MOMENT OF INERTIA

$$I = \sum m_i r_i^2$$ Moment of Inertia

The rotational KE can now be expressed in terms of the Moment of Inertia:

$$K_R = \frac{1}{2} I \omega^2$$ Rotational Kinetic Energy

a) The SI unit of 'I' is the kg m^2
b) 'I' is the rotational analog of mass.

$$K_T = \frac{1}{2} m V^2$$ Translational Kinetic Energy

$$m \approx I$$
$$V \approx \omega$$

Just as mass is a measure of the tendency of resistance of an object to changes in its linear motion, we can say that:

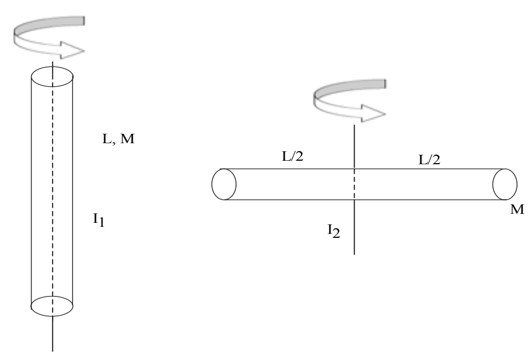
c) Moment of Inertial is a measure of the tendency of resistance of an object to changes in its rotational motion.

- The larger 'I', the larger the tendency of resistance to changes in its rotational motion
- The smaller 'I', the smaller the tendency of resistance to changes in its rotational motion

d) Moment of Inertial depends on the axis of rotation.

Ex. Rotating A Uniform Heavy Rod

Consider rotating a uniform heavy rod about two different axis of rotation as shown below. Let's see about which axis it is easier to rotate the rod.



a) Mass distributed closer to axis of rotation	a) Mass distributed further from axis of rotation
b) Since $I = \sum m_i r_i^2$ then body has smaller moment if inertia about this axis	b) Since $I = \sum m_i r_i^2$ then body has larger moment if inertia about this axis
c) Easier to rotate body about this axis	c) Harder to rotate body about this axis