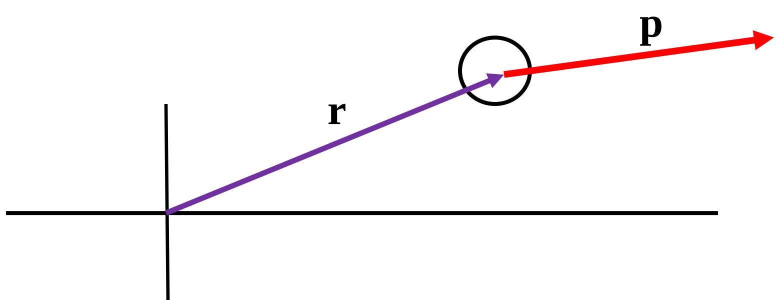
Angular Momentum

1. Symbol –

2. Definition:



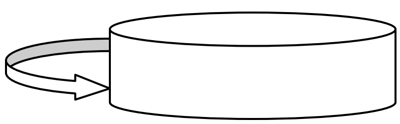
Angular Momentum is a ____________________.

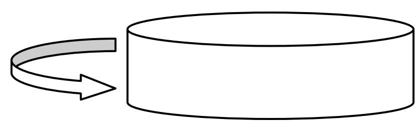
Magnitude given by:

Direction by the _______________ ____________ ______________

3. An object doesn't have to be rotating to have angular momentum. It just has to have linear momentum and a lever arm.

4. For a rigid body rotating around a fixed axis, the magnitude of the angular momentum can be found using:





Example: What is the magnitude of the angular momentum of a uniform disk of mass 5 kg and radius 0.2 m rotating at 0.40 rad/s?

Newton's 2^{nd} Law

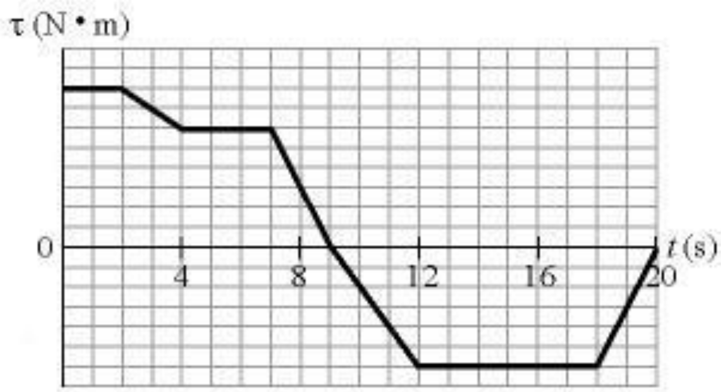
The moment of inertia of an object can change without changing the object's mass if the axis of rotation is changed or the object's mass is redistributed. In these cases, we need the more general form of Newton's 2^{nd} Law.

This says that ________________ is the cause of _____________

in __________________________ ______________________.

We can rearrange this equation to get a rotational analog to the "impulse" we studied in the Chapter on Linear Momentum:

Thus, the change in angular momentum if the area under a torque-time graph.



Angular momentum will be conserved (ie constant) if

1)

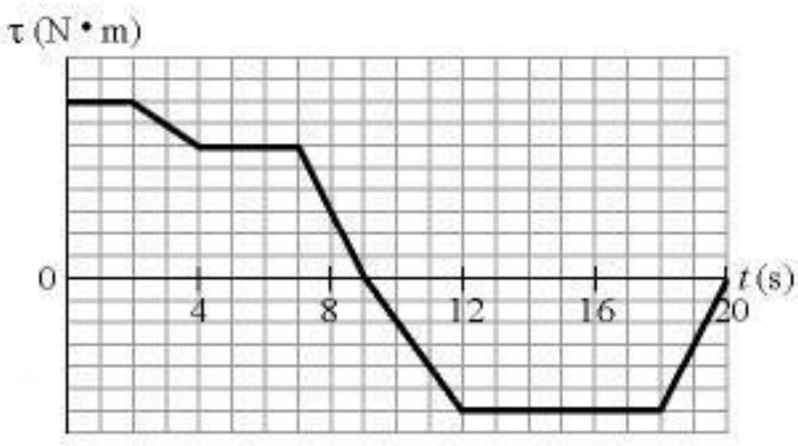
2)

The angular momentum of a flywheel having a rotational inertia of 0.200 $kg \cdot m^2$ about its central axis decreases from 3.00 to 0.400 $kg \cdot m^2/s$ in 2.00 s.

(a) What is the magnitude of the average torque acting on the flywheel about its central axis during this period?

c) How much work is done on the wheel?

The figure below gives the torque τ that acts on an initially stationary disk that can rotate about its center like a merry-go-round. (The vertical axis is marked in increments of 0.25 N·m.)



What is the angular momentum of the disk about the rotation axis t = 5.0 s?

A man stands on a platform that is rotating (without friction) with an angular speed of 0.9 rev/s; his arms are outstretched and he holds a brick in each hand. The rotational inertia of the system consisting of the man, bricks, and platform about the central vertical axis of the platform is 5.5 $kg \cdot m^2$. By moving the bricks the man decreases the rotational inertia of the system to 2.0 $kg \cdot m^2$. What is the resulting angular speed of the platform?