

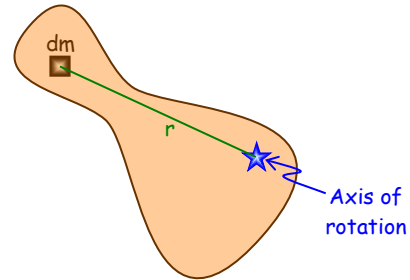
MOMENT OF INERTIA

The moment of inertia is the rotational equivalent of mass, that is, the inertia of the body that resists rotation. It is defined


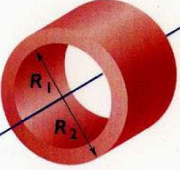
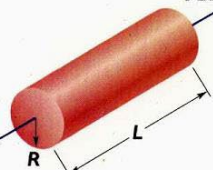
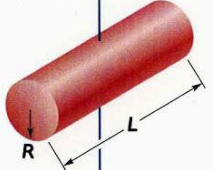
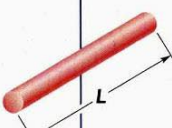
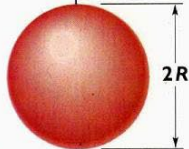
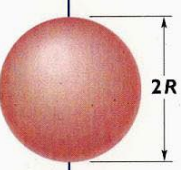
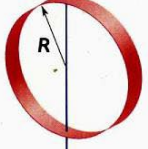
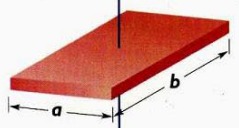
For a point mass: $I = mr^2$



For a solid body: $I = \int_M r^2 dm$



Some common moments of inertia are:

 Axis Hoop about central axis $I = MR^2$ (a)	 Axis Annular cylinder (or ring) about central axis $I = \frac{1}{2}M(R_1^2 + R_2^2)$ (b)	 Axis Solid cylinder (or disk) about central axis $I = \frac{1}{2}MR^2$ (c)
 Axis Solid cylinder (or disk) about central diameter $I = \frac{1}{4}MR^2 + \frac{1}{12}ML^2$ (d)	 Axis Thin rod about axis through center perpendicular to length $I = \frac{1}{12}ML^2$ (e)	 Axis Solid sphere about any diameter $I = \frac{2}{5}MR^2$ (f)
 Axis Thin spherical shell about any diameter $I = \frac{2}{3}MR^2$ (g)	 Axis Hoop about any diameter $I = \frac{1}{2}MR^2$ (h)	 Axis Slab about perpendicular axis through center $I = \frac{1}{12}M(a^2 + b^2)$ (i)

<https://web2.ph.utexas.edu/~coker2/index.files/RI.htm>

For an axis parallel to one for which the moment of inertia is known, the moment of inertia about the parallel axis at a distance r is given by the Parallel Axis Theorem:

$$I_{\text{Parallel Axis}} = I_{\text{Known}} + mr^2$$