Table

Derivation of Radius of Epicycle

From Retrograde Arc		Saturn	Jupiter	Mars	(Venus)	(Mercury)
Half retrograde arc	$-\underline{l}^{\circ}$	$3\frac{1}{2}$	5	8	$7\frac{1}{2}$	6
Time	$\underline{t}^{d}$	70	60	36	20	10
Ratio of velocities	$\underline{v_p}/\underline{v_c}$	57/2	65/6	37/42	5/8	145/46
Angular motion $\underline{t}^{d}$ after perigee passage	$\underline{c}^{\circ} = \underline{t}\underline{v_c}$	2;20	5;0	18;52	19;43	9;51
	$\underline{p}^{\circ} = \underline{t}\underline{v_p}$	66;39	54;8	16;37	12;19	31;4
	$\underline{d_2}^{\circ} = \underline{c} + \underline{l}$	5;50	10;0	26;52	27;13	15;51
Radius of epicycle where $\underline{R} = 60$	$\underline{r}$	6;24	11;35	39;24	43;6	22;26
Ptolemy	$\underline{r}$	6;30	11;30	39;30	43;10	22;30
Modern	$\underline{r}$	6;17	11;32	39;23	43;24	23;14

From Greatest Elongation					Venus	Mercury
Greatest elongation	$\underline{d}_{2\ max}^{\circ}$	--	--	--	46	22
Radius of epicycle	$\underline{r}$	--	--	--	43;10	22;29

The assumed mean values for $-\underline{l}$ and $\underline{t}$ are nearly correct and are also close to Ptolemy's final results, which are generally accurate. The ratios of $\underline{v_p}/\underline{v_c}$ are from Babylonian period relations given by Ptolemy. The angular motions are computed from the ratios using a solar velocity of $360^{\circ}/365\frac{1}{4}^{d} \approx 0;59,8^{\circ/d}$. Even a crude solar velocity of $1^{\circ/d}$ hardly changes the resulting values of $\underline{r}$. The resulting radii are much better than one would expect given the roughness of the parameters, particularly $\underline{t}$, and this is because the derivation is very insensitive to errors in time. The greatest elongations of Venus and Mercury are conventional ancient values found, for example, in Pliny's Natural History. Ptolemy's own derivations of epicyclic radii are far more sophisticated than these, but that earlier values of this kind gave him something to work from cannot be doubted.