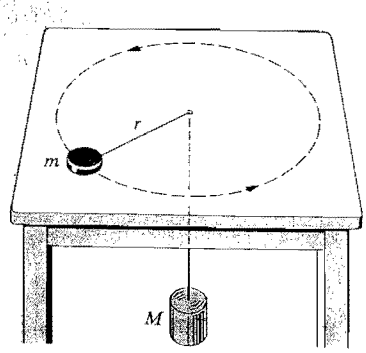
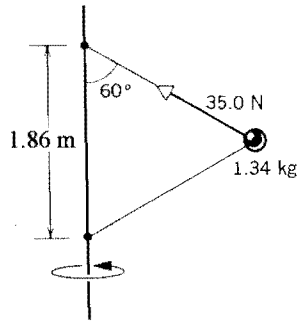
Ph201H/211H
F08

Homework – Due Monday, November 3, 2008



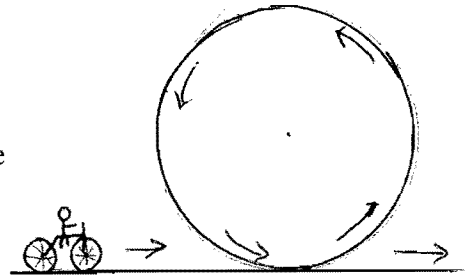
1. A small flat object of mass m = 1.3 kg moves on a frictionless horizontal table. It is attached to a second freely hanging object of mass M = 4.8 kg by a string that passes through a hole in the center of the table. Find the speed with which m must move on a circular path of radius r = 0.38 m in order for M to remain at rest.

Answer: 3._ m/s



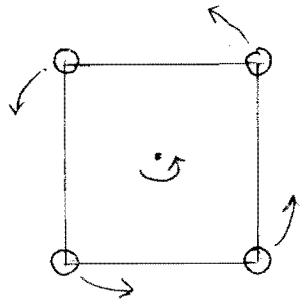
2. A ball of mass 1.34 kg is attached to a rigid vertical rod by 2 strings of length 1.86 m that have negligibly small masses. The strings are attached to the rod at points 1.86 m apart so that they form 2 sides of an equilateral triangle. The entire system is rotating about the axis of the rod. Both strings are taut. The tension in the upper string is 35.0 N. (a) Find the tension in the lower string. (b) Calculate the net force on the ball. (c) What is the speed of the ball?

Answer: (a) 8._4 N; (b) 3_.9 N; (c) 6._5 m/s



3. A bicycle daredevil rides his cycle around a loop of radius 3.3 m. The combined mass of the cycle and rider is 75 kg. He rides around the loop at a speed of 8.4 m/s. (a) What is the normal force exerted on the cycle by the loop when the cyclist is at the top of the loop? (b) What must be his minimum speed in order not to lose contact with the loop at the top?

Answer: (a) 8._ $\times 10^2$ N; (b) 5._ m/s



4. In an unusual astronomical discovery, four stars all of the same mass M are found to be occupying the corners of a square whose sides are of length L. The entire arrangement is rotating about an axis perpendicular to the plane in which the stars are located; the axis passes through the center of the square. Find the speed of any one of the stars.