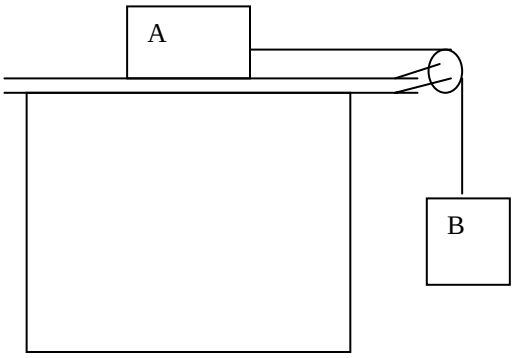
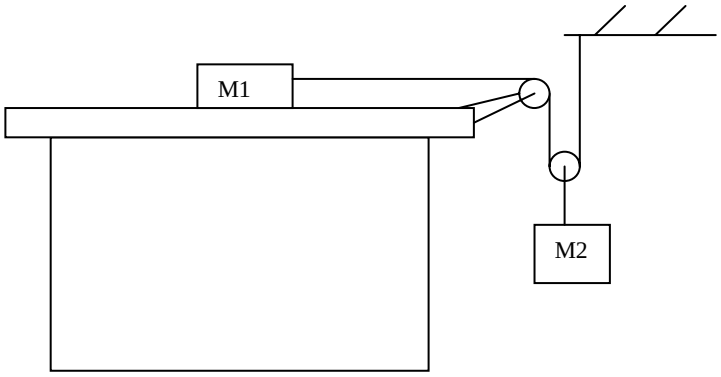
Physics 113 - Fall 2006 - workshop module 4
More Newton's Laws, friction, start of work

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?

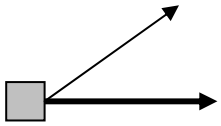


2. When stopping a car on an icy or wet road … or a dry road, for that matter … is it better to push the brake pedal hard enough to lock the wheels and make them slide or to push gently so that the wheels continue to roll? What is the point behind "anti-lock disk brakes"?
3. Consider the drawing below. 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. Divide into small groups. Each group should pick one (or more if the workshop is small) of the five parts below. For each part consider a mass of 2 kg that is moved by one or more forces along the surface of a horizontal, frictionless floor. In the following diagrams, one vector (the thin one) represents one of the forces (of magnitude 3 N) that acts on the mass. The other vector (the thick one) represents the net displacement, S = 4 meters, of the mass due to the motion caused by the forces acting on it. Determine the work performed on the mass by the force shown during the movement. For your assigned part, converge on an answer within your small group and then convince the other groups that your answer is correct.

(a)



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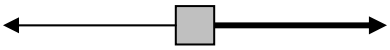
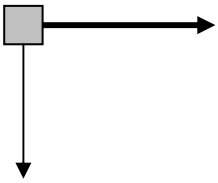
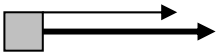


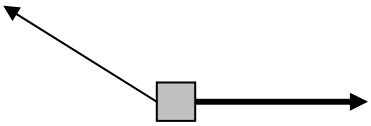
(c)



(d)



(e)



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?