University of Alabama
Department of Physics and Astronomy

PH 105 LeClair Summer 2012

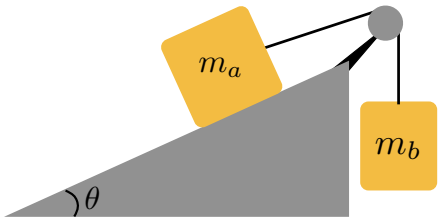
Problem Set 5

Instructions:

1. Answer all questions below. All questions have equal weight.
2. All problems are due Wed 6 June 2012 at the start of lecture.
3. You may collaborate, but everyone must turn in their own work.

1. *HRW 5.31* A block is projected up a frictionless inclined plane with an initial speed of $v_o = 3.50\,\text{m/s}$. The angle of incline is $\theta = 32.0°$. (a) How far up the plane does the block go? (b) How long does it take to get there? (c) What is its speed when it gets back to the bottom?

2. *HRW 5.57* A block of mass $m_a = 3.70\,\text{kg}$ on a frictionless plane inclined at an angle $\theta = 30.0°$ is connected by a cord over a massless, frictionless pulley to a second block of mass $m_b = 2.30\,\text{kg}$ (figure below). What are (a) the magnitude of the acceleration of each block, (b) the direction of the acceleration of the hanging block, and (c) the tension in the cord?



3. *HRW 5.50* In the figure below, three ballot boxes are connected by cords, one of which wraps over a pulley having negligible friction on its axle and negligible mass. The three masses are $m_a = 30.0\,\text{kg}$, $m_b = 40.0\,\text{kg}$, and $m_c = 10.0\,\text{kg}$. When the assembly is released from rest, (a) what is the tension in the cord connecting B and C, and (b) how far does A move in the first 0.250 s (assuming it does not reach the pulley and B and C do not reach the floor)?

4. *HRW 6.30* A toy chest and its contents have a combined weight of 180 N. The coefficient of static friction between toy chest and floor is $\mu_s = 0.42$. A child attempts to move the chest across the floor

by pulling on an attached rope. (a) If the rope makes an angle of $\theta = 42^\circ$ with the horizontal, what is the magnitude of the force $\vec{\mathbf{F}}$ that the child must exert on the rope to pull the chest on the verge of moving? (b) Write an expression for the magnitude F required to pull the chest on the verge of moving as a function of the angle θ. Determine the value of θ for which F is (c) a minimum and (d) a maximum magnitude.