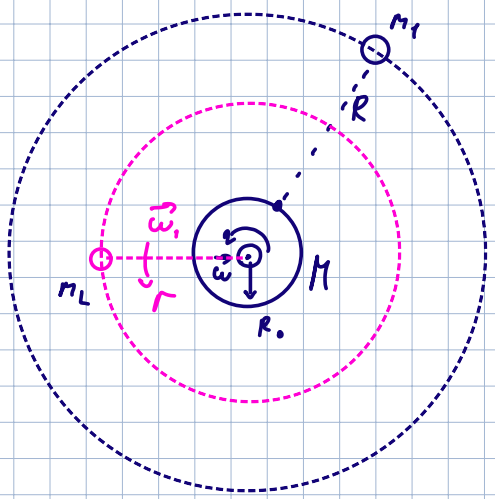


1) Над одной и той же точкой => $\omega_{сп.} = \omega_{планеты} = \omega$

2) II з.н. для спутника

$m_1 \vec{a}_1 = -G \frac{M m_1}{R^2} \cdot \frac{\vec{R}}{R}$

$m_2 \vec{a}_2 = -G \frac{M m_2}{r^2} \cdot \frac{\vec{r}}{r}$ в проекции

на радиус:

$a_1 = \frac{GM}{R^2}$ $a_2 = \frac{GM}{r^2}$

3) $a_1 = \omega^2 R$, $a_2 = \omega_1^2 r$ $\Rightarrow$ $\omega^2 = \frac{GM}{R^3}$, $\omega_1^2 = \frac{GM}{r^3}$

4) $r^3 = (R_0 + h)^3$ т.к. $h \ll R_0$ $\Rightarrow$ $r^3 \approx R_0^3$ Пренебрежем высотой

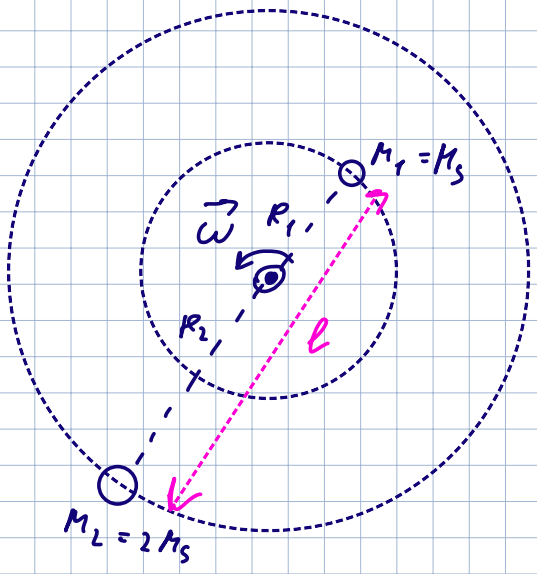
5) Получили:

$\frac{\omega^2}{\omega_1^2} = \frac{R_0^3}{R^3}$ // $\omega = \frac{2\pi}{T}$, где T - период об/р. //

$\Rightarrow$ $\frac{T_1^2}{T^2} = \frac{R_0^3}{R^3}$ // Третий з-н Кеплера //

По усл-ию $T = 17 T_1$

$\Rightarrow$ $\frac{1}{17^2} = \frac{R_0^2}{R^3}$ или $\boxed{\frac{R}{R_0} = 17^{\frac{2}{3}}}$



$$\begin{cases} (\omega^2 R_1) M_1 = G \dfrac{M_1 M_2}{l^2} \\ (\omega^2 R_2) M_2 = G \dfrac{M_1 M_2}{l^2} \end{cases}$$

$$\begin{cases} \omega^2 R_1 = G \dfrac{M_2}{l^2} \\ \omega^2 R_2 = G \dfrac{M_1}{l^2} \end{cases}$$

1) $\dfrac{R_1}{R_2} = \dfrac{M_2}{M_1} \Rightarrow R_1 = \dfrac{M_2}{M_1} R_2$

$l = R_1 + R_2 \Rightarrow l = \dfrac{M_2 + M_1}{M_1} R_2$

$\Rightarrow R_2 = \dfrac{M_1}{M_1 + M_2} l$

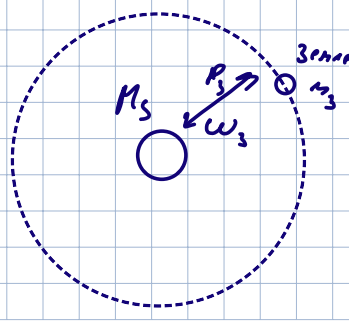
$$\omega^2 \cdot \frac{M_1}{M_1 + M_2} l = G \frac{M_1}{l^2}$$

$$\omega^2 = G \frac{M_1 + M_2}{l^3} = G \cdot \frac{3M_S}{l^3}$$

$$\omega = \sqrt{\frac{3GM_S}{l^3}}$$

$$T = \frac{2\pi}{\omega} = 2\pi \sqrt{\frac{l^3}{3GM_S}} \qquad T = 2\pi \sqrt{\frac{l^3}{3GM_S}} \qquad \text{// } T \approx 74{,}6 \text{ суток } \text{//}$$

Для Земли и Солнца



Для Земли: $T_3 = 365$ дней $\qquad \omega_3 = \dfrac{2\pi}{T_3}$

$M_3 \cdot (\omega_3^2 R_3) = G \dfrac{M_3 M_S}{R_3^2} \qquad R_3 = 1$ а.е. // по опр. //

$\Rightarrow \omega_3 = \sqrt{\dfrac{GM_S}{R_3^3}}$

$T_3 = 2\pi \sqrt{\dfrac{R_3^3}{GM_S}}$

$$\Rightarrow \quad \frac{T}{T_3} = \frac{2\pi\sqrt{\frac{e^3}{3GM_5}}}{2\pi\sqrt{\frac{R_3^3}{6M_5}}} = \sqrt{\left(\frac{e}{R_3}\right)^3 \cdot \frac{1}{3}} = \sqrt{\left(\frac{0{,}5}{1}\right)^3 \cdot \frac{1}{3}} = \sqrt{\frac{1}{24}}$$

$$\Rightarrow T = T_3 \cdot \sqrt{\frac{1}{24}} = 365 \text{ суток} \cdot \sqrt{\frac{1}{24}} \approx 74{,}5 \text{ суток}$$