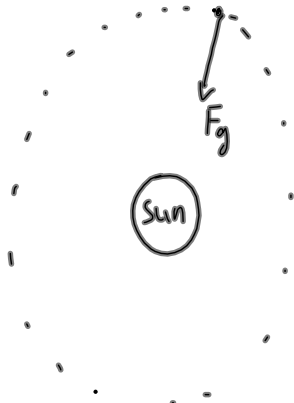


Newton's Hypothesis

Newton believed that  $F_g$  provided the centripetal force ( $F_c$ ) for a body orbiting the Sun!



$F_g$  is the net force ( $F_c$ )

We can equate  $F_g$  and  $F_c$  to solve for various things.

MP/585

$T = 365.25 \text{ d}$

$\times 24 \times 3600 \text{ s}$   
 $31557600 \text{ s}$

$r = 1.49 \times 10^{11} \text{ m}$

$m_{\text{Sun}} = ?$

$F_g = F_c$

← the Earth is the orbiting body, The Sun is the central body

$\frac{G m_{\text{earth}} m_{\text{sun}}}{r^2} = m_{\text{earth}} a_c$

$\frac{G m_{\text{earth}} m_{\text{sun}}}{r^2} = m_{\text{earth}} \left( \frac{4\pi^2 r}{T^2} \right)$

$m_{\text{sun}} = \frac{4\pi^2 r^3}{G T^2}$  **K**

$m_{\text{sun}} = \frac{4\pi^2 (1.49 \times 10^{11} \text{ m})^3}{(6.67 \times 10^{-11} \frac{\text{N}\cdot\text{m}^2}{\text{kg}^2}) (31557600 \text{ s})^2}$

$m_{\text{sun}} = 1.97 \times 10^{30} \text{ kg}$

TO DO:

① PP/580

② PP/586