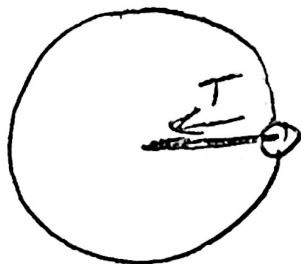


Circular Motion Practice Problems:

3. [Horizontal circles] A 0.4kg ball on a string is swinging in circles (in a horizontal plane) at a constant speed of 3m/s. The radius of the orbit (i.e. the string length) is 0.5m and the string is horizontal (because this is happening in the absence of gravity). What is the tension in the string?

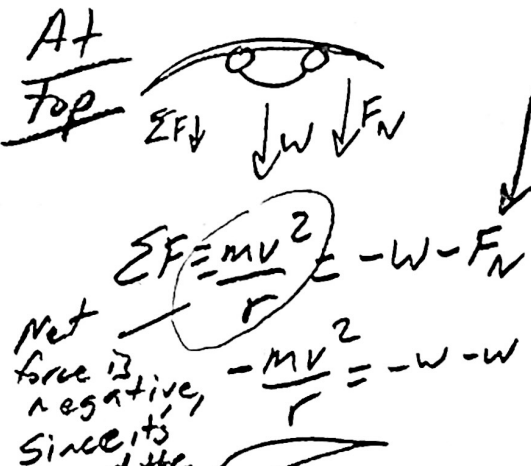
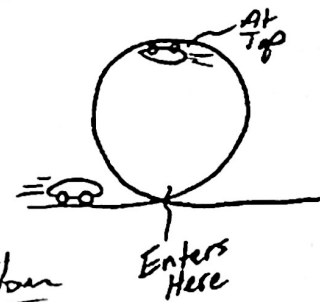


$$\Sigma F = \frac{mv^2}{r} \Rightarrow T = \frac{mv^2}{r} = \frac{0.4\text{kg} (3\text{m/s})^2}{0.5\text{m}}$$

$$\Sigma F = T$$

$T = 7.2\text{N}$

4. [Vertical Circles] A car is approaching a "loop-the-loop" with a radius of 15m. What speed does the car need to maintain in order to experience a normal force at the top of the loop that is equal to the weight of the car? At this speed, what normal force does the car experience when it is just entering the loop?

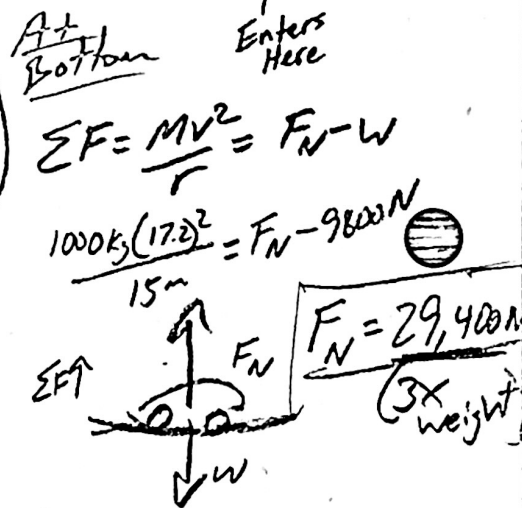


$$-\frac{mv^2}{r} = -2mg$$

$$v = \sqrt{2gr}$$

$$v = \sqrt{2(9.8\text{m/s}^2)(15\text{m})}$$

$v = 17.2\text{m/s}$



Net force is negative, since it's toward the center, which is down.

- [Vertical Circles] A child weighing 200N is standing on a bathroom scale inside a Ferris Wheel that is rotating at a constant rate. If the radius of the circles made by the child is 10m, and the scale reads 100N at the top, what is the child's speed? What does the scale read when the child is at the bottom?

