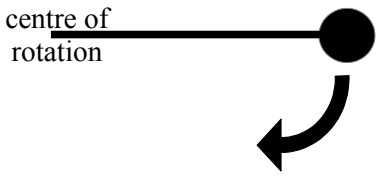
Practice Problem Set 10

1) Conservation of Angular Momentum
A figure skater is rotating at an angular speed of 12.56 *rad/s* with their arms outstretched. By pulling their arms in to their body the skater changes their moment of inertia from 2.7 $kg\ m^2$ to 1.2 $kg\ m^2$. Assuming angular momentum is conserved, what is their new angular speed?
If they spin at this new speed for 2 *s*, how many rotations have they completed?

2) Moment of Inertia and Angular Momentum
A ball-and-chain flail is a medieval weapon that can be modelled as a massive sphere attached to a massless rope; the sphere are rope combination rotates about the other end of the rope.



The sphere has a mass of 1.00 *kg* and a diameter of 10.0 *cm*. Given that the system makes two rotations every second and its angular momentum is 5.039 $kg\ m^2/s$, find:
a) the moment of inertia of the system;
b) how far the centre of the sphere is from the point of rotation.

3) 2015 Final Exam Question 7

7. A 40 kg, 5.0m long beam is supported, but NOT attached to, the two posts in Figure 4. A 20kg child stands at the centre of mass of the beam. Everything is at rest.

   (a) Calculate the force acting on the beam by post 1.

   (b) The child starts walking to the right along the beam. How close can he get to the right end of the beam without the beam tipping over?