

## Angular Momentum Worksheet

### Angular momentum and the Principle of Conservation of Angular Momentum

1. What is the angular momentum of a 0.25 kg mass rotating on the end of a piece of rope in a circle of radius 0.75m at an angular speed of 12.5 rad/s?
2. A figure skater rotates on ice at a rate of 3.5 rad/s with her arms extended horizontally. When she lowers her arms to her side, she speeds up to 7.5 rad/s. Find the ratio of her moment of inertia in the first case to that in the second case.
3. A disk has a mass of 3.5 kg and radius of 15 cm is rotating with an angular speed of 15 rev/s when a second non-rotating disk of 5.0 kg, mounted on the same shaft is dropped onto it. If the second disk has a diameter of 18 cm and a mass of 5.0 kg, what is the common final angular speed of the system?
4. A bowling ball has a mass of 5.5 kg and a radius of 12.0 cm. It is released so that it rolls down the alley at a rate of 12 rev/s. Find the magnitude of its angular momentum.
5. If the total angular momentum of a system of particles is zero, are all the particles at rest? Explain.
6. If the total angular momentum of a system is constant, does this mean that no net force acts on the system? Explain
7. A student whose mass is 60 kg is standing on the edge of a circular merry-go- round facing inward. The merry-go-round has a mass of 100 kg and a radius of 2.0 m and spins at a rate of 2 rad/s. The student walks slowly from the outer edge toward the center and stops at a distance of 0.50m from the center. Calculate the magnitude of the angular velocity of the system.

#### Answers:

1.  $1.8 \text{ kg}\cdot\text{m}^2/\text{s}$
2. 2.1
3. 9.9 rev/s
4.  $0.76 \text{ kg}\cdot\text{m}^2/\text{s}$
5. See theory of section 9.6
6. Same as above
7. 4.1 rad/s