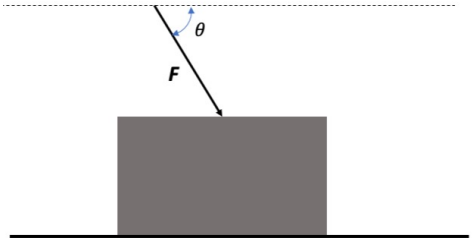
Chapter 5 Written Homework Problems
DUE: February 17 at the beginning of class
SHOW ALL WORK FOR FULL CREDIT

1. In an amusement park ride of days-gone-by passengers would enter a large vertical cylinder. After the passengers stood against the wall the rotational speed of the cylinder was increased to a predetermined value and the floor below the passengers was lowered, see Figure. Onlookers could stand on walkways above the ride and look at the passengers 'pinned' to the wall of the rotating cylinder. Taking the radius of the cylinder to be *R* and the speed of the passengers as *v*, what must be the minimum coefficient of static friction to prevent the passengers from slipping on the wall of the cylinder?

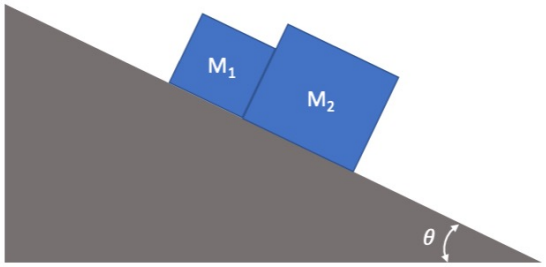
2. A car is traveling along a road when the driver sees the bridge over the canyon he is approaching has been washed out by flooding due to a recent rain storm. The driver locks-up his tires on the wet concrete and skids for 60 m before going over the edge of the 50 m deep canyon, and crashing onto level ground 55 m from the edge of the canyon. After taking the driver to the hospital the police ask the investigator to determine the driver's speed just before he hit the brakes and started to skid. What is the investigator's answer? The investigator justifiably ignored air resistance.

3. One of the oldest Olympic competitions is the hammer throw. In this competition the thrower rotates a 7.30 kg metal sphere (the 'hammer') attached to a 121 cm long spring-steel wire. If the steel wire makes an angle of 10.0^{o} below the horizontal, what is the speed of the hammer?

4. You push on a heavy box at an angle of θ below the horizontal as shown in the Figure to the right. Show that of the coefficient of static friction between the box and floor on which it rests exceeds 0.75 the box will not move no matter how large a force you apply if $\theta > 54^{\circ}$.



5. Two blocks slide down an inclined plane as shown in the Figure. The coefficient of kinetic friction between the blocks and the incline is μ_1 for m_1 and μ_2 for m_2. *(a)* what is the acceleration of the pair and *(b)* the force that m_1 exerts on m_2? Take $\theta = 35^{\circ}$, $m_1 = 2.0$ kg, $m_2 = 3.0$ kg, $\mu_1 = 0.25$, and $\mu_2 = 0.50$.



6. In Chapter 5 your book finds an expression for an object's speed as a function of time, when it starts from rest and falls vertically through the liquid at 'low' speed and then shows that the terminal speed is $v_T = mg/k$ (see equation 5.8 in the 14th and 15th editions). Suppose now that the object is given an initial velocity in the horizontal direction equal to the terminal speed. In terms of v_T what is the maximum horizontal distance the object can travel?