Student Practice
Force Centripetal

#1 explained on YouTube

1. A 2kg bucket is swung around a vertical circle at 4m/s on a 1M string. Answer the following.
   a. What is the force centripetal?

$F_c = \frac{mv^2}{r}$ $\frac{2 \cdot 4^2}{1} = 32\,N$

   b. What is the force tension on the string at the top?

$\Sigma F = F_c = -F_g - T$ $F_g = 2 \cdot 10 = 20$ $32 - 20 = \underline{12N}$

   c. What is the force tension on the string at the bottom?

$32 + 20 = 52N$

   d. What is the minimum speed the bucket could swing around and still complete the circle?

$F_c = F_g \longrightarrow v_t = \sqrt{gr}$ $\sqrt{10 \cdot 1} = 3.16\,m/s$

   e. What is the angular velocity on the bucket at this minimum speed?

$\frac{\theta}{s} = \omega$ $v_t = \omega r$ $\frac{v_t}{r} = \omega$ $\frac{3.16}{1} = \boxed{3.16}$

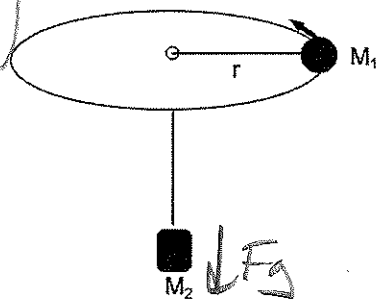
2. Derive a formula for the minimum speed for a bucket to make a complete loop in terms of gravity and radius. Show all steps.

$F_c = F_g$

$\frac{mv_t^2}{r} = mg$ $\frac{v_t^2}{r} = g$

$\boxed{v_t = \sqrt{gr}}$

3. The picture to the right is a very common phenomenon seen in physics classes.
   a. Draw the forces present on each mass. $F_g = F_c$
   b. Using only variable derive a formula for the velocity of M_1 to maintain the mass of M_2 in equilibrium.



   c. If $M_2 = 0.5kg$ and $M_1 = 0.001kg$, how fast would M_1 need to move? (20cm)

b) $F_c = F_g$

$\frac{M_1 v_t^2}{r} = M_2 g \longrightarrow \sqrt{\frac{M_2 g r}{M_1}}$

c) $\sqrt{\frac{.5 \cdot 10 \cdot .2}{.001}} = 31.6\,m/s$