

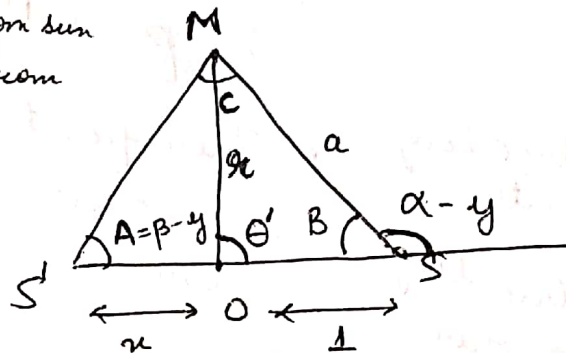
S: Sun  
S': mean sun  
 $S'O = x$   
 $SO = 1$

Aries ( $O'$ )

Point M can be specified by  $(r, \theta)$

where  $\theta = \theta' + y$   
and  $x, \theta'$  can be found as below.

$\alpha$ : angle of Mars from sun  
 $\beta$ : angle of Mars from mean sun.



$$\begin{aligned}\angle A &= \beta - y \\ \angle B &= \pi - (\alpha - y) \\ \angle C &= \pi - A - B\end{aligned}$$

Applying sine rule on  $\Delta MSS'$

$$\frac{\sin C}{1+x} = \frac{\sin A}{a}$$

$$\therefore \boxed{a = \frac{\sin A}{\sin C} (1+x)}$$

Now applying cos rule in  $\Delta MOS$

$$\begin{aligned}r^2 &= (1)^2 + a^2 - 2(1)(a)\cos B \\ r &= \sqrt{1 + a^2 - 2a\cos B}\end{aligned}$$

Finding  $\theta'$

From sine rule in  $\Delta MOS$

$$\frac{\sin \theta'}{a} = \frac{\sin B}{r}$$

$$\boxed{\theta' = \sin^{-1} \left( \frac{a \sin B}{r} \right)}$$

and  $\theta' + y = \theta$