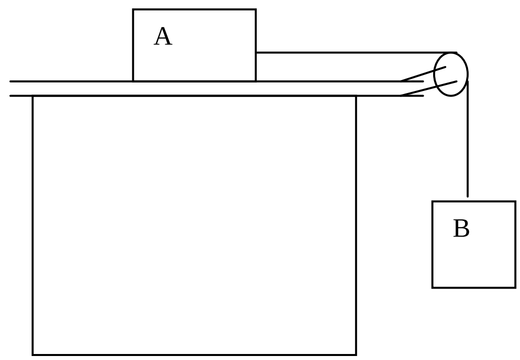
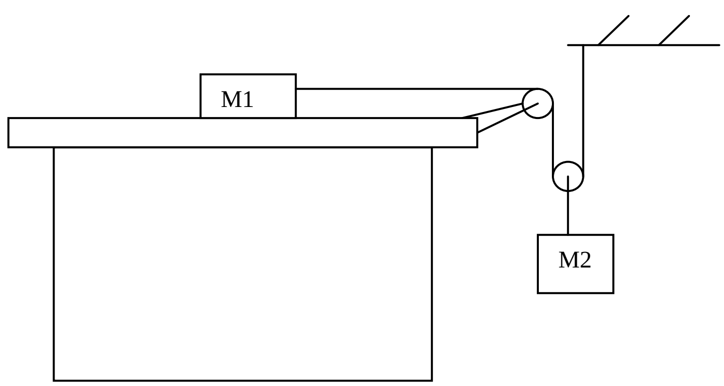
Physics 113 - Fall 2012 - workshop module 4
More Newton's Laws, friction, start of work

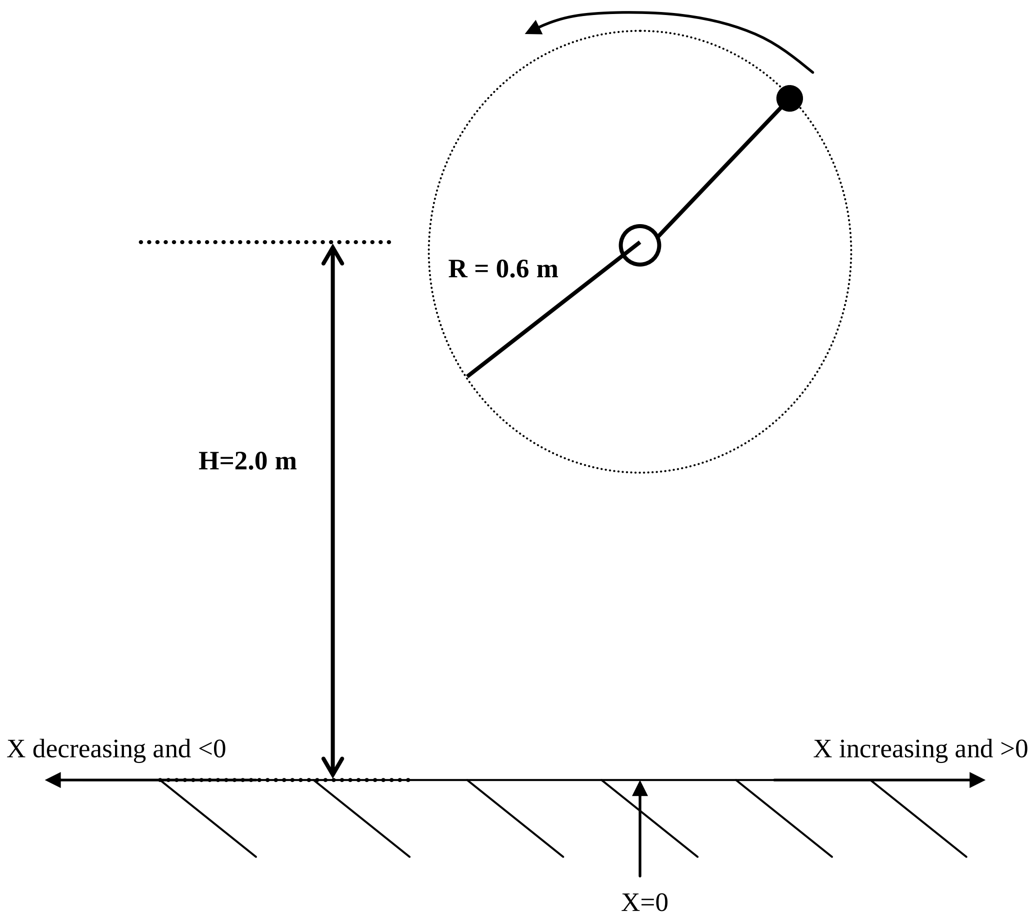
1. Consider the system shown below. The coefficient of kinetic friction between block A (with weight W_a) and the table top is μ_k. (a) Calculate the weight W_b of the hanging block required if this block is to descend at constant speed once it has been set into motion. (b) Suppose the coefficient of static friction is $\mu_s = 0.4$ and the mass of A is 30 kg and the mass of B is 2 kg. What is the force of friction on mass A now (assuming an initial condition of no motion)? How will the system move as time increases?



2. When stopping a car on an icy or wet road … or a dry road, for that matter … is it better to push the brake pedal hard enough to lock the wheels and make them slide or to push gently so that the wheels continue to roll? What is the point behind "anti-lock disk brakes"?
3. Consider the drawing below. In terms of m_1, m_2 and g, find the acceleration of each block in the system. Assume there is no friction anywhere in the system. Check your solution with limiting cases.



4. A steel ball of mass M=1.2 kg is tethered to the end of a massless cable. The ball is attached to a spinning axle that causes the ball and cable to rotate in a vertical circle as shown below. The ball moves in a circle of radius 0.6 m centered at a height of 2.0 m above a flat surface. The rate of rotation increases VERY SLOWLY until the cable snaps. The cable snaps when the tension in the cable reaches 100 Newtons. Relative to the position of the axle over the floor (x=0 in the sketch), where does the ball hit the floor?



5. A traffic engineer claims that traffic lights timed so motorists can travel long distances between stops will improve air quality in a city. Do you believe this? Why or why not?