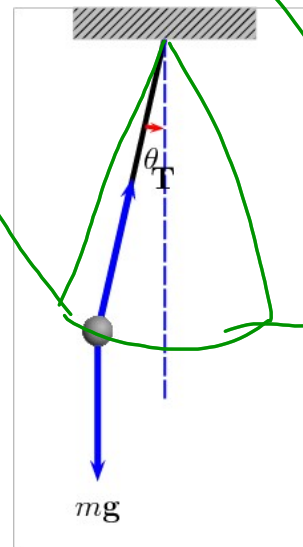


Tension Application - Pendulum



- As the pendulum swings, the angle between the rope and the vertical changes
 - > Periodic motion
- Force of gravity remains constant
- Tension changes throughout swing
 - > Full analysis while swinging for a later time
- For now, can consider when object is stationary



Ex 3: A pendulum of mass 200g is suspended vertically on a thread. The mass is then pulled horizontally until the string makes an angle of 30° with the vertical.

- What force is applied horizontally?
- What is the resultant tension in the string?

https://commons.wikimedia.org/wiki/File:Foucault_pendulum_animated.gif

Do Practice Problems 15, 18 on page 478

Ex 3

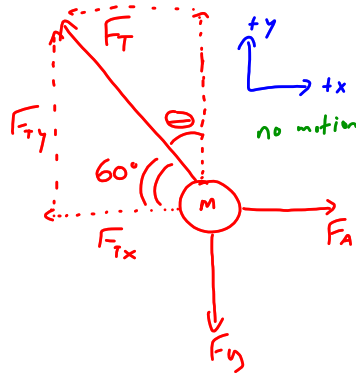
$$m = 200 \text{ g}$$

$$\theta = 30^\circ$$

$$\vec{a}_x = 0 \text{ m/s}^2$$

$$\vec{a}_y = 0 \text{ m/s}^2$$

$$\vec{g} = 9.81 \text{ m/s}^2 \text{ [down]}$$



$$F_{\text{Net},x} = F_A - F_{Tx} = ma_x = 0 \text{ N}$$

$$F_A = F_{Tx} = F_T \cos \theta$$

$$F_{\text{Net},y} = F_{Ty} - F_g = ma_y = 0 \text{ N}$$

$$F_g = F_{Ty} = F_T \sin \theta$$

$$\left(\frac{F_g}{F_A} \right) = \frac{F_T \sin \theta}{F_T \cos \theta} = \tan \theta$$

$$F_A = \frac{F_g}{\tan \theta} = \frac{mg}{\tan \theta} = \frac{(200 \text{ kg})(9.81 \text{ m/s}^2)}{\tan 60^\circ}$$

$$F_A = 1.1328 \text{ N} = \boxed{1.13 \text{ N}}$$

$$b) F_g = F_T \sin \theta$$

$$F_T = \frac{F_g}{\sin \theta} = \frac{mg}{\sin \theta} = \frac{(0.200 \text{ kg})(9.81 \text{ m/s}^2)}{\sin 60^\circ}$$

$$F_T = 2.265 = \boxed{2.27 \text{ N}}$$