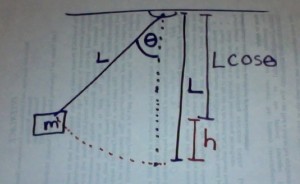
Given a pendulum with L = 0.75 m, W = 0.22 kg, that is pulled away by an angle of 8.1֯ and released from rest resulting in simple harmonic motion, find a) the angular frequency, b) the total mechanical energy at the lowest point of the swing, and c) the velocity of the swing.

1. The equation for angular frequency of a pendulum is pretty easy: , where g is gravitational acceleration, and L is the Length of the pendulum.
2. At the lowest point of the swing, the pendulum has ONLY kinetic energy, and NO potential energy, so the total mechanical energy at that point will be just the kinetic energy. Now this would make you want to jump right into the kinetic energy equation, but since we do not know the velocity, we can’t do that. This problem is trying to be tricky, and make you realize that you need to use the conservation of energy to determine the total energy of the system. To get around this, we can just determine the total energy of the system at the point where the pendulum was *released* instead of at the bottom of the swing, since Total Energy = KEbottom = PErelease. So instead we will use the equation . Although we don’t know the height (h) of the pendulum at the release, we can calculate it using the angle that the pendulum was pulled and the length of the pendulum (L). Here is a visualization that I stole from the internet:

[](http://blogs.bu.edu/ggarber/files/2012/03/PendulumHeight2.jpg)

Using this information, we can determine that . Now we can calculate the energy in the system.

1. Now that we know what the kinetic energy is at the bottom of the swing, we can use the kinetic energy equation to determine the velocity: