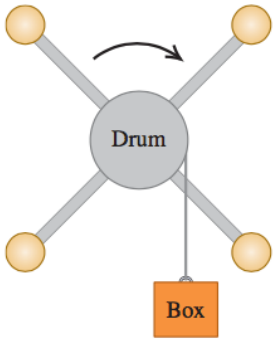
Spring-2018 Phys101
Assignment 9
Check MateringPhysics for other problems
Due date: 15 April 2018.

Discussion questions

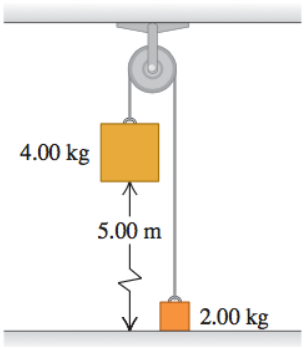
1-An elaborate pulley consists of four identical balls at the ends of spokes extending out from a rotating drum as shown below. A box is connected to a light thin rope wound around the rim of the drum. When it is released from rest, the box acquires a speed V after having fallen a distance d. Now the four balls are moved inward closer to the drum, and the box is again released from rest. After it has fallen a distance d, will its speed be equal to V, greater than V, or less than V? Show or explain why.



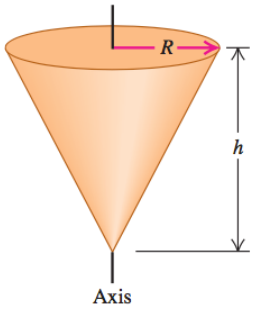
2- How might you determine experimentally the moment of inertia of an irregularly shaped body about a given axis?

Problems

3- The pulley in the figure below has radius 0.160 m and moment of inertia 0.560 kg.m^2. The rope does not slip on the pulley rim. Use energy methods to calculatethe speed of the 4.00-kg block just before it strikes the floor.



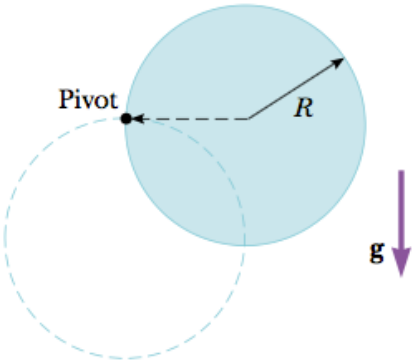
4- Calculate the moment of inertia of a uniform solid cone about an axis through its center. The cone has mass M and altitude h. The radius of its circular base is R.



5- A uniform, solid disk of radius R and mass M is free to rotate on a frictionless pivot through a point on its rim (see the figure below). If the disk is released from rest in the position shown by the blue circle,

(a) What is the speed of its center of mass when the disk reaches the position indicated by the dashed circle?

(b) What is the speed of the lowest point on the disk in the dashed position?



6- The pulley shown below has radius R and moment of inertia I. One end of the mass m is connected to a spring of force constant k, and the other end is fastened to a cord wrapped around the pulley. The pulley axle and the incline are frictionless. If the pulley is wound counterclockwise so that the spring is stretched a distance d from its unstretched position and is then released from rest, find an expression for the angular speed of the pulley when the spring is in the unstretched position.