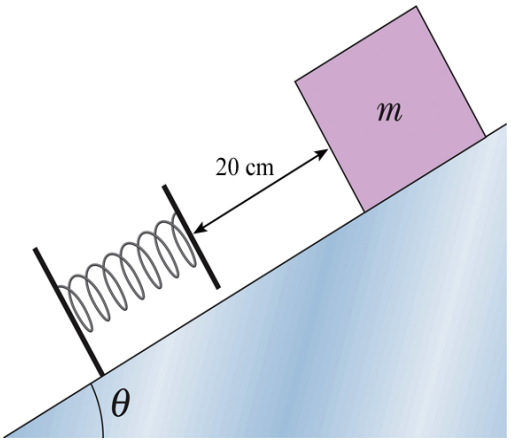
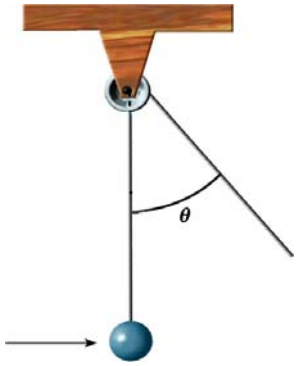
Phyx 135-1 Midterm I, Spring 2015 **Name** _____

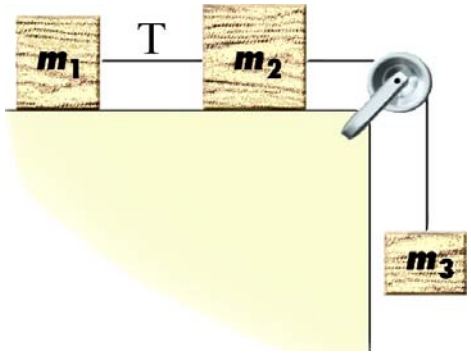
1) (12 points) A block of mass m = 2.5 kg is setting on a ramp inclined at θ = 37°. There is a coefficient of kinetic friction μ_k = 0.15 between the ramp and the block. The block is 20 cm (*along* the ramp) from a spring with a spring constant of k = 30 N/m. If I release the block and let it slide freely until it just stops, by what distance x (measured along the ramp) will it have compressed the spring?



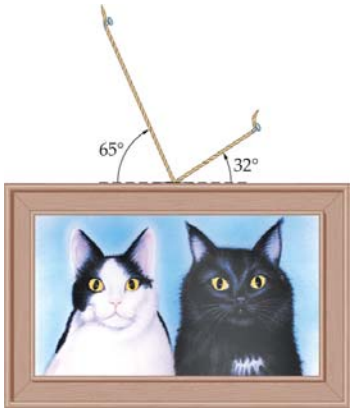
2) (10 points) Suppose a ball of mass m = 5 kg is hanging by a string from a frictionless pivot. The length of the string is 2 meters. Then, a bullet of mass m = 35 g travelling at 600 m/s is shot horizontally into the ball (i.e., the bullet remains stuck inside the ball). To what angle θ will the ball rise?



3) (10 points) Three masses of $m_1 = 2$ kg, $m_2 = 3$ kg, and $m_3 = 1$ kg are arranged at shown at right. There is a coefficient of kinetic friction $\mu_k = 0.25$ between mass m_2 and the table; the rest of the system is frictionless. If I allow m_3 to fall freely, what will be the tension T in the cord between masses m_1 and m_2?



4) (10 points) You tack a photo to the wall by using two pieces of string that are rather sloppily attached to the photo at angles of 65° and 32°, respectively, for the left and right strings. If the photo has a mass of 5 kg, what are the tensions in the two strings?



5) (8 points) If the coordinate origin of the boxes shown at right is chosen to be at the far back left corner of the pallet, then where is the center of mass of the boxes? (There are 10 boxes total on the pallet.) Take l = 1 meter.