

Test 2 Phys 111, Fall 2009, Section 1

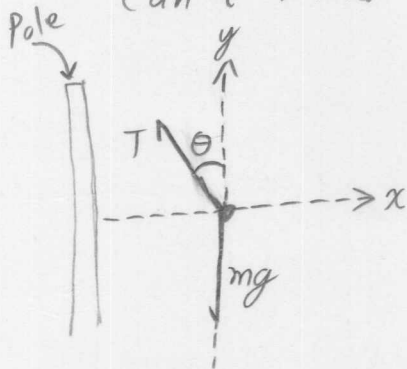
Napoleon lands a flippin' sweet blow to the tether ball, which is attached to a rope of whose length is $L = 0.60\text{m}$ sending it whipping around the pole with a period of of 0.75s .



a) Napoleon is jealous of your awesome physics skills and needs your help finding an expression for the angle, θ , that the rope makes with the pole.

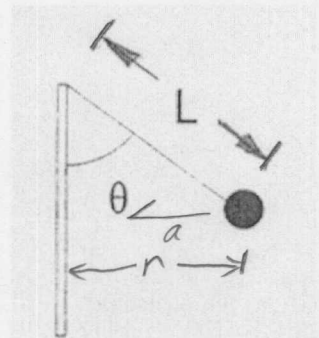
b) Calculate a numeric value for θ using your expression from part a and use it to calculate the tension in the rope.

I forgot to include m , so really you can't find the tension.



$$x: +T \sin \theta = m r \omega^2 \quad (1)$$

condition for
uniform circular
motion



$$r = L \sin \theta$$

$$y: T \cos \theta - mg = 0$$

↑
no motion
in y

$$T \cos \theta = mg \quad (2)$$

Divide (1) by (2)

$$\frac{T \sin \theta}{T \cos \theta} = \frac{m r \omega^2}{m g}$$

Replace $r = L \sin \theta$ and $\omega = \frac{2\pi}{P}$

$$\frac{\sin \theta}{\cos \theta} = \frac{L \sin \theta}{g} \frac{4\pi^2}{P^2} \Rightarrow \boxed{\cos \theta = \frac{g P^2}{4\pi^2 L}}$$

$$\theta = \cos^{-1} \left[\frac{(9.8)(0.75)^2}{(4)\pi^2 (0.6)^2} \right] = \boxed{67^\circ}$$