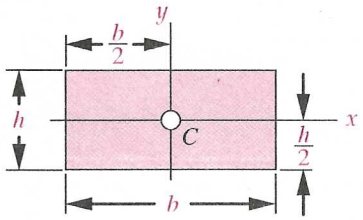
CROSS-SECTIONAL PROPERTIES OF SECTIONS

A = area
C = centroid location
I_x = second moment of area about x axis
I_y = second moment of area about y axis
k_x = radius of gyration about x axis
k_y = radius of gyration about y axis
J_z = second polar moment of area about z axis through C



$A = bh$

$I_x = \dfrac{bh^3}{12}$

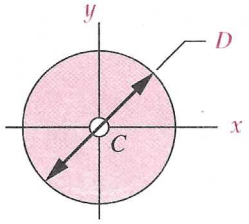
$k_x = \sqrt{\dfrac{I_x}{A}}$

$J_z = I_x + I_y$

$I_y = \dfrac{b^3h}{12}$

$k_y = \sqrt{\dfrac{I_y}{A}}$

(a) Rectangle



$A = \dfrac{\pi D^2}{4}$

$I_x = \dfrac{\pi D^4}{64}$

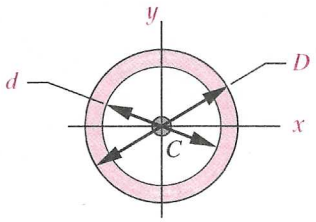
$k_x = \sqrt{\dfrac{I_x}{A}}$

$J_z = \dfrac{\pi D^4}{32}$

$I_y = \dfrac{\pi D^4}{64}$

$k_y = \sqrt{\dfrac{I_y}{A}}$

(b) Circle



$A = \dfrac{\pi}{4}\left(D^2 - d^2\right)$

$I_x = \dfrac{\pi}{64}\left(D^4 - d^4\right)$

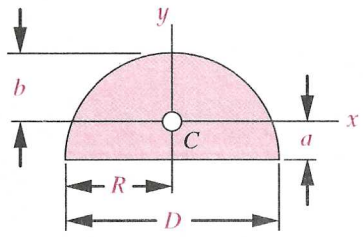
$k_x = \sqrt{\dfrac{I_x}{A}}$

$J_z = \dfrac{\pi}{32}\left(D^4 - d^4\right)$

$I_y = \dfrac{\pi}{64}\left(D^4 - d^4\right)$

$k_y = \sqrt{\dfrac{I_y}{A}}$

(c) Hollow circle



$A = \dfrac{\pi D^2}{8}$

$I_x = 0.109\,8R^4$

$a = 0.424\,4R$

$k_x = \sqrt{\dfrac{I_x}{A}}$

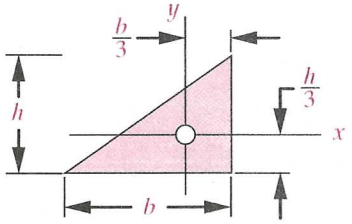
$J_z = I_x + I_y$

$I_y = \dfrac{\pi}{8}R^4$

$b = 0.575\,6R$

$k_y = \sqrt{\dfrac{I_y}{A}}$

(d) Solid semicircle



$A = \dfrac{bh}{2}$

$I_x = \dfrac{bh^3}{36}$

$k_x = \sqrt{\dfrac{I_x}{A}}$

$J_z = I_x + I_y$

$I_y = \dfrac{b^3h}{36}$

$k_y = \sqrt{\dfrac{I_y}{A}}$

(e) Right triangle