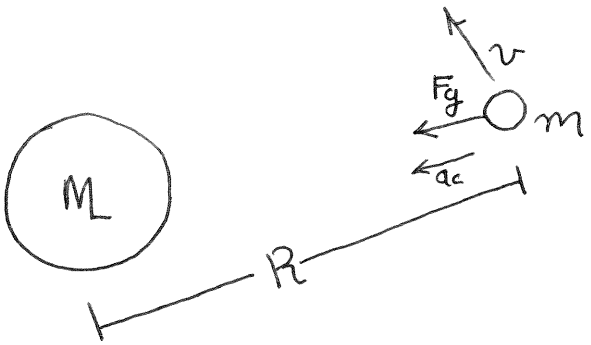
CH5 #31

TWO satellites in different CIRCULAR orbits

=> Different ORBITAL radii

$v_A = 3.43\, v_B$ FIND $\frac{T_A}{T_B}$ T ≡ ORBITAL PERIOD

I $\boxed{T = \frac{2\pi R}{v}}$ => WE DO NOT KNOW R => ELIMINATE R IN FAVOR OF v



$|\vec{a}_c| = \frac{v^2}{R}$

$$F_g = \frac{GMm}{R^2} = m a_c = \frac{m v^2}{R}$$

$$\frac{GM}{R} = v^2 \quad \boxed{\frac{GM}{v^2} = R} \quad \text{II}$$

II → I => $T = \frac{2\pi}{v}\left[\frac{GM}{v^2}\right]$

R

$$T = \frac{2\pi G M}{v^3} \quad \Rightarrow \text{COMPARE } T_A \text{ \& } T_B \text{ VIA A RATIO}$$

$$T_A = \frac{2\pi G M}{v_A^3} \qquad T_B = \frac{2\pi G M}{v_B^3}$$

$$\frac{T_A}{T_B} = \frac{\cancel{2\pi G M}}{v_A^3} \cdot \frac{v_B^3}{\cancel{2\pi G M}} = \frac{v_B^3}{v_A^3}$$

$$\frac{T_A}{T_B} = \frac{v_B^3}{v_A^3} \qquad v_A = 3.43\, v_B$$

$$\frac{T_A}{T_B} = \frac{v_B^3}{(3.43 v_B)^3} = \frac{\cancel{v_B^3}}{(3.43)^3 \cancel{v_B^3}} = \frac{1}{(3.43)^3}$$

$$T_A = \frac{1}{(3.43)^3} T_B$$