# FAQ's

**1. Define moment of inertia of area.**

Moment of inertia of area is defined as the product of the area and the square of its perpendicular distance between cg of the area and the reference axis.

**2. State the formula for moment of inertia of a rectangular section and triangular section about their centroidal axes.**

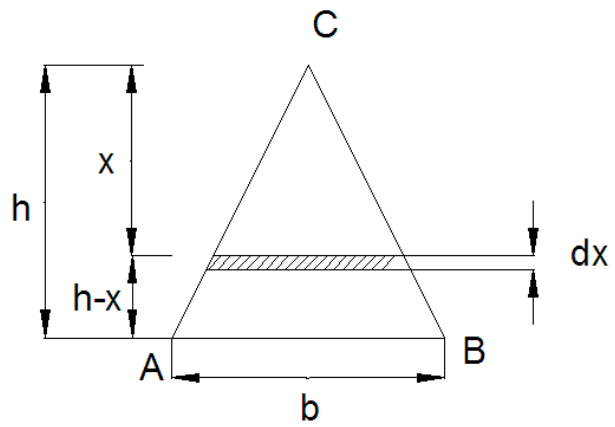
Rectangular section:

$I_{xx} = bd^3/12 mm^4$ $I_{yy} = bd^3/12 mm^4$

Triangular section:

$I_{xx} = bh^3/36\ mm^4$ $I_{yy} = hb^3/48\ mm^4$

**3. Derive the expression for calculating moment of inertia of triangular section.**




Consider an elementary strip PQ located at a distance of 'x' from the apex 'C'.

By similar triangle principle,

$x/h = PQ/AB = PQ/b$

Therefore width of the elementary strip, PQ = xb/h

Area of strip = xb/h * dx

Moment of inertia of this strip about 'AB' = $xb/h*dx*(h-x)^2$

Moment of inertia of the whole triangular section about 'AB'

$I_{AB} = \int_{x=0}^{h} b/h * x(h-x)^2 dx$

$= b/h \int_{x=0}^{h} (xh^2 - x_2^3 - 2hx^2)dx$

$I_{AB} = b/h [h^2x^2/2-x^4/4-2hx3/3]_0^h$

$=b/h[h^4/2-h^4/4-2h*h^3/3] = bh3/12$

$I_{AB}= bh^3/12$

$I_{AB}=ig+ah^2$

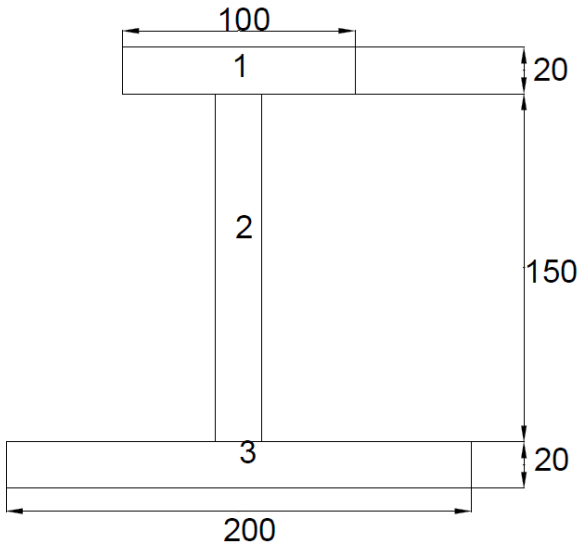
$Bh^3/12=I_{xx}+1/2bh*(h/3)^2$

$Bh^3/12=I_{xx}+bh^3/18$

$I_{xx}=bh^3/12-bh^3/18$

$I_{xx}=bh^3/36$

**4. For the section shown below determine the moment of inertia about x axis.**




(Note: All dimensions are in mm)

**Step 1: To find centroidal distances**

$\ddot{X} = a_1X_1+a_2X_2+a_3X_3 / \Sigma a$

$\bar{Y} = a_1y_1+a_2y_2+a_3y_3 / \Sigma a$

**Section 1:**

$a_1 = 100*2 = 2000mm^2$

$x_1 = 50+(100/2) = 100mm$

$y_1 = 20+150+(20/2) = 180mm$

**Section 2:**

$a_2 = 150 * 20 = 3000mm^2$

$x_2 = 90+(20/2)= 100mm$

$y_2 = 20+(150/2) = 95mm$

**Section 3:**

$a_3 = 200 * 20 = 4000mm^2$

$x_3 = 200/2 = 100mm$

$y_3 = 20/2 = 10mm$

$\ddot{Y} = (a_1y_1 + a_2y_2 + a_3y_3) / \Sigma a$

$= (2000*180 + 3000*95 + 4000*10) / (2000+3000+4000)$

$= 76.11mm$

$I_{xx} = I_{xx1} + I_{xx2} + I_{xx3}$

$= (d_1b_1^3/12 + a_1h_1^2) + (d_2b_2^3/12 + a_2h_2^2) + (d_3b_3^3/12 + a_3h_3^2)$

$=(100*20^3/12)+(2000*103.89^2)+(20*150^3/12)*(3000*18.89^2)+(200*20^3/12)+(4000*66.11^2)$

$= 28.63*10^6 mm^4$

**Result:** $I_{xx} = 28.63*10^6 mm^4$