Name_____

Phys 2010 (NSCC), Fall 2005
Problem Set #12

1. A horizontal 800-N merry-go-round of radius 1.50 m is started from rest by a constant horizontal force of 50.0 N applied tangentially to the merry-go-round. Find the kinetic energy of the merry-go-round after 3.00 s.

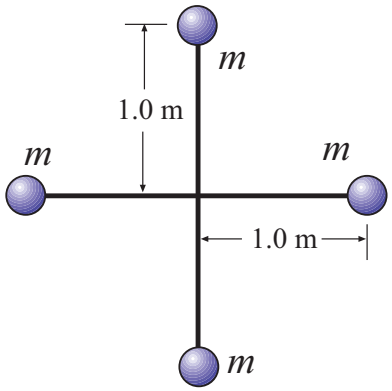
2. A 10.0-kg cylinder rolls without slipping on a rough surface. At an instant when its center of mass has a speed of $10.0\,\frac{\mathrm{m}}{\mathrm{s}}$, determine (a) the translational kinetic energy of its center of mass (b) the rotational kinetic energy about its center of mass and (c) its total kinetic energy.

3. In class we found (using the conservation of energy) that the acceleration of a uniform cylinder when it rolls without slipping down a slope of angle θ is $\frac{2}{3}g\sin\theta$.

Redo the problem for a uniform solid *sphere* rolling down a slope of angle θ. You can assume the sphere has mass M and radius R, but the answer won't depend on these.

4. The system of small objects shown at the right is rotating at an angular speed of 2.0 rev/s. The objects are connected by light, flexible spokes which can be lengthened or shortened.

What is the new angular speed if the spokes are shortened to 0.50 m? (Assume that the shortening of the spokes does not change the angular momentum of the system.)



5. A merry-go-round rotates at a rate of 0.20 rev/s with an 80-kg man standing at a point 2.0 m from the axis of rotation. What is the new angular speed when the man walks to a point 1.0 m from the center? Assume that the merry-go-round is a solid 25-kg cylinder of radius 2.0 m.

6. For the situation in Problem 5, find the change in kinetic energy due to the man's movement.

7. A 0.40-kg object is attached to a spring with force constant 160 N/m so that the object is allowed to move on a horizontal frictionless surface. The object is released from rest when the spring is compressed 0.15 m. Find (a) the force on the object and (b) its acceleration at that moment.

8. An archer pulls her bowstring back 0.400 m by exerting a force that increases uniformly form zero to 230 N. (a) What is the equivalent spring constant of the bow? (b) How much work is done in pulling the bow?