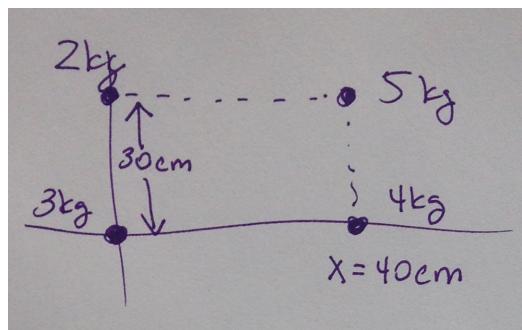


12/1 In Class 13—Review Ch 7-12

1. A solid ball of mass 500g starts from rest, 1.5 m above the surface of a lab table, and then rolls down an incline (to the table) and hits and sticks to a block of mass 1kg. The moment of inertia of a sphere is $\frac{2}{5}MR^2$.
 - (a) What is the speed of the ball just before it hits?
 - (b) Now ignore the fact that the clay was rotating, assume it's just traveling with the speed from part (a). What is the speed of the combined object (block plus ball) right after the collision?
 - (c) If the coefficient of friction is .7 between the combined object and the surface, how far will they go before they come to a stop?
2. For the configuration shown here:
 - (a) What is the center of mass?
 - (b) What is the moment of inertia if it is rotated around the origin? (in the plane of the paper).
 - (c) What is the moment of inertia if it is rotated around the x -axis?



3. A person pushes a merry-go-round so that it accelerates from rest to 10rpm in 15seconds.
 - (a) What is the angular acceleration of the merry-go-round in those 15 seconds?
 - (b) How many revolutions does the merry-go-round execute in those 15 seconds?

- (c) If you approximate the merry-go-round as a disk of radius 1.5 m and mass 50kg, what torque must the person exert on the merry-go-round? ($I_{disk} = \frac{1}{2}MR^2$)
4. A simple pendulum consists of a 200g mass hanging from the end of a 1.5 m long string. Assume it undergoes simple harmonic motion (the angle is small enough.) The mass is pulled so that the string makes an angle of 20° with respect to the vertical.
- What is the period of the motion?
 - Does the amplitude or mass affect the period?
5. A 200g mass on the end of a spring executes simple harmonic motion with a period of 2s. The mass is pulled back 12cm and released.
- What is the spring constant, k ?
 - Write an equation for the motion of the mass as a function of time.
($x =$)
 - What is the speed of the mass as it passes through equilibrium?
6. An organ pipe is 75cm long, closed on one end and open on the other. The speed of sound in air is 343m/s.
- Draw the first three harmonics.
 - Find the wavelength of the first harmonic.
 - Find the wavelength of the second harmonic.
 - Find the frequency of the first harmonic.
 - Find the frequency of the second harmonic.