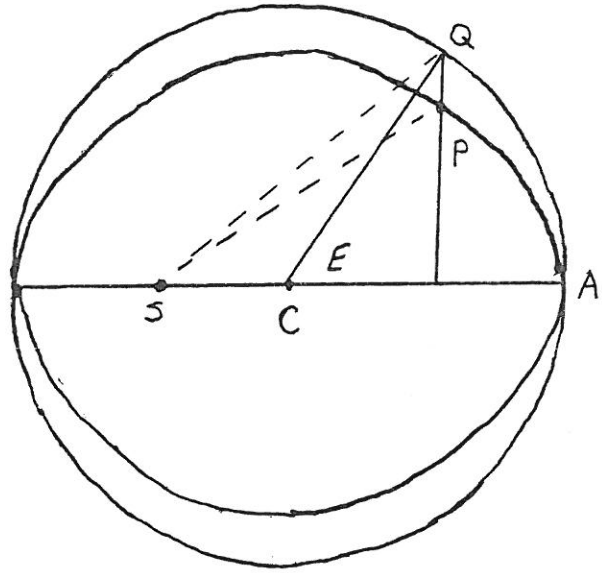


$CA = a$

$\frac{CS}{CA} = e$

$$\text{fraction of period} = \frac{n(t-T)}{2\pi} = \frac{M}{2\pi}$$

where n is mean (angular) motion, T is time of aphelion, and M is called "mean anomaly"

$$\frac{M}{2\pi} = \frac{\text{area of sector } ASP}{\text{area of ellipse}} = \frac{\text{area of sector } ASQ}{\text{area of circle}}$$

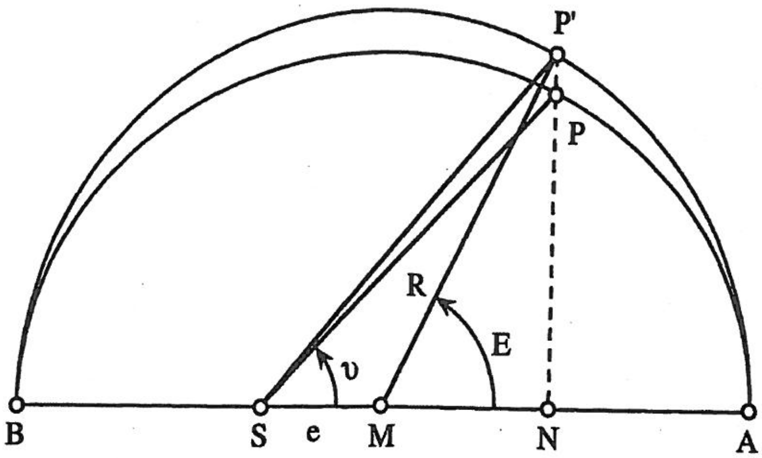
$$= \frac{\frac{a^2}{2}E + \frac{a^2 e}{2}\sin E}{\pi a^2}$$

$$= \frac{E + e\sin E}{2\pi}$$

Therefore

$$n(t-T) = M = E + e\sin E \quad \text{(Kepler's equation)}$$

Where E is called the "eccentric anomaly"



You have shown how to compute the mean anomaly and the coequated (true) anomaly from a given eccentric anomaly. But more frequently use requires that for a given mean anomaly, as from a given time, we find the others. Explain that also.

Here there is no direct way, but one who wishes to compute this without tables must employ the 'rule of assumptions', namely, as shown in the following figure, assuming the eccentric anomaly (arc) *AP′* as such and such an amount, and for the eccentric anomaly so assumed, computing its mean anomaly (area) *ASP′*. And if the result is the amount (of the mean anomaly) that was proposed, the eccentric anomaly (arc) *AP′* will have been assumed correctly. But if the result is not such an amount, the assumption will have to be corrected by means of the result and the work repeated.