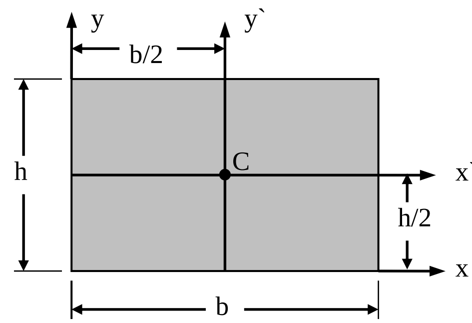
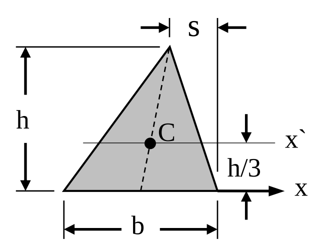
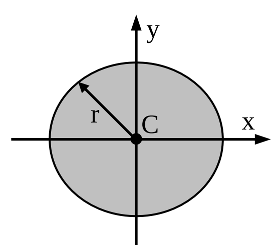
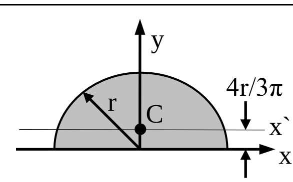
Useful Moment of Inertia Formulas

Note: In the table below, the overbar indicates the moment of inertia is taken about an axis that passes through the centroid, denoted as ‘ C’ . Parallel axis theorems are:

$$I_x = \bar{I}_x + Ad^2 \qquad I_y = \bar{I}_y + Ad^2 \qquad I_{xy} = \bar{I}_{xy} + A\bar{x}\bar{y}$$

Here, *A* is the area of the shape, *d* is the distance from the centroidal axis to the desired parallel axis, and $\bar{x}\ \bar{y}$ are the *x* and *y* distances of the centroid from the origin of the desired coordinate frame.

Rectangle: $\bar{I}_{x'} = \frac{1}{12}bh^3 \qquad I_x = \frac{1}{3}bh^3$ $\bar{I}_{y'} = \frac{1}{12}b^3h \qquad I_y = \frac{1}{3}b^3h$ $\bar{I}_{xy'} = 0 \qquad Area = bh$	
Triangle: $\bar{I}_{x'} = \frac{1}{36}bh^3 \qquad I_x = \frac{1}{12}bh^3$ $\bar{I}_{xy} = \frac{b(b-2s)h^2}{72} \qquad Area = \frac{1}{2}bh$	
Circle: $\bar{I}_x = \bar{I}_y = \frac{1}{4}\pi r^4$ $\bar{I}_{xy'} = 0$ $Area = \pi r^2$	
Semi-circle: $I_x = \bar{I}_y = \frac{1}{8}\pi r^4 \qquad \bar{I}_{x'} = \left(\frac{\pi}{8} - \frac{8}{9\pi}\right)r^4$ $\bar{I}_{xy'} = 0 \qquad Area = \frac{\pi r^2}{2}$	
Ellipse: $\bar{I}_x = \frac{1}{4}\pi ab^3 \qquad \bar{I}_y = \frac{1}{4}\pi a^3b$ $\bar{I}_{xy'} = 0$ $Area = \pi ab$