Structural Mechanics

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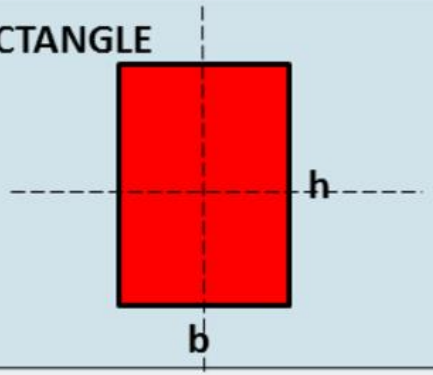
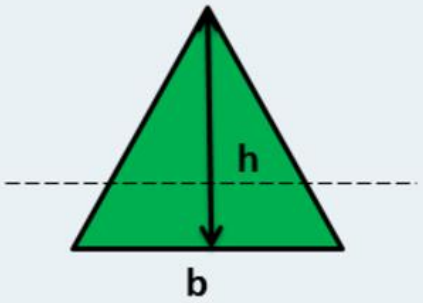
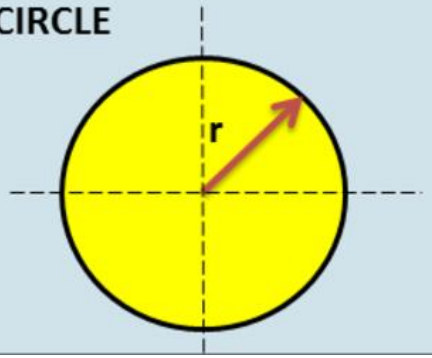
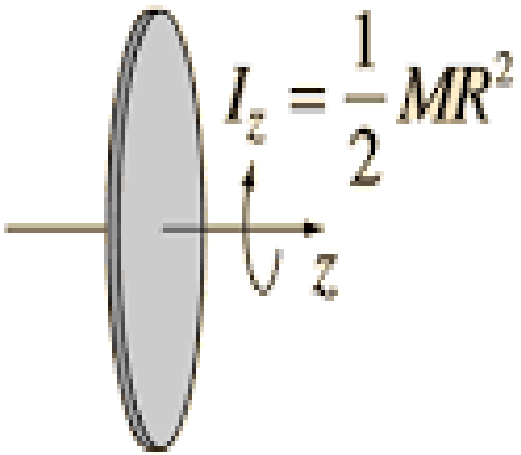
CIVIL TECHNOLOGY

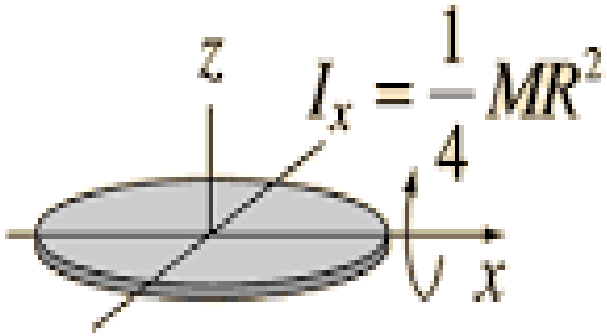
Moment of Inertia

- Moment of inertia is usually specified with respect to a chosen axis of rotation. It mainly depends on the distribution of mass around an axis of rotation. MOI varies depending on the axis that is chosen.

SHAPE	MOMENT OF INERTIA	RADIUS OF GYRATION
RECTANGLE 	$I_x = \frac{bh^3}{12}$	$\frac{h}{\sqrt{12}}$
TRIANGLE 	$I_x = \frac{bh^3}{36}$	$\frac{h}{\sqrt{18}}$
CIRCLE 	$\frac{\pi r^4}{4}$ OR $\frac{\pi D^4}{64}$	$\frac{r}{2}$

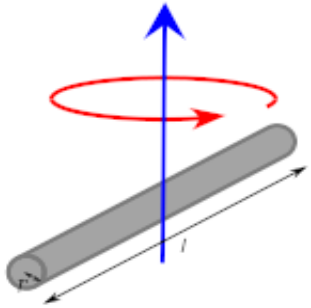
$$I_z = I_x + I_y$$





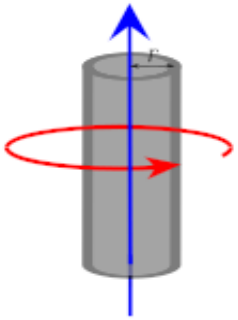
$$I_x = I_y = \frac{1}{4}MR^2$$

Since the x and y axes are identical by symmetry, they must have equal moments of inertia.



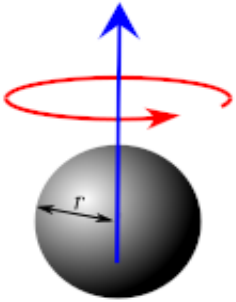
Rod about center

$I = \frac{1}{12}ml^2$



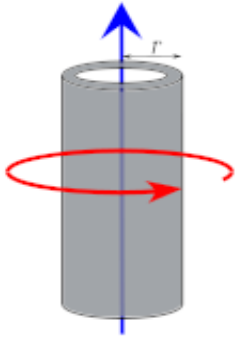
Rod or disc about axis

$I = \frac{1}{2}mr^2$



Sphere

$I = \frac{2}{5}mr^2$

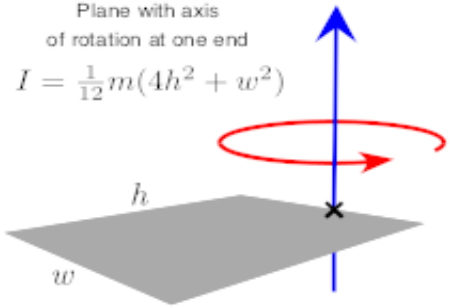


Hollow rod or disc,
thin wall. About axis.

$I = mr^2$

Plane with axis
of rotation at one end

$I = \frac{1}{12}m(4h^2 + w^2)$



Plane about center

$I = \frac{1}{12}m(h^2 + w^2)$