3) You are looking to drop two satellites into orbit around two planets made of the same substance, except that planet A has twice the diameter as planet B. The satellites will be close to the surface of each planet, which we can do because neither planet has atmosphere. How does the speed of satellite B (orbiting planet B in low orbit) compare to the speed of satellite A? That is:

v_A = __B__ v_B

A correct answer with no explanation will earn you an F. Please explain what is going on.

Along the way, it might be a good idea to explain what is the ratio of the masses of the planets:

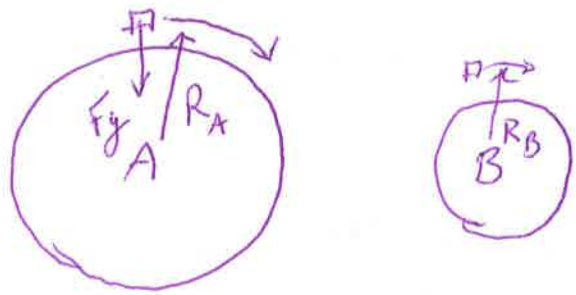
m_A = __8__ m_B

As well as the ratio of the accelerations of the two satellites:

a_A = __2__ a_B

$m \propto$ Volume $\propto r^3$

$m_A = 2^3 m_B = 8 m_B$



Dynamics because

$\Sigma \vec{F} = m\vec{a}$ .... $= m\dfrac{v^2}{r}$ There is only 1 force

.... ~~Centripetal Force~~

OMG... I didn't say that...

The gravitational force $= m a_c$

$\propto \dfrac{m_{(planet)}}{r^2}$, so $a_A = \dfrac{(8)}{2^2} a_B = 2 a_B$

$a_c = \dfrac{v^2}{r}$ $\quad v = \sqrt{a_c r}$

$v_A = \sqrt{(2)(2)}\, v_B = 2 v_B$

or = all together:

$F_g = m a_c$ $\Rightarrow$ $\dfrac{m_s M_{planet}}{r^2} G = \dfrac{m_s v_s^2}{r}$

M_{planet} = Density $\cdot \frac{4}{3}\pi r^3$ $\qquad \dfrac{\text{Density} \cdot \frac{4}{3}\pi r^3}{r^2} G = \dfrac{v_s^2}{r}$