - x0)²	(x-x)(y-y)	O - C
1	22.5180	0.0000	+1	0.0000	3.1993	+66
2	22.0000	-0.5180	+1	0.2679	3.7405	-22
3	21.0000	-1.5180	+2	2.3037	3.7406	-21
4	20.9113	-1.6067	+2	2.5808	3.7943	+8
5	-20.5836	-1.9344		3.7419	3.7419	-8
6	20.8173	-1.7007	-2	2.8931	3.7437	+10
7	21.0000	-1.5180	-2	2.3039	3.7331	-96
8	22.0000	-0.5180	-1	0.2687	3.7436	+9

C = 3.7427

	y	y - y0	Δy	(y - y0)²	∠
1	-17.1723	-1.9357	-6	3.7493	+180
2	17.2151	-1.8629	-6	3.4726	173
3	17.8797	-1.1983	-1	1.4369	231
4	15.0000	-1.0780	-3	1.1627	233
5	16.0780	0.0000	0	0.0000	+270
6	17.0000	+0.9220	+3	0.8506	278
7	17.2727	+1.1947	+1	1.4272	309
8	17.9415	+1.8635	+6	3.4749	315

Approx Center

x = 22 y = 17.2151
17.9415
35.1566
y0 = 16.0783

y max = 17.1823
R = 1.7360
x max = 20.5836
x0 = 22.5180

Moons Center xc = 22.5180
yc = 16.0780

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Formation of Normals.

1	+ 0.00	- 0.0	- 128.0
2	+ 0.97	+ 11.5	+ 41.0
3	+ 1.82	+ 32.0	+ 25.0
4	+ 1.74	- 13.0	- 9.0
5	+ 0.00	+ 15.5	+ 0.0
6	- 1.56	- 17.0	+ 9.2
7	- 1.81	+ 146.0	- 114.0
8	- 0.97	- 8.5	+ 16.5
	+ 4.53	+ 205.0	+ 91.7
	- 4.34	- 34.5	- 25.1.0
	+ 0.19	+ 170.5	- 159.3

a +10

b +2

c +15

a	b	c (+15)
- 0	- 4	+ 11 ✓
- 5	- 4	+ 6
- 13	- 2	- 2
- 16	- 2	- 3
- 19	- 0	- 4
- 17	+ 2	0
- 15	+ 2	+ 2
- 5	+ 4	+ 14 ✓

+0.19 + 15.57 = - 2.11

+ [ ] + 0 = - 0.09

+15.57 = - 2.02

14.36 = - 9.02 + .02 = - 9.00

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9195 Conditional Equations.

										O − C	new O − C
1	− 0.0	− 1.94	=	+ 66	− 0	+ .19	=	+ 19		+ 47	+58
2	− 0.52	− 1.86	=	− 22	− 6	+ 19	=	+ 13		− 35	−24
3	− 1.52	− 1.20	=	− 21	− 18	+ 12	=	− 6		− 15	−17
4	− 1.61	− 1.08	=	+ 8	− 19	+ 11	=	− 8		+ 16	+13
5	− 1.93	− 0.00	=	− 8	− 23	+ 0	=	− 23		+ 15	+11
6	− 1.70	+ 0.92	=	+ 10	− 20	− 9	=	− 29		+ 39	+39
7	− 1.52	+ 1.19	=	− 96	− 18	− 12	=	− 30		− 69	−67
8	− 0.52	+ 1.86	=	+ 9	− 6	− 19	=	− 25		+ 37	+48

+ 151 − 119

average 34

14.36 + 0.19 = + 170.5 − 9.32

+ 0.19 + 15.57 = − 159.3 − 2.11

+ 0.19 + 00 = + 2.3

+ 15.57 = − 161.6

14.36 = + 170.5 + 2.0 = + 172.5

b = + − 0.13 Δ

b = − 10.3

a = + 12.0

− 0.65

Arc Measured 165°

$\frac{p}{4}$ = .22 $\frac{\pm v}{4}$ = +4

± rr 3   R 1.93

+ 2RC = + 0.77 $\frac{+4}{.22}$ = +18.2

ΔR = + 0.2

corr = − 0.2

ΔR = + 0.4

Δb = − 0.10   Δδ = 0.″0

Δa = − 0.50   Δα = − 0.s02

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9193 Conditional Equations.

					O-C
1	- 0.0 - 1.99	= + 66	- 0 + 19 = + 11		+ 77
2	- 0.52 - 1.86	= - 22	- 6 + 19 = + 13		- 35
3	- 1.52 - 1.20	= - 21	- 18 + 12 = - 6		- 15
4	- 1.61 - 1.08	= + 8	- 19 + 11 = - 8		+ 16
5	- 1.93 - 0.00	= - 8	- 23 + 0 = - 23		+ 15
6	- 1.70 + 0.92	= + 10	- 20 - 9 = - 29		+ 39
7	- 1.52 + 1.19	= - 96	- 14 - 12 = - 30		- 69
8	- 0.52 + 1.86	= + 9	- 6 - 19 = - 25		+ 34
				+ 191	- 117
				average	37

14.36 + 0.19 = + 170.3

+ 0.19 + 15.37 = - 157.3

+ 0.19 + 0.0 = + 2.3

+ 15.37 = - 161.6

14.36 = + 170.3 + 2.0 = + 172.3

Δ = +

b = - 10.3

a = + 12.0

Arc Measured 165°0

$\frac{\beta}{4}$ = .22

$\frac{\Sigma\gamma}{4}$ = + 4

$\frac{+4}{.22}$ = + 18.2

ΔR = + 0.2

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Moon's Mean Position.

9195

$\chi_0 = 22.5180$
$+6$
22.5186

$\eta_0 = 16.0780$
-5
16.0775

From Plate Constants.

$\chi = 23,3285$
$\xi \quad +1.3285$

$\eta = 15.7101$
$n \quad -2.2899$

$\log \xi \; 0.12336$
$\cos \delta \; 9.99790$
8.507247
1.618222

$\log \tan \delta \; 8.99866_n$
$\xi \; 0.24677$
7.05378
6.29674_n

$n_1 \quad -0.00002$
$n_0 \quad -2.28977$

$\log n_0 \; 0.35978_n$
7.331155
3.02863_n

$\alpha - A \quad +11.52$
$A \quad 22\ 51\ 11.20$
$\alpha_0 \quad 22\ 51\ 52.72$
-1068.1
$\delta - D \quad -17\ 48.1$
$\text{Red} \quad +4.25$
$\alpha' \; 22\ 51\ 56.97$
$D \quad -5\ 19\ 49.5$
$\delta_0 \quad -5\ 37\ 37.6$
$\text{Red} \quad +24.0$
$5\ 37\ 13.6$
δ'

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1919.5

Illoomis Nicaea Position

$\alpha_0 = 22^h 51^m 8^s.0$
$+6^s.4$
$22^h 51^m 8^s.64$

$\delta_0 = 16° 7' 8''.0$
$-3''.2$
$16° 7' 7''.8$

From Plate Constants

$x = 23.328^s$ $\quad y = 15'.701$

$\xi_1 + 1.328^s$ $\quad \eta = -2.287''$

$\log \xi_1 \; 0.12336$
$\log \cos\delta \; 9.99990$
8.50224
1.61822

$\log \tan \; 8.79966$
$\xi \; 0.24671$
7.05347
6.29671
$\eta \; -0.0002$
$\eta_0 \; -2.2897''$

$\alpha - A + 11.52^s$

$A \; 22^h 51^m 11.20^s$

$\alpha_0 \; 22^h 51^m 32.72^s$

$\log \eta_0 \; 0.35978$
7.33113
3.02863
$-106.8''$

$\delta - D \; -17' 7''.1$

$D \; -5° 17' 19''.5$

$\delta_0 \; -5° 37' 31''.6$

$+292.0$

$-5° 37' 13''.6$

δ'

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9195 Reduction to Apparent Place.

H+α	5ʰ	00.5ˢ	= 75°	7.5′	δ	− 5°	37 37
H	6	8.6					
α	22	51.9					
G	22	38.5ˢ					
G+α	21	30.4	= −37°	24′			

log Cos δ 9.9979
i 0.9107 +
i 0.9086

log Cos(G+α) 9.9000
g 1.3132
Sin(G+α) 9.7835 n
tan δ 8.9936 n
8.8239

log Sin δ 8.9915 n
Cos (H+α) 9.7097
h .1273 7
Sin (H+α) 9.9852
Sec δ 0.0021
8.8239

log g′ 1.2132
g 8.9142

log h′ 9.6749 n
∴ h 0.0849

f +2.978
g +0.082
h +0.246
+4.246

g′ +16.34
h′ +0.473
i 8.102
+23.969

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9175 Reduction to Apparent Place.

H + α 5h 00.5s = 75° 7.5' δ − 5° 37 37

H	6	8 6	
α	22	51.9	Log Cos δ 9.9977
G	22	38.5	μ 0.91074
G + α	21	30.1 = −37° 24'	i 0.9086

Log Cos(G+α)	9	9 0 0 0	Log Sin δ 8.9915n
q		1.3132	Cos (H+α) 9.9097
Sin (G+α)	9	7.7835n	h 1.2737
tan δ	8	9.9936n	Sin (H+α) 9.7852
	8	8.8239	Sec δ 0.0021
			8.8239

Log q' 1.2132
q 8.9172

Log h' 9.6777n
h 0.0479

f	+2.7788
q	+0.0822
h	+1.2136
	+7.2746

q'	+16.34
h'	−0.973
i	8.102
	23.869

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9.95 Lunar Parallax 9

α'	22	51	56.97	π	57′ 15″.68
ϕ	21	45	09.50		
$\phi - \alpha'$	−1	06	47.47	9.86913	
	= −16°	81′	52.05	8.22157	
$\frac{1}{2}\Delta\alpha$		− 6	06.89	9.45853 π_H	
				0.00160	
$(\phi - \alpha') - \frac{1}{2}(\alpha - \alpha')$	−16°	35	45.56	7.55067 π_H	

9.95727
0.00000
0.01858
9.97585

$\alpha - \alpha'$ −12′ 12.98
= − 48.86

δ 43 22 09.8

δ −5 37 13.6

$\gamma - \delta$ 49 01 28.2

9.82670
8.22157
9.87722
0.16298
8.08887

$\delta - \delta'$ +42 11.1

δ	−4	55	02.5	α	22	51	08.11
Am Eph δ	−4	55	06.6	Am Eph	22	51	07.38
O − C			+4.1	O − C			+ 0.73
Corr of Plate			00				− 0.03
2nd Order Ref			+0.1				
Irr Corr			0.0				− 0.02
δ	−4	55	02.7	α	22	51	08.09
O − C			+4.2				+ 0.71

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1915 Lunar Parallax 9

α' 22 51 56.97
φ 21 45 09.30
α-α' +1 06 77.97
= +16° 39' 52.05"
½ t' - 6 06.89
(α-α')-½(t+t') - 16 38 45.56

π 57' 15".68
1.867113
2.221537
9.758830n
0.001600
7.550067n

9.957127
0.000000
0.001588
9.958715

α-α' -12' 02.98"
= -4.88"

α 43 24 09.8
δ -5 37 13.6
δ-δ' 39 01 18.2

9.826700
8.221537
9.887229
0.162988
8.088717

δ-δ' +42 14.6"

δ -4 55 02.5
Am Eph δ -4 55 06.6

Am Eph 22 51 07.34
α-α' -4.84

δ-δ' +42 14.6"
δ -4 55 02.5
Am Eph δ -4 55 06.6
δ-δ' +4.1

Am Eph 22 51 07.34
α-α' -4.84
+0.73
-0.03

Curve of Plate 00
2nd Order Corr +0.1

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9249 Star Measures.

	d	x	d	x
1	20272	19602	16572	19406
17.7	12338 43	17350 56	15288 86	10700 99
10.1	48	62	84	88
	72	22	86	20
	17.7729	17.7751	10.1288	10.1276
2	20100	19754	17818	19616
29.9	18808 03	19072 77	14760 58 59	12647 41
29.4	98	82	58	38
	06	52	16	30
	24.9302	24.9324	24.3058	24.3016
3	20000	17550	18740	19418
29.7	13421 24	19164 63	15626 28	12516 06
17.9	27	62	30	496
	06	64	50	32
	29.6580	29.6608	17.3116	17.3078

Moon Measures.

1			16710	16980
24			16900	11940 37
15.6			slant 8889	34
			12	88
			15.5022	15.4952
2	20080	17682		
24.2	17660 63	10044 47		
16	66	50		
	88	24		
	24.2418	24.2428		
3	20080	17598		
24.3	16870 35	10840 36		
16.4	30	32		
+ x	82	7602		
	24.3246	24.3237		

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9249 Star Measures

	d		d	
1	20272	17602	16372	19706
17.7	12538	17320	12488	10800
16.1	1 13	6 12	3 4	8
	12	2	6	20
	17.7129	17.7251	10.1248	10.1276
2	20100	19727	17218	79616
24.9	10408 3	19072 77	17760 7	12647 91
24.4	1 3	2 2	3 3 7	28
	6	3 2	16	30
	24.7202	24.9327	24.3035	24.3016
3	20000	17250	15710	19415
24.7	12421 4	17164 63	12626 4	12516 06
17.9	27	62	30	996
	06	64	30	32
	24.6540	24.6608	17.2116	17.2078

Moon Measures

4			16710	16780
24			16490	11710 7
15.6			3 7	4
			12	8
			15.0922	15.4932
2	20040	17612		
24.2	17660 3	10494 47		
16	2 3	30		
	21	29		
	24.2913	24.2928		
3	20090	17298		
24.3	10370 3	10370 36		
14.9	3	2		
+ X	2	7606		
	24.3246	24.3237		

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4	19092	16600
24.2	16300 15	9390 31
17	10	22
	110	08
	24.27 82	24.27 24

5	19178	19288
24	13050 50	15424 22
17.6	50	20
	98	68
	17.6140	17.6142

6	19186	18104
23.6	12680 79	14680 84
18	78	88
	204	098
	23.65 18	23.65 82

7	19930	18412
23	16282 80	12118 08
18.3	78	098
	40	00
	18.3654	18.3704

8	18952	18298
22.3	14378	12876 68
18.7	78	60
+4	58	302
	18.9576	18.9568

9	19762	17752
21.2	17872	9672 61
18	72	50
	78	72
	21.1892	21.1892

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9 17672 16600
24.2 16300 15 7340 21
17 14 2
110 04
24.2782 24.2724

5
27
17.6

19178 19288
12050 15429
50 20 22
78 68
17.6140 17.6172

6
23.6 19186 17107
18 12650 17640 44
79 85
204 098
23.6318 23.6542

7
23
18.3

14930 15412
16242 50 12118 68
74 095
40 00
18.3659 18.3704

8
22.3
18.7
+4

17952 17298
17378 12376 67
18 60
56 02
18.7376 18.7365

9
21.2 17762 17752
18 17872 9672 61
72 50
74 72
21.2742 21.2732

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9249 Times & Etc.

Sept. 23 '15

Exp. to Stars	0	1	28		−	1.	90
" " Moon		1	34	29.3		1	34 29.5 ⌐
Clock fast			2	28.5 ⌐			
H. Sid Time		1	32	04.9 ⌐	$\phi-\alpha$ =	+	1h 1m
H. Long.		4	44	31.65 ⌐			
g. Sid T.		16	16	35.95 ⌐			
Sid T.M.N.		12	5	0.55 ⌐			
Interval		18	11	35.40 ⌐			
Reduction			2	58.83 ⌐			
g.M.T.		18	8	36.57 ⌐			

From Naut. Alm.	R.A.		Dec.	
Moon 18h	0	31	06.68	+ 7 51 52.1
Motion m/m			1.927.9 ⌐	+ 17.177 ⌐
" 8.6095 ⌐			+ 16.60 ⌐	+ 2 02.0 ⌐
Tabular Place	0	31	23.28 ⌐	+ 7 53 54.1 ⌐

Moon's age 14 days.

Parallax	56'	5.02 ⌐
Semid.	15'	18."5 ⌐
R.		918.5 ⌐
aug.		12.1 ⌐
Ecl. +		−0.6 ⌐
R.		930.0 ⌐
R.		1.9936 ⌐
alt.		−951 ⌐
(1+q)R.		1.8985 ⌐
R.		3.6043 ⌐

934 = 12.5 ⌐

a = −501
+24
−477

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7-49 Sirius & Etc.

Sept 23 '15

Exp. for Time 0 1 27 .01 90

" " Noon 1 29 = 29.5" 1 27 = 27.0"

Clock fast 2 29.5"

H Sid Time 1 32 0 11 4 - X = + 1h 1m

H Long 2 44 31 03"

Y Sid Yj 16 15 35 53"

Sid Yj M.N. 12 3 29.5" -

Interval 18 11 33 30 -

Reduction 2 56 43 -

G.M.T. 14 4 36 47 -

From Naut. Alm. R.A. Dec

Noon 18h 0 31 06.64 +7 51 32.1

Motion in 1m 1.9 25 19" 14.11"

" 8.609 5" + 16.60" 2 07. -

Tabular Place 0 31 23.28 -7 51 46.1

Procyon Age 11 days

Parallax 5.6" 5.02 -

Semid. 15" 18.5" -

IK 9 18.3 -

Aug. 12.9 -

Ex. 9 - -

K. 930.0 -

K. 1.9936 -

ak = 43.1 -

1+ak 1.9979 -

K 3.9779 -

9.9: 12.5 -

a = -5.01

-2.4

-7.41

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Plate Center

9249

	x	y	α	δ
	17.7780	10.1282	00 28 00.52	6 29 10.4
	24.9313	24.3037	32 00.45	8 24 27.3
	29.6594	17.3097	34 33.81	7 26 53.9
3)	72.3647	51.7416	00 94 34.78	21 79 88.6
	24.1215	17.2472	00 31 31.59	+7 26 79.5
	22	18	−1 05.75	+05 49.9
	−2.1215	+0.7528	00 30 25.84	+7 32 39.4
	31.5	466.5		
	−65.75	5'49.9		

Plate center { A 00 30 26.
D +7 32.39

x − ξ

+4228	+8887	= +13115	+ 974	+ 1x	− 19115
− 734	+12766	= +11732	+ 982 = +14097	+ 18 =	− 19115 = 0
−2929	+19830	= +12906	+ 2357 = +14089	+ 25 =	+ 19119 − 1
			+ 1679 = +14085	+ 30 =	+ 19115 = 0
22.4255	+11213		+ 1606	+ 22 =	22.2981

y − η

+2904	+5064	= +7968	− 1653	= +6310 + 20 =	+6330 − 0
−3547	+12152	= +8605	− 2319	= +6286 + 49 =	+ 35 0
+ 903	+ 8655	= +9558	− 2758	= +6300 + 35 =	+ 35
16.5577	78279		− 2086	+ 33 =	16.5468

Tables a = +.2 e = +2.2 a − e = +2.8 b + d = +1
Wbo = −501 = −502 = +1.0 = −7

−501.2 −499.8 −3.0

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Cage No 63 1145.7 Cage No 71 - 1145.0 Cage No 75 - 1145.0

3)

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Plate Center

1

9249

	x	y	x	δ
	17.7790	10.1282	00 28 00.52	6 29 10.7
	29.9313	29.3037	32 00.40	8 24 27.3
	29.6599	17.3097	39 32.81	7 26 53.9
3)	72.3697	57.1716	00 99 33.78	21 79 86
	24.1215	17.2372	00 31 31.59	+7 26 99.5
	22	18	-1 05.73	+05 49.9
	-2.1215	+07528	00 30 25.86	+7 32 39.4
	31.5	966.5		
	-65.73	5 49.9	Plate Center	A 00 30 26.
				D +7 32.39

X-7

+9228	+8887	= +13113	+ 994	+ 1A		-19113
- 739	+12966	= +11732	+ 2357	+19089	+ 18	= +19113
-2929	+19830	= +12906	+ 1679	+19085	+ 20	= +19119
22.7255	+11213		+ 1606		+22	= 22.2981

Y-11 +5004 -93X +2Y -6335

+2904	+5069	= +7965	-1653	= +6312	+ 20	= +6332
-3377	+12152	= +8602	-2319	= +6286	+ 99	= + 33
+903	+8655	= +9558	-2728	= +6300	+ 33	= + 33
16.55	77	+8279	-2086		+33	= 16.54680

Tables a = +2 e = +1.2 a-e +2.0 b-d = +1

Ceb = -501 = -502 = +1.0 = -9

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Cape No 63 Mg 5.7 Cape No 71 - Mg 8.0 Cape No 78 - Mg 8.5

	ξ	η	Δξ	-1.8η	+2
1	-4.65	-8.17	-10	+8	-2
2	+3.00	+6.66	+8	-5	-1
3	+7.90	-0.74	+12	-14	-2
M	+0.30	-1.75	-1		+1

	Δη	-1.8ξ	+2
	-18	+15	-3
	+9	-12	-3
	-1	+12	0
	0	+3	+3

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9249 Standard Coordinates 15

Cap.	00 27 17.17	00 31 13.95	00 33 47.36
2	17.17	13.98	47.32
3	17.13	13.98	47.32
Mean	00 27 17.15	00 31 13.96	00 33 47.33
Prec.	+46.37	+46.49	46.87
α	00 28 00.52	00 32 00.45	00 34 33.81
A	00 30 26	00 30 26	00 30 26
α-A	-2 25.48	+1 34.45	+4 07.81
Sin(α-A)	-145.78	+94.45	247.80
Log "	2.162801n	1.975201	2.394101
" Cosδ	9.999721	9.995311	9.999632
" ζ0	0.662725n	0.477775	0.897666
ζ0	-9.6478	+3.0043	+7.9006
ζ1	-10	+7	+12
ζ	17.3582	25.0047	29.9018
X	17.7790	24.9313	29.6594
X-ζ	+.4228	-.0734	-.2424
c	+6 27 11.8	+8 19 26.6	+7 21 56.6
1	11.6	26.7	56.6
2	11.6	26.4	56.6
Mean	6 27 11.5	8 19 26.5	7 21 56.6
Prec	+4 58.9	+4 57.8	+4 57.3
δ	6 29 10.4	8 24 24.3	7 26 53.9
D	7 32 39	7 32 39	7 32 39
δ-D	-1 03 28.6	+51 45.3	-05 45.1
tan(δ-D)	-3809.0	+3105.4	-345.1
Log "	3.580811n	3.492121	2.537971n
η0	0.911961n	0.823271	9.869091n
Cotan δ	9.0557	9.1698	9.1164
ζ2	1.3385	0.9555	1.7953
H.	7.4436	7.1787	7.9651
η0	-8.1650	+6.6569	-0.7398
η1	+0.0028	+0.0015	+0.0092
η	9.8378	24.6584	17.2694
y	10.1282	24.3037	17.3097
y-η	+.2904	-.3547	+.0403

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1877 Standard Coordinates

Cap.	00 27 19.17	00 31 13.95	00 33 97.36
1	19.19	13.98	97.32
2	19.13	13.98	97.32
Mean	00 27 19.15	00 31 13.96	00 33 97.34
Prec.	+46.37	46.47	46.87
λ	00 28 00.52	00 32 00.43	00 34 33.81
A	00 30 26	00 30 26	00 30 26
λ-A	-2 25.48	+1 34.43	+3 07.81
Sun(λ-A)	-14 5.48	+99.43	247.80
log r	2.162801n	1.997520	2.399110
cos	9.999721	9.999231	9.999632
log r₀	0.662725n	0.997751	0.899766
ξ	-9.64758	+3.00943	+7.97006
	-10	+7	+12
η	1135.12	2520.77	2910.18
λ	17.77790	24.93113	29.65994
x-ξ	+.7228	-.7397	-.2924

C	+6 27 11.7	+8 19 26.6	+7 21 56.6
1	11.6	26.7	56.6
2	11.6	26.7	56.6
Mean	6 27 11.5	8 19 26.5	7 21 56.6
Prec.	+4 58.9	+4 37.8	+4 37.3
3	6 27 10.4	8 27 24.3	7 26 33.9
D	7 32 39	7 32 39	7 32 39
λ-D	-1 03 28.6	+1 07 44.7	-0 54 51
log Δ	-3809.0	+3105.7	-3.95.1
log r	3.358081n	3.792112	2.537799n
r₀	0.911196n	0.823227	9.869097n
tan δ	-7.05537	9.16978	9.11169
ε	13375	09555	17753
H	7.74436	7.17887	7.96551
H₀	-8.16550	+6.65569	-0.73998
η	+0.00285	+0.00115	+0.00092
y	9.63785	24.65579	17.26974
y	10.12842	24.30037	17.00977
y-y	+2907	-3547	+403

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$a = +.9$

$B = +1.3$



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9249 Moore's Center

	x	x - x0	Δx	(x-x0)²	(x-x0)²+(y-y0)²	O-C
1	24.0600	+ 1.5760	- 1	2.4835	3.6037	- 6
2	24.2423	+ 1.8183	- 0	3.3062	3.6165	+ 122
3	+24.3240	+ 1.9000	0	3.6100	3.6100	+ 57
4	24.2753	+ 1.8513	+ 0	3.4273	3.6236	+ 193
5	24.0000	+ 1.5760	+ 1	2.4841	3.6017	- 26
6	23.6550	+ 1.2310	+ 1	1.5156	3.5984	- 59
7	23.0000	+ 0.5760	+ 2	0.3320	3.6121	+ 78
8	22.4240	0.0000	+ 2	0.0000	3.6115	+ 72
9	21.1892	- 1.2348	+ 1	1.5245	3.6073	+ 30

	y	y - y0	Δy	(y-y0)²	R² = 3.6073	∠
1	15.4987	- 1.0583	- 1	1.1202		+127°
2	16.0000	- 0.5570	- 1	0.3103		107°
3	16.5570	0.0000	0	0.0000		90°
4	17.0000	+ 0.4430	+ 1	0.1963		77°
5	17.6181	+ 1.0571	+ 1	1.1176		56°
6	18.0000	+ 1.4430	+ 2	2.0828		40°
7	18.3679	+ 1.8109	+ 2	3.2801		18°
8	+18.4572	+ 1.9002	+ 2	3.6115		0°
9	18.0000	+ 1.4430	2	2.0828	164°	+320°

Approx. Center

y = 18 x = 21.1892
23.6550
44842
x_0 = 22.4221
x_{max} = 24.3240
x R = 1.9019
y_{max} = 18.4572
y_0 = 16.5572

Moore's Center = { x_0 22.4240
y_0 16.5570

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9249 Moon's Center

	λ	λ - λ0	Δλ	(λ - λ0)²	(λ - λ0)² + (1 - η0)²	O - C
1	24.0000	+ 1.5760	- 1.2435	3.6037		- 6
2	24.2723	+ 1.8483	- 0.9712	3.6163		+ 12
3	+ 24.3240	+ 1.9000	+ 3.6100	3.6100		+ 59
4	24.2753	+ 1.8513	+ 3.1213	3.6236		+ 17
5	24.0000	+ 1.5760	- 1.2741	3.6017		- 24
6	23.6550	+ 1.2310	- 1.6191	3.6284		- 5
7	23.0000	+ 0.5760	2 0.3320	3.6121		+ 7
8	22.7240	0.0000	2 0.0000	3.6113		+ 7
9	21.1892	- 1.5348	1 1.5248	3.6073		+ 3

	η	η - η0	Δη	(η - η0)²	(λ - λ0)² + (1 - η0)² = 3.6073	C
1	19.7937	- 1.0535	- 1 1.1202			+ 121
2	16.0000	- 0.3570	- 1 0.3123			107
3	16.3570	0.0000	2 0.0000			90
4	17.0000	+ 0.6430	- 1 0.7163			77
5	17.6171	+ 1.0571	- 1 1.1176			59
6	18.0000	+ 1.4430	2 2.0428			70
7	18.3679	+ 1.8107	+ 2 3.2801			18
8	+ 18.4572	+ 1.9002	+ 2 3.6115			0
9	18.0000	+ 1.4430	1 2 2.0428	169°	+ 320	

Approx. Center

η = 18 λ = 21.1892

23.6550

7 1 8 4 7 2

λ0 = 7 2 4 2 2 1

λ mean = 23.2420

λ λ0 = 1 9 0 1 9

η mean = 18.4572

η0 = 16 3 5 7 2

Mean Center = { λ 22.9420 / η0 16.3570

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Formation of Normals.

1 - 1,67	- 9,5	+ 6,5
2 - 1,02	+ 222	- 68,5
3 + 0,00	+ 108,0	0,0
4 + 0,81	+ 357,0	+ 85,0
5 + 1,68	- 41,0	- 27,5
6 + 1,77	- 72,5	- 185,0
7 + 1,05	+ 45,5	+ 171,0
8 0,0	+ 0,0	+ 137,0
9 - 1,77	- 37,0	+ 83
+ 5,31	+ 732,5	+ 412,5
- 4,46	- 160,0	- 181,0
+ ,85	+ 572,5	+ 231,5

	a	b	c
a +7	+ 11	- 6	- 10
b +6	+ 13	- 3	- 5
c -15	+ 13	0	- 2
	+ 13	+ 3	+ 1
	+ 11	+ 6	+ 2
	+ 9	+ 8	+ 2
	+ 4	+ 11	.0
	+ 0	+ 11	- 4
	- 9	+ 8	- 16

-15

+0.85 +13.80 = +6.47 +8°

+ [ ] + 0.04 = +0.36

+ 13.76 = +6.11

+18.65 = +9.31 - 0.38 + 8.93

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Conditional Equations

9279

								O-C	new O-C
1	+ 1,58	- 1,06	= - 6	+ 47	- 16	= + 31		- 37	- 77
2	+ 1,82	- 0,56	= +122	+ 59	- 8	= + 76		+ 76	+ 71
3	+ 1,90	0,00	= +57	+ 57	0	= + 57		0	- 2
4	+ 1,85	+ 0,44	= +193	+ 55	+ 7	= + 62		+ 131	+ 132
5	+ 1,58	+ 1,06	= - 26	+ 47	+ 16	= + 63		- 89	- 87
6	+ 1,23	+ 1,47	= -59	+ 36	+ 21	= + 57		- 116	- 114
7	+ 0,58	+ 1,81	= +78	+ 17	+ 27	= + 44		+ 37	+ 39
8	+ 0,00	+ 1,90	= +72	+ 0	+ 28	= + 28		+ 44	+ 40
9	- 1,23	+ 1,47	= +30	- 37	+ 21	= - 16		+ 46	+ 30
								+331	-242

average = 64

+18,68 + 0,85 = +572,5 +9.31

+ 0,85 +13.80 = +231,5 +6.47

+ 0,85 + ,03 = 26.1

+ 0.47

+13.77 = +205.7 b = + 14.9

+18.68 = +572.5 - 12.7 = +559.8 a = + 30,0

+ 0.48

Arc Measured 167°

$\frac{p}{n}$ = 1.215 $\frac{\Sigma v}{4}$ = + 9.9

Int 4 R = 1.90

$\frac{+9.9}{21.5}$ = + 46 ΔR = + 0.6

-2RC = - 0.76 Corr = + 0.2

Δ b = - 0,33 Δ S = - 0.2 Δ R = + 0.8

Δ a = - 0.36 Δ q = - 0,01

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Conditional Equations

9279

								O - C
1	+ 1.58	- 1.06	= - 6	+ 77	- 16	= + 31		- 37
2	+ 1.42	- 0.56	= + 142	+ 39	- 8	= + 96		+ 76
3	+ 1.90	0.00	= + 37	+ 37	0	= + 37		0
4	+ 1.85	+ 0.44	= + 193	+ 32	+ 7	= + 62		+ 131
5	+ 1.58	+ 1.06	= - 26	+ 17	+ 16	= + 63		+ 89
6	+ 1.23	+ 1.47	= - 59	+ 36	+ 21	= + 57		- 116
7	+ 0.58	+ 1.81	= + 75	+ 17	+ 27	= + 92		+ 39
8	+ 0.00	+ 1.90	= + 72	+ 0	+ 28	= + 28		+ 44
9	- 1.23	+ 1.47	= + 30	- 37	+ 21	= - 16		+ 46
								+ 331 - 242
								Range = 89

+ 14.44 + 0.56 = + 572.3

+ 0.85 + 13.80 = + 231.2

+ 0.85 + .03 = 26.1

+ 13.77 = + 205.4 b = + 14.9

+ 15.68 = 572.3 - 12.7 = + 559.6 a = + 30.0

Arc Measured 164°

$\frac{p}{n}$ = .215

$\frac{\Sigma y}{9}$ = + 9.9

$\frac{+ 9.9}{215}$ = + 46 Δk = + 0.6

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9249 Moon's Mean Position

$\gamma_0 = 22.4240$
$+15$
22.4255

$\gamma_0 = 16.5570$
$+7$
16.5577

From Plate Constants

$x = 22.2981$

$\xi \quad +.2981$

$\log \xi \quad 9.474636$
$\cos \delta \quad 9.999647$
8.507284
0.970711

$\alpha - A \quad +9.35$

$A \quad 00\ 30\ 26$

$\alpha_0 \quad 00\ 30\ 35.35$

$\text{Red} \quad +4.17$

$\alpha' \quad 00\ 30\ 39.52$

$y = 16.5468$

$\eta \quad -1.4532$

$\log \tan \delta \quad 9.1108$
$\xi \quad 8.9787$
7.0538
5.1129

$\eta_1 \quad 0.0000$
η_0

$\log \eta_0 \quad 0.16238\ \eta$
7.33115
$2.83118\ \eta$
-6774.9

$\delta - D \quad -1017.9$

$D \quad +7\ 32\ 39$

$\delta_0 \quad +7\ 21\ 21.1$

$\text{Red} \quad +27.8$

$\delta' \quad 7\ 21\ 48.9$

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9299 Minor Planet Position 18

$\alpha_0 = 22\ 42\ 40^s$
$+\ 10^s$
$22\ 42\ 53^s$

$\delta_0 = 16\ 33\ 70''$
$+\ 7''$
$16\ 33\ 77''$

From Plate Constants

$x = 2\ 29\ 81''$

$y = 16\ 37\ 68''$

$\xi + 29\ 81''$

$\eta - 1\ 32''$

$\log \xi\ 9.97436''$
$\cos\ 9.99641$
$3\ 07\ 29''$
$1\ 17\ 71''$

$\log \tan \delta\ 7.1108''$
$\xi\ 8.47881''$
$1\ 03\ 37''$
$3\ 11\ 29''$

$1 - A \quad +9\ 35''$

$A \quad 00\ 30\ 26''$

$\alpha_0 \quad 00\ 30\ 35^s\ 30''$

$\log \sec \quad +1.17''$

$\alpha \quad 00\ 30\ 39^s\ 32''$

$\log \sec \delta\ 0.16238''$
$7\ 32\ 11^s\ 30''$
$2\ 48\ 31\ 18''$

$-\ 679.9$
$\delta D \quad -11\ 179$

$D \quad +7\ 32\ 38''$

$\delta \alpha \quad +7\ 21\ 21.1$

$\log d \quad +2\ 1.8$

$\delta' \quad 7\ 21\ 19''$

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0 30 56.58 −8 3 9.7

0 25 46.30
72.07
7.29

−7 25 8.3
−36.49
+28.19

0 32 24.48
20.22
7.26

+33 15 31.2
5.76
+25.44

0 48 43.93
39.75
7.18

−1 35 50.8
−36 19.65
+28.85

+20
+30
+20
+10
0

.2

X

3' .1

40 30 20 10 54

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9249 Reduction to Apparent Place 19

H + α 6 30.1 = 97° 31.5 δ + 7 21.3

H 5 59.5
α 00 30.6
G 22 38.6
G + α 23 09.2 = − 12° 42.0

Log cos δ 9.9964
l 0.9109+
l' 0.9073

Log cos (G+α) 9.9892
q 1.3131
sin " 9.3721 n
tan δ 9.1109
8.8239

Log sin δ 9.1073
cos H+α 9.1176 n
h 1.2737
Sin H+α 9.9913
Sec δ 0.0036
8.8239

log q' 1.3023
q 8.5900 n

h' 9.7981 n
h 0.0974

f +2.96
g −0.039
h +1.251
+4.172

q' +20.06
h' −0.315
i +8.078
+27.823

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9279 Reduction to Apparent Place 1.7

H + L 6 30.1 = 97° 31.5 3. + 7 21.3
H 23 29.5
L + 0 30.6
G 22 38 6
G + L 23 09.2 = − 12° 42.0

log cos(G+L) 9 9 8 7 2
1 3 1 3 1
g 9 7 3 9 2 1 n
sin 9 7 3 9 2 1 n
tan δ 9.1109
8.8239

log cos 3 9.1766
L 0.7107
i 0.0015

log sin 9 7 10 73
cos H + L 7 11 78 n
L 1 27 37
sin H + L 7 99 62
sec δ 0.0036
8.8239

L' 9.7781 n
L 0.0977

g + 20.05
L' − 0.315
i + 5078
+ 27.823

log g' 1.3023
g' 20.00 n
g 20.00

f + 2.76
g − 0.039
h + 1.2721
+ 4.172

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9279 Lunar Parallax

α'	0	30	39.52	
δ	1	32	09.9	
$\delta - \alpha'$	1	01	25.38	
	= +15°	21	20.70	
$\frac{1}{2}(\delta - \alpha')$		5'	32.76	
$\odot\alpha) - \frac{1}{2}(\delta - \alpha')$	15°	15'	47".94	

π	5'6' 03."02
	9.869113
	8.212547
	9.422933
	0.004714
	7.508774

$\alpha - \alpha'$ + 11 05.52

= + 4' 45.37

	9.957727			
	0.000000			
	0.015559			
	9.97286			

γ	43	12	39.2	
δ	+7	21	48.9	
$\gamma - \delta$	35'	50'	50.3	

	9.826740			
	8.212547			
	9.762762			
	0.164551			
	7.971107			

$\delta - \delta'$ + 32 09.7

δ +7 53 58.6 α 00 31 23.89

Am Eph δ +7 53 57.1 Am Eph 00 31 23.28

O-C +8.5 O-C +0.61

Curv of Plate +0.2

2nd Order Ref 00

Err Corr -0.2 -0.01

δ +7 53 58.7 α 00 31 23.88

O-C +3.3 +0.60

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9279 Lunar Parallax

x' 0 30 39.52
ζ 1 32 09.9
ζ - x' 1 01 25.38
= +13° 21 20.70
½(1-x') 5 32.76
x') - ½(1-x') 15 15' 47.94

9.933727
0.000000
0015539
9.997286

δ +7 21 48.9
ζ - δ 35 30 30.3

9.826700
8.212537
9.762262
0167231
7.971107

δ - δ' 32 07.7
δ +7 53 56.6

m Gchd +7 53 47.1

δ - C +8.5

Corr of Plate +0.2
2nd Order 0.0

π 56' 03.02
9.869913
8.212537
9.422913
0007147
7.508774

1 - x' 1 11 05.52
= 41.37

x 0.0031 2329

m Gchd 00 31 23.28
C 10.61
00

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925-0 Star Measures.

1	18590	16748	16126	18570
15.9	10122 17	15230 45	15052 49	96742 45
10.1	12	4045	96	48
	96	50	32	76
	15.8475	15.8496	10.1078	10.1070
2	16314	17632	17090	16620
23	15790	81770 73	14500 05	92100 08
24.3	90	76	10	06
	32	42	126	70
	23.0524	23.0532	24.2594	24.2582
3	18696	14888	16550	16370
27.8	11190	12952	14076 71	88684
17.3	4879	4679	66	82
	720	00	70	94
	27.7570	27.7558	17.2482	17.2494

Moon Measures.

1	20206	19692
22.7	13076 71	16800 03
15	66	06
	20	702
	22.7147	22.7168
2	20220	19668
22.9	10622 20	19288 89
15.9	18	78
+X	10	70
	22.9590	22.9617
4	19232	18634
22.8	12958 51	14908 15
18	77	22
	32	38
	22.6282	22.6280

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7 2 5 0 Star Measures.

	15590	16748	16126	18570
3.9	10122 11	15230	15022 99	96742 95
0.1	12	7095	76	78
	96	50	32	76
	12.8972	15.8996	10.1078	10.1070
	16314	17632	17480	16620
3	15790	18170 73	14500 05	97210 08
9.3	90	76	10	06
	32	92	120	70
	23.0529	23.0232	24.2597	24.2582
	16396	14888	16550	16370
.5	11890	12952	14076 71	98689
.3	9899	4699	66	8289
	720	00	70	99
	27.7570	27.7528	17.2982	17.2997

Moon Measures.

	20206	19692
2.7	13076 71	16800 03
5	66	06
	20	702
	22.7197	22.7108
	20220	19668
.9	10622 20	17288 83
.7	18	78
	10	70
	22.9590	22.7614
4	19232	18639
2.6	12958 51	19908 45
6	77	22
	32	38
	22.6282	22.6248

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3
22.9
16

19212	18660
9618 14	18250 45
10	40
20	74
22.9606	22.9587

5
22
17.6

19336	17032
13550 41	12822 27
32	32
52	80
17.5804	17.5792

6
21.+
17.8
44

18312	16940
10048 39	15228 32
30	36
40	52
17.8296	17.8290

7
20
17.5

18306	16854
13236 33	11926 21
30	16
34	80
17.5088	17.5054

8
19.5
17

17936	18998
12870 79	14070 94
88	88
40	9000
19.5060	19.5044

9
19.8
19.3
SC

17856	19494	19536	19626
10076 69	17286 85	16212 10	12960 50 50
62	84	08	92
66	94	70	
19.7794	19.7792	17.3336	17.3318

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9250 Wien Mechanics 32

3
22.9
16

19212 18660
9618 19 18250 95
10 40
20 19
22.9606 22.9357

2
12
17.6

19336 17032
13330 91 12822 27
32 32
52 10
17.5804 17.5792

6
21.1
7.8
7+

18312 16940
10048 37 10248 32
30 36
40 32
17.8276 17.8290

7
20
17.5

18306 16838
13236 33 11926 81
30 16
39 80
17.5038 17.5039

8
9.5
17

17936 18998
12870 79 14070 99
86 84
90 90
19.5060 19.5097

9
11.8
10.3
SC

17856 17999 19536 19626
10476 69 17276 55 16212 10 12960 55
62 37 08 30
66 74 70 92
19.7799 19.7792 18.3336 18.3318

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Sept. 23'15

Eqn. to Stars	01	43		01	55		
Moon	1	48	48.9	01	48	49.1	
Clock fast		2	28.5				
M. Sid Time	1	46	28.5	$\odot - \alpha = +1^h\ 15^m -$			
ℓ Long	7	44	31.05				
G. Sid T.	6	30	55.55				
G. T. M. N.	12	05	05 55				
Interval	18	25	55.00				
Reduction		3	01.18				
G. M. T.	18	22	53.82				

From Nautical Alm.		R. A.			Dec.		
Moon 18h	00	31	06.68	+7	51	52.1	
Motion 1m			1.9280			+18.168	
22.8970			44.15		+5	24.4	
Tabular Place	00	31	50.83	+7	57	16.5	

Moon's Age 18 days.

Parallax	56'	7".69
Semid.	15	18.4
R		918.4
Aug.		12.9
Lu. t		-0.6
R		930.7
R		1.9951
ak		-955
(1+a)R		1.8996
R²		3.6085

934 = 12.33

a = -502.9
24
-4789

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925-0 Times &c Etc 25

Sept 23'43"

Eq. t. Stars 01 43 01 33

Moon 1 98 999 01 18 471"

Clock fast 2 29.5"

H. Sid Time 1 76 29.5" + x = + 1h 15m

H. Long 7 77 31 45"

9 Sid T. 6 30 33 33 -

J. I. M. T. 12 03 03 3 -

Interval 18 23 33 00 -

Reduction 3 01.18 -

J. M. T. 18 22 33 42 -

From Nautical Alm Ac A Acc.

Moon 184 00 31 0668 +7 51 32.1

Motion 1m 17 12 17 16"

22.8970 21 15" + 3 24.7"

Tabular Place 00 31 32 83" +7 37 16 2"

Moons Age 14 days.

Parallax 56' 1".67"

Semid 15' 18.7"

1c 7 18 1 -

Aug 12.9"

Ev -0.6"

1c 9307 -

1c 1 99 31"

-755"

Mayer 1 8 7 7 6 -

1c 2 3.6 0 8 5 -

a: -5 0 2 7

24

-7 7 8 7

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9250 Plate Constants. 24

x	15.8485	23.0528	27.7564
ξ	17.3512	25.0047	29.9018
$x-\xi$	-.1527	-.7519	-.2454

a	10.1078	24.2583	17.2788
η	9.8378	24.6584	17.2694
$a-\eta$	+.2698	-.4001	+.0094

$x-\xi$	$+500x$	$+61.7y$	$+2.9x$	$+6937$	
-.1527	+79.24 =	-.7103	+.621 = -.6482	+.546 = -.6436	= +1
-.2519	+115.26 =	-.7993	+1.1489 = -.6504	+.567 =	37 = 0
-.2154	+138.78 =	-.7576	+1.0579 = -.6517	+.580 =	37 = 0
21.0603	+10530		+1039	+61 =	22.8690

$y-\eta$	$+500y$	$-57.8x$	$+2.7y$	-6861	
.2698	+50.54 = +77.50	-.916 = +.6834	+.27 = +.6861	=	0
.4061	+121.29 = +81.28	-1.332 = .6796	+.65 =	61	= 0
-.2667	+86.27 = +84.18	-1.604 = .6814	+.96 =	60	= -1
16.9298	+8765	-1217	+46 =	16.9731	

Tables $a = +.2$ $c = -1.6$ $a-c = +1.8$ $b+d = -1.5$
Obs $= -502.9$ $= -502.7$ $= -.2$ $= -3.6$

O-C -503.1 -501.1 -2.1

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9250 Plate constants. 24

x	15.8485	23.0528	27.7569
y	17.3512	25.0097	29.9018
1	1.0027	- 20519	- 21454
x	10.1074	29.2983	17.2788
y	9.8378	24.6584	17.2699
1	+ 2696	- 9001	- 206

x-y	+2004	+ 61.74	+ 2.9X	+ 6937
15027	+ 7704	= - 7103	+ 621 = + 6982	+ 96 = - 6936 = +1
19514	+ 11326	= - 7993	+ 1429 = + 6509	+ 67 = 37 = 0
21497	+ 13378	= - 7576	+ 1059 = - 6517	+ 80 = 37 = 0
21.0623	+ 10530	-	+ 1089	+ 61 = ~~22.8629~~
				22.8670

y-y	+2004	- 5781	+ 2.7 y	- 6861
1696	+ 5054	= + 7750	- 916 = + 6834	+ 27 = + 6861 = 0
1001	+ 12129	= + 8128	- 1332 = 6796	+ 65 = 61 = 0
206	+ 8629	= + 8835	- 1669 = 6819	+ 96 = 60 = -1
16.9298	+ 8965		- 1217	+ 96 = 16.9237

Tables a = + 2 c = -1.6 a - e = +1.8 b + d = -1.3
log = - 3.0.9 = - 3027 = - 2 = - 3.6

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A = +1.2
B = +1.2

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9250 Moon's Center 25

	x	x − x₀	Δx	(x − x₀)²	(x−x₀)²+(y−y₀)²	δ − c
1	22,71 26	+ 1,06466 − 1	2,71094		3,58416	− 169
2	+22,96 02	+ 1,89472 − 0	3,58880		3,58880	− 205
3	22,95 95	+ 1,89335 + 0	3,58853		3,58898	− 187
4	22,62 81	+ 1,56211 + 1	2,47104		3,57911	− 294
5	22,00000	+ 0,93470 + 2	0,87228		3,58554	− 231
6	21,06660	0,00000 + 2	0,00000		3,59677	− 118
7	20,00000	− 1,06660 + 2	1,13360		3,61444	+ 59
8	19,50 52	− 1,56088 + 1	2,43358		3,57455	− 340
9	19,77 93	− 1,28677 + 1	1,65554		3,61488	+ 69

R = 3,60 85

	y	y − y₀	Δy	(y − y₀)²
1	15,00000	− 0,93330 − 1	0,87077	
2	15,93330	− 0,00000 − 0	0,00000	
3	16,00000	+ 0,06670 + 0	0,00445	
4	17,00000	+ 1,06670 + 1	1,13871	
5	17,5 798	+ 1,64688 + 2	2,71126	
6	+17,8293	+ 1,89633 + 2	3,59677	
7	17,50,71	+ 1,57841 + 2	2,47784	
8	17,00000	+ 1,06670 + 1	1,13871	
9	17,33 27	+ 1,39977 + 1	1,95994	

120° 0′
90 0
90 88
56
30
0
326 0 163
304
317 0

Approx Center

y = 17.

x = 22.6281
19,5052
42,1333
x₀ 21.0666
x max 22,9602
R = 1,8936
y max = 17.8293
y₀ = 15.9357

{ x₀ = 21,0660
{ y₀ = 15,9330

Should be 16.93

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9250 Moore Center

	x	x - x0	Δx	(Δx)²	(x-c)²	(x-c)
1	22.7126	+ 1.6966	1	2.7109	3.5846	- 167
2	22.7602	+ 1.7442	2	3.0422	3.3840	- 205
3	22.9395	+ 1.9235	3	3.6997	3.5898	- 147
4	22.6281	+ 1.6121	1	2.5988	3.5741	- 279
5	22.0000	+ 0.9840	2	0.9682	3.5459	- 231
6	21.0660	0.0000	-	0.0000	3.5967	- 113
7	20.0000	- 1.0660	-	1.1364	3.6149	+ 69
8	19.5052	- 1.5608	1	2.4365	3.5745	- 340
9	19.7793	- 1.2867	1	1.6549	3.6148	+ 63
					3.5485	

	y	y - y0	Δy	(Δy)²	(y-c)²	(y-c)
1	15.0000	- 0.9330	-	0.8705	120	
2	15.9330	- 0.0000	-	0.0000	90	
3	16.0000	+ 0.0670	1	0.0045	90	
4	17.0000	+ 1.0670	1	1.1383	36	
5	17.3795	+ 1.4465	2	2.0923	30	
6	17.8293	+ 1.8963	3	3.5966	0	
7	17.3071	+ 1.3741	2	1.8882	-326	163
8	17.0000	+ 1.0670	1	1.1383	349	
9	17.3327	+ 1.3997	1	1.9590	317	

Approx Center

y = 17. x = 22.6281
17.3327
92.1303
x0 21.0660
x trial 22.9602
R = 1.8971
y trial = 17.8213
y0 15.9330
{ x0 = 21.0660
{ y0 = 15.9330
16.

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Formation of Normals.

1	-1.53	-279.0	+157.0
2	-0.00	-387.5	+00
3	+0.13	-354.0	-131
4	+1.67	-458	-3145
5	+1.53	-215.0	-3810
6	+0.0	-00	-2270
7	-1.68	-630	+925
8	-1.67	+530	-364.0
	+3.33	-1693.5	+249.5
	-4.88	+5930	-1296.6
	-1.55	-1100.5	-1067.1
	-.83	+265	-1820
	-0.72	-1365.5	-885.1

change $\frac{1}{2}$ 10

9	-1.81	-81.0	+88.0
	-1.69	-1711.5	-615.1

Graph No. 8.

	a	b	c
a +6	+10	-8	-13 ✓
b +9	+11	-0	-4 ✓
c -15	+11	+0	-4 ✓
	+9	+8	+2 ✓
	+6	+13	+4 ✓
	+0	+15	0 ✓
	-6	+13	-8 ✓
	omit		
	-8	+11	-12 ✓

$-1.69 + 12.76 = +6.73\,\Delta$

$+ [\,] - 0.18 = +0.59\,\Delta$

$+12.58 = +7.32\,\Delta$

$+15.99 - 1.69 = +5.56$

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9250 Conditional Equations. 26

				O-C	new O-C
1	+1.65 - 0.93 = -169	-188 + 39	= -149	- 80	-53
2	+1.87 - 0.00 = -245	-215 + 10	= -215	+ 10	+6
3	+1.89 + 0.07 = -187	-215 - 4	= -219	+ 32	+28
4	+1.56 + 1.07 = -294	-178 - 68	= -246	- 78	-96
5	+0.93 + 1.65 = -231	-106 - 103	= -218	- 20	-16
6	+0.00 + 1.90 = -118	0 - 120	= -120	+ 20	+2
7	-1.07 + 1.57 = +59	+122 - 100	= +22	+ 37	+29
Omit	1.56 + 1.07 = -340	+116 - 106	= +10	- 30	
9	-1.29 + 1.40 = +63	+197 - 89	+ 58	+ 7	-53
				+88	-108

Roll

16.77 - 1.55 = -1100.5
-1.55 + 11.94 = -1067.1
+1.55 - 0.14 = -101.7
+11.8 = -1168.8 b = -99.0
+16.77 = -1100.5 - 153. = +1253.5 a = -75.

15.99 - 1.69 = -1711.5 + 5.56 ΔInr. 9 R 1.90
-1.69 + 12.76 = -615.1 + 6.73 Δ -2RC = -.76
+1.69 - 0.18 = -181
+12.58 = -796.1 b = -63.4 = +0.58 Δ
+15.99 = -1711.5 - 107.0 = +1818.5 a = -113.8 = +0.81 Δ

Arc Measured 163°

p/n = .22 Σv/4 = -2.5

Δ b2 - 0".88 Δδ = -0".2 -2.5/.22 = -19.9 ΔP = -0.1
Corr +0.2
Δ a = -0".31 Δγ = -0".01 ΔR = -0.3

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Final Conditional Equations 26

				O − C
1	+1.65 − 0.93	= −169	−188 + 59	= −129 −70
2	+1.47 − 0.00	= −20	−215 + 0	= −215 +10
3	+1.59 + 0.07	= −157	−215 + 9	= −219 +32
4	+1.56 + 1.07	= −299	−178 + 68	= −296 −98
5	+0.93 + 1.65	= −231	−106 + 105	= −211 +20
6	+0.00 + 1.90	= −118	− 0 + 120	= −120 +2
7	−1.07 + 1.57	= +59	+122 + 100	= +222 +37
omit	−1.56 + 1.07	= −349	+166 + 100	= +266 −33
9	−1.29 + 1.40	= +63	+197 + 89	= +286 +7
				+288 −108

Inverse

16.77 − 1.55 = −1100.5

−1.55 + 11.94 = −1467.1

+1.55 − 0.14 = −1017

+11.8 = −1164.8 b = −71.0

+16.77 = −1100.5 + 153. = −1253.5 a = −73.

15.99 − 1.69 = −1711.5

−1.69 + 12.76 = −615.1

+1.69 − 0.18 = −181

+12.58 = −796.1 b = −63.1

+15.99 = −1711.5 + 107.0 = −1818.5 a = −113.8

are Measured 183°

$\frac{P}{h} = .32$ $\frac{\Sigma V}{h} = -2.5$

$\frac{-2.5}{.32} = -17.9$ $\Delta\Pi = -0.1$

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9250 Moons Mean Position

x_0 = 21.06 60 (37) − 57 = 21.0623 21.0603

y_0 = 16.93 30 (50) − 32 = 15.9280 16.9298

From Plate Constants

x = (22.8629) = 22.8670

ξ + 0.8670

y = (15.9210) = 16.9731

η − 1.0269

log ξ 9.938021
cos δ 9.999636
8.507274
1434.72

log tan δ 9.11192
ξ 9.87600
7.05374
6.0736

α − A + 27.89

A 00 30 26

α_0 00 30 53.89

Red + 4.27

α' 00 30 57.36

η_1 + 0.0001
η_0 − 1.0270

log η_0 0.011757
7.331135
2.680742
− 479.1

δ − D − 07 59.1

D +7 32 39

1 δ_0 +7 24 39.8

Red + 27.8

δ' +7 25 07.7

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9250 Means Mean Positions 27

x_0 = 21.0660 (50) − 57 − 21.0603 −

y_0 = 16.9330 (−37) − 32 16.9298

From Plate Constants

x = (22.8629) = 22.8670 − ξ_1 + 0.8670 −

y = (15.9210) = 16.9738 − n − 1.0289 −

log ξ_1 9.9380 2 −
cos δ 9.9961 6 −
8.0727 −
1.9349 2 −

log tan δ 9.1092 −
ξ_1 9.8769 −
1.0539 −
6.0500 −

x − A + 2789 −

A 00 30 26 −

x_0 00 30 53.89 −

lead + 1.17 −

x' 00 30 57.06 −

n 1.000001
n_0 − 1.0278 −
log n 0.012577 n
7.3311 5 −
2.8072 n −
− 9.9911 −
δ − D − 07 59.1 −
D + 17 32 39 −
1 Jan 17.29 388 −
lead + 27.8 −
x' 17 29 07.9 −

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9250 Reduction to Apparent Place 28

H+α	6h	30.2	= 97° 33'.0	δ	+7 16.5"
H	5	59.3			
R	00	30.9		log cos δ	9.9965
GR	22	38.6		Δ	0.9109+
G+α	23	09.5"	= −12° 37.5"	i	0.9074

log cos G+α	9.9894			log Sin δ	9.1025"
q	1.3131			Cos H+α	9.1186n
Sin G+α	9.3396n			h	1.2737
tan δ	9.1060			Sin H+α	9.9962
	8.8239			Sec δ	0.0035"
					8.8239
log q'	1.3025"				
q	8.5876n			log h'	9.4948n
				h	0.0973

f	+2.960
g	−0.038
h	+1.251
	+4.173

g'	+20.07
h'	−0.31
i	+8.080
	+27.84

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9 2 5 0 Reduction To Apparent Place 28

H + χ 6h 30.2 = 97° 33.0 δ + 77 16.5'
H 5 39.3
R 00 30.9
- Gm 22 34.6
G + χ 23 09.5' = - 12° 37.5'

log cos δ 9.7765
d 0.9104 +
δ' 0.9077

log cos G + χ 9.9717
q 13131
Sin G + χ 9.3396 n
Tan φ 9.1060
8.8239

log Sin δ 9.1025
Cos H + χ 9.1186 n
h 12737
Sin H + χ 9.9962
Sec δ 0.0035
8.8239

log q' 1.3025
q 8.5826 n

log h' 7.9978 n
h 0.0973

f + 2.960
g .0038
h + 1.251
+ 4.173

g' + 20.07
h' - 0.31
d + 8.080
+ 27.89

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α' 0 30 57.36 ⌐
θ 1 16 27.5 ⌐
θ-α' 1 15 27.18 ⌐
= +18° 51' 47.10"

½ α-α' 6 46.50

(θ-α')-(½α-α') = 18 45 01.00

9.957127 ⌐
0.000000 ⌐
0.023685 ⌐
9.980805

δ 43° 44 38.4 ⌐

δ +7 25 07.7 ⌐

δ-δ' 36.19 30.7 ⌐

9.826740 ⌐
8.212509 ⌐
9.772599 ⌐
0.160255 ⌐
7.971781 ⌐

δ-δ' + 32 12.7 ⌐

δ 7 57 20.4 ⌐
Am Ephd +7 57 16.5 ⌐
O-C δ +3.9 ⌐
= 480'

Corr of Plate +0.2
2nd Order Reg 0.0
Im Corr −0.2
δ +7 57 20.2
O-C +3.7

δ'

π 56' 07."69 ⌐

9.869113 ⌐
8.212509 ⌐
9.509660 ⌐
0.004740 ⌐
7.595129 ⌐

α-α' 13' 32."21 ⌐
:
= + 57.13 ⌐
57.36

α 00 31 51.54 ⌐
Am Eph 00 31 50.83 ⌐
O-C +0.78 ⌐

.00
s
−0.01
α 00 31 51.50
+0.67

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7250 Lunar Parallax 24

L' 0 30 37 9 b
L 1 96 27 3
L-L' 1 1 3 27 18
= +1° 31 9 7.1 0

½ L-L' 6 76 59

C-L-½(L-L') 18 45 91.00

9.7 3 1 2 7
0.0 0 0 0 0
0.0 2 3 6 8
9 9 8 0 9 5

L 93° 44 3 4 4

+7 25 0 7

-836.19 3 0 7

9.8 2 6 7 0
9.2 1 2 5 0
9 7 7 2 5 8
0 1 6 0.2 5
7 9 7 1 7 8

L-L' +32 12 7

L 7 57 20 4 L 00 31 5 1 5 4

Amplt +7 57 16.5 Amplt 00 31 5 0.8 3

O-C +3.9 O-C +0.7 4

Curve Plate +0.2 .00
2nd Order Inf 0.0

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