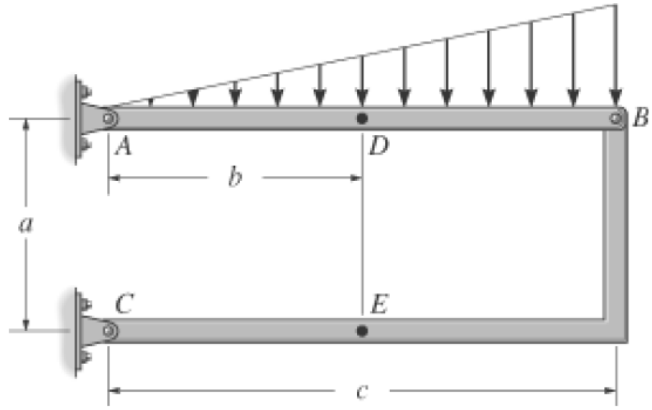
1 Determine the normal force, shear force, and moment at a section passing through point D of the two-member frame.

$$w = 400\ \frac{\text{N}}{\text{m}}$$

$a = 2.5$ m

$b = 3$ m

$c = 6$ m

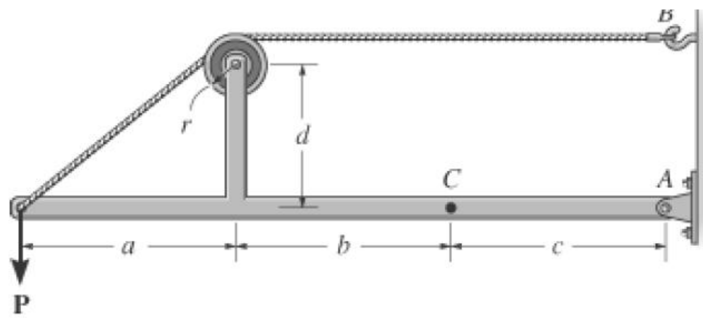


2 Determine the normal force, shear force, and moment at a section passing through point C.

$P = 8$ kN $c = 0.75$ m

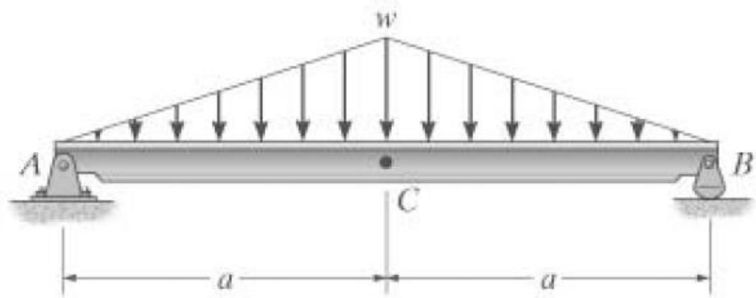
$a = 0.75$m $d = 0.5$ m

$b = 0.75$m $r = 0.1$ m

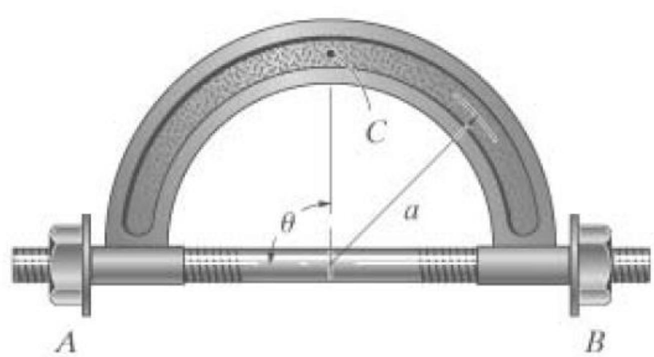


3 Determine the internal shear force and moment acting at point C of the beam.

Units Used:



4 The bolt shank is subjected to a tension F. Determine the internal normal force, shear force, and moment at point C.



5 Determine the normal force, shear force, and moment at a section passing through point D of the two-member frame.

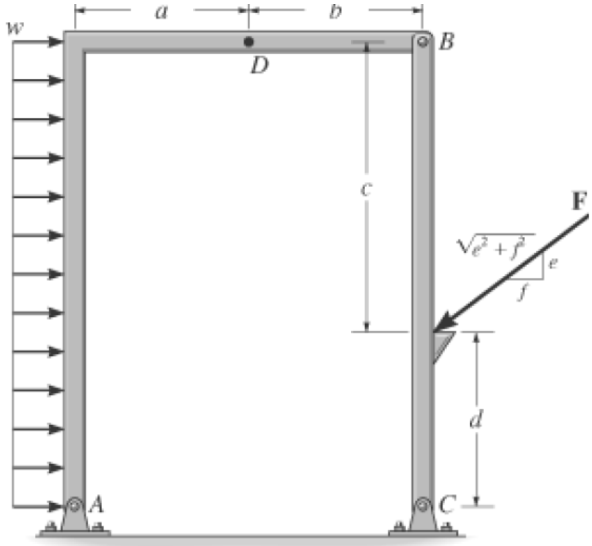
$$w = 0.75\ \frac{\text{kN}}{\text{m}}$$

$F = 4$ kN

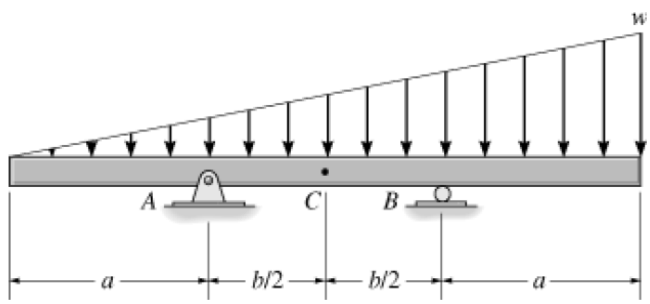
$a = 1.5$ m $\quad d = 1.5$ m

$b = 1.5$ m $\quad e = 3$

$c = 2.5$ m $\quad f = 4$



6 Determine the ratio a/b for which the shear force will be zero at the midpoint C of the beam.



7 Determine the x, y, z components of internal loading in the rod at point E.

$M = 3$ kN·m

$$\mathbf{F} = \begin{pmatrix} 7 \\ -12 \\ -5 \end{pmatrix} \text{kN}$$

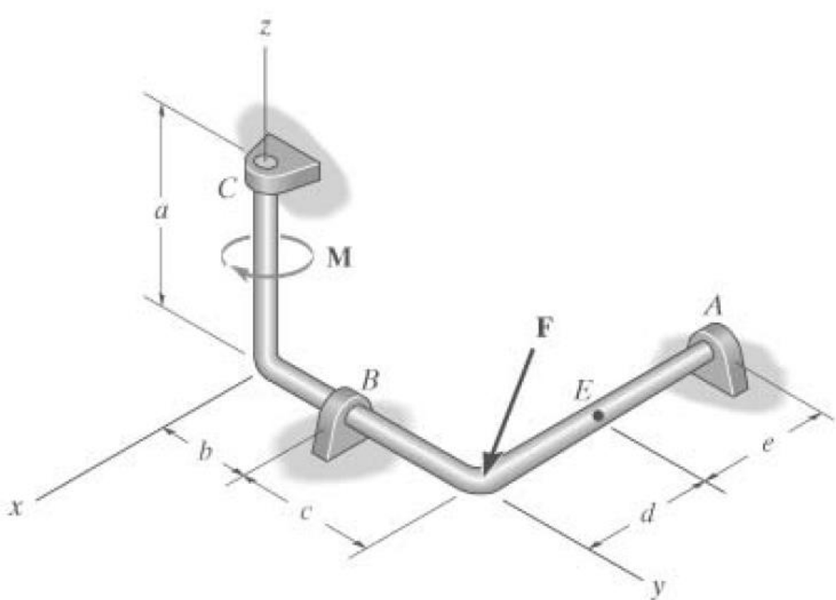
$a = 0.75$ m

$b = 0.4$ m

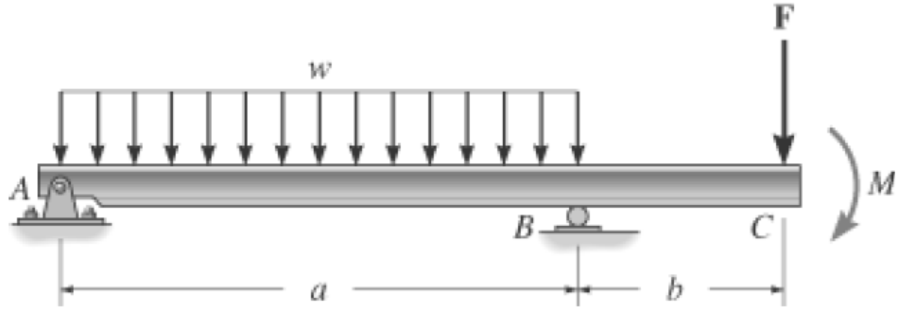
$c = 0.6$ m

$d = 0.5$ m

$e = 0.5$ m

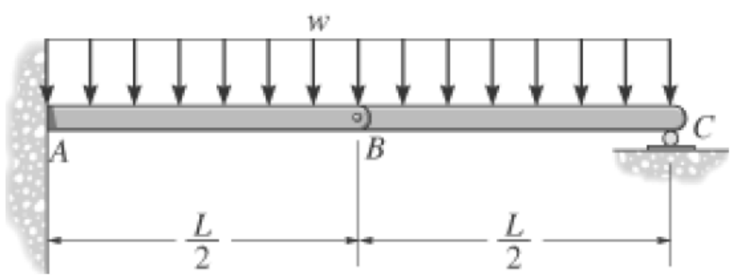


8 Draw the shear and moment diagrams for the beam.

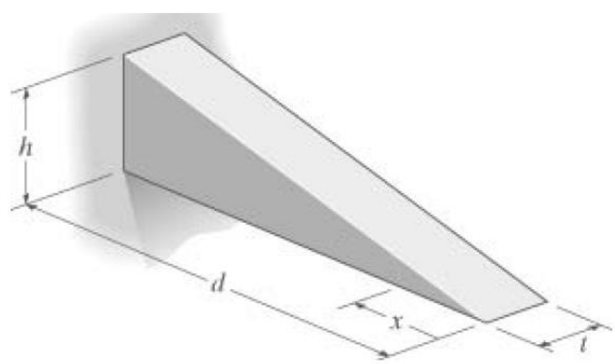


$w = 40 \dfrac{\text{kN}}{\text{m}}$ $F = 20 \text{ kN}$ $M = 150 \text{ kN}\cdot\text{m}$ $a = 8 \text{ m}$ $b = 3 \text{ m}$

9 Draw the shear and bending-moment diagrams for beam ABC. Note that there is a pin at B.

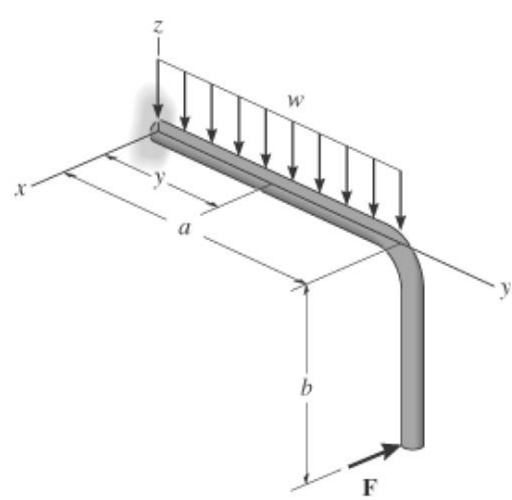


10 The cantilevered beam is made of material having a specific weight γ. Determine the shear and moment in the beam as a function of x.



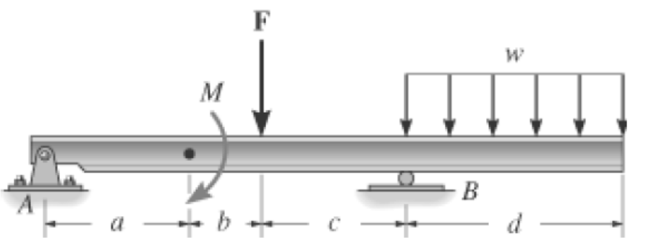
11 Express the x, y, z components of internal loading in the rod at the specific value for y, where $0 < y < a$

W=800 N/m
F=1500 N
a=4 m
b=2 m



12

Draw the shear and moment diagrams for the beam.



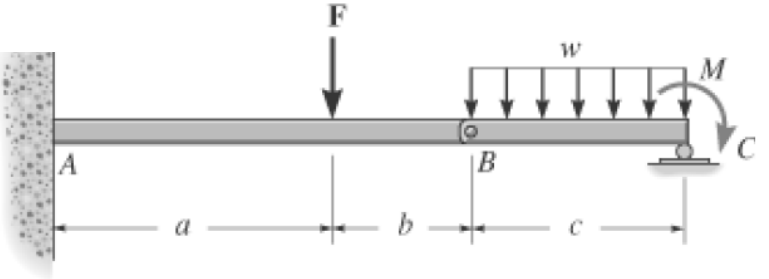
$F = 8\ \mathrm{kN}$ $M = 20\ \mathrm{kN \cdot m}$ $w = 15\ \dfrac{\mathrm{kN}}{\mathrm{m}}$ $a = 2\ \mathrm{m}$ $b = 1\ \mathrm{m}$

$c = 2\ \mathrm{m}$ $d = 3\ \mathrm{m}$

13

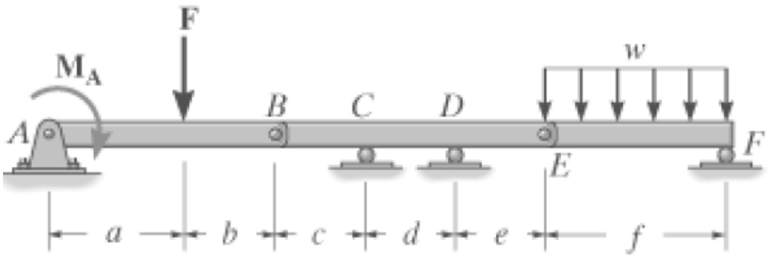
Draw the shear and moment diagrams for the beam.

F=700 N
w=150 N/m
M=800 N.m
a=8 m
b=4 m
c=6 m



14

The beam consists of three segments pin connected at B and E. Draw the shear and moment diagrams for the beam.

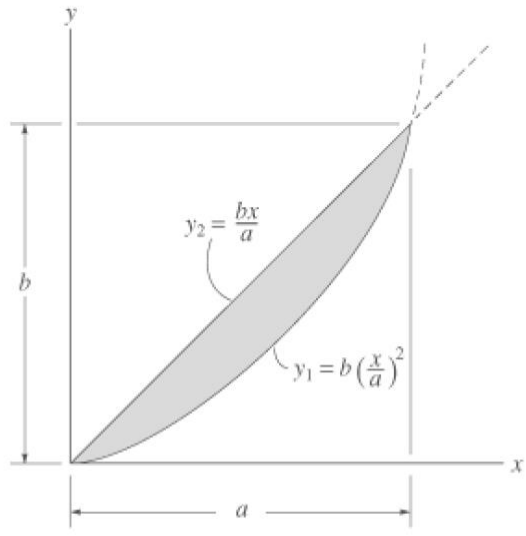


$M_A = 8\ \mathrm{kN \cdot m}$ $F = 15\ \mathrm{kN}$ $w = 3\ \dfrac{\mathrm{kN}}{\mathrm{m}}$ $a = 3\ \mathrm{m}$ $b = 2\ \mathrm{m}$

$c = 2\ \mathrm{m}$ $d = 2\ \mathrm{m}$ $e = 2\ \mathrm{m}$ $f = 4\ \mathrm{m}$

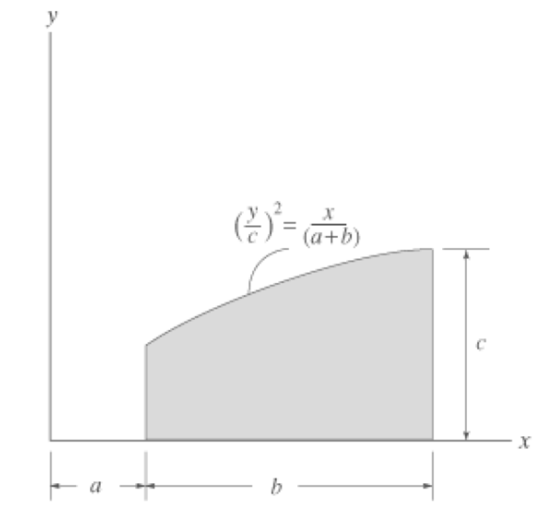
15 Locate the centroid of the shaded area.

a=4 m
b=4 m



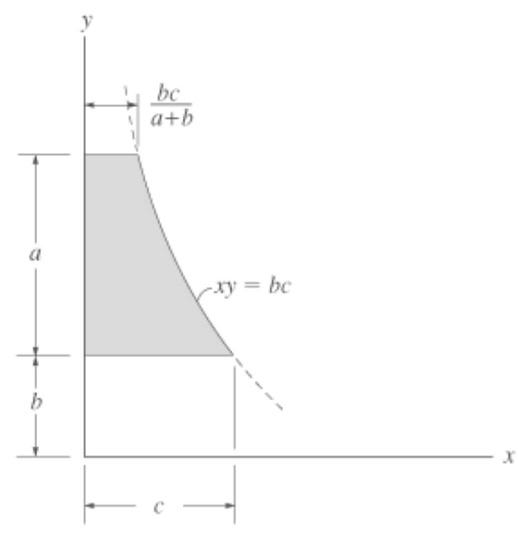
16 Locate the centroid of the shaded area.

a=1 cm
b=3 cm
c=2 cm



17 Locate the centroid of the shaded area.

a=4 cm
b=2 cm
c=3 cm



A rack is made from roll-formed sheet steel and has the cross section shown. Determine the location (x_c, y_c) of the centroid of the cross section. The dimensions are indicated at the center thickness of each segment.

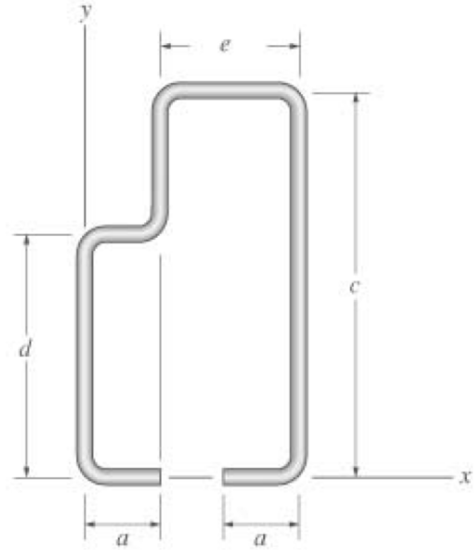
18

$a = 15$ mm

$c = 80$ mm

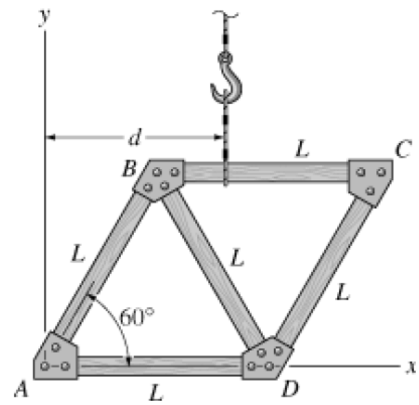
$d = 50$ mm

$e = 30$ mm



19

The truss is made from five members, each having a length L and a mass density ρ. If the mass of the gusset plates at the joints and the thickness of the members can be neglected, determine the distance d to where the hoisting cable must be attached, so that the truss does not tip (rotate) when it is lifted.

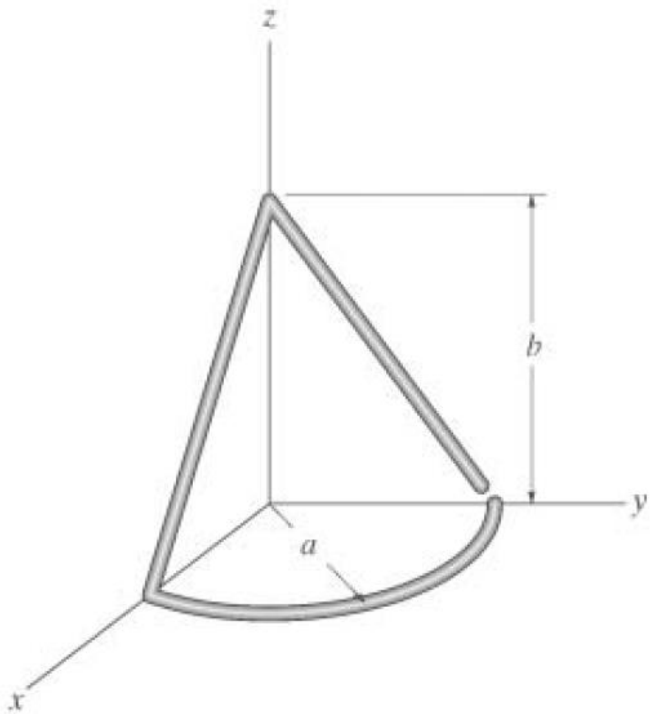


20

Locate the center of gravity (x_c, y_c, z_c) of the homogeneous wire.

$a = 300$ mm

$b = 400$ mm



The gravity wall is made of concrete. Determine the location (x_c, y_c) of the center of gravity G for the wall.

21

$a = 0.6$ m

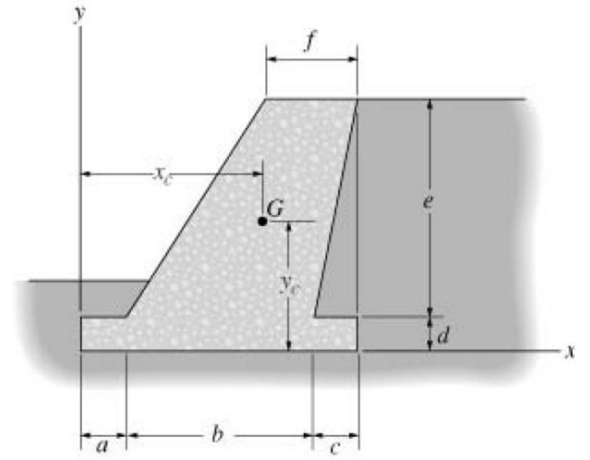
$b = 2.4$ m

$c = 0.6$ m

$d = 0.4$ m

$e = 3$ m

$f = 1.2$ m



22

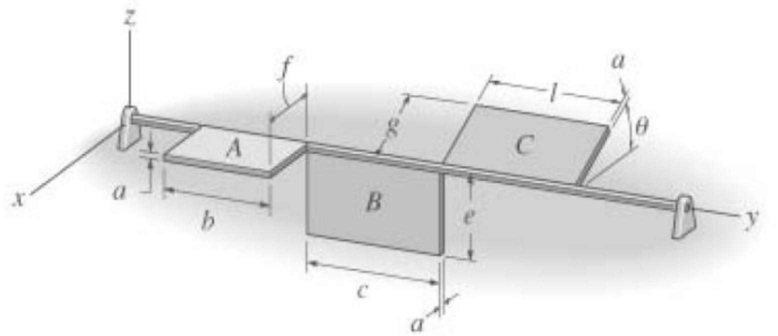
Each of the three homogeneous plates welded to the rod has a density ρ and a thickness a. Determine the length l of plate C and the angle of placement, θ, so that the center of mass of the assembly lies on the y axis. Plates A and B lie in the x–y and z–y planes, respectively.

$a = 10$ mm $f = 100$ mm

$b = 200$ mm $g = 150$ mm

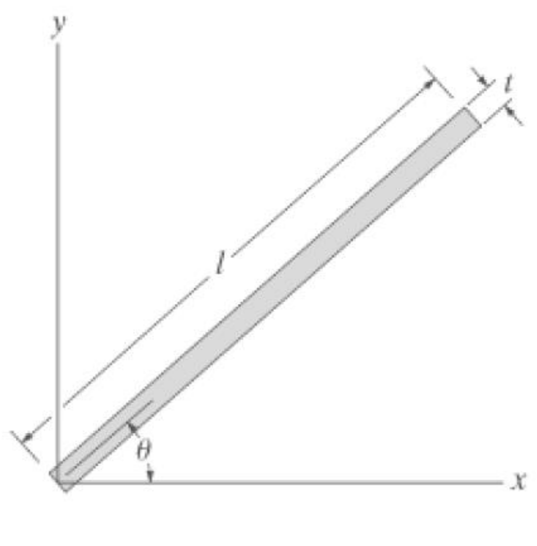
$c = 250$ mm $e = 150$ mm

$$\rho = 6\ \frac{\text{Mg}}{\text{m}^3}$$

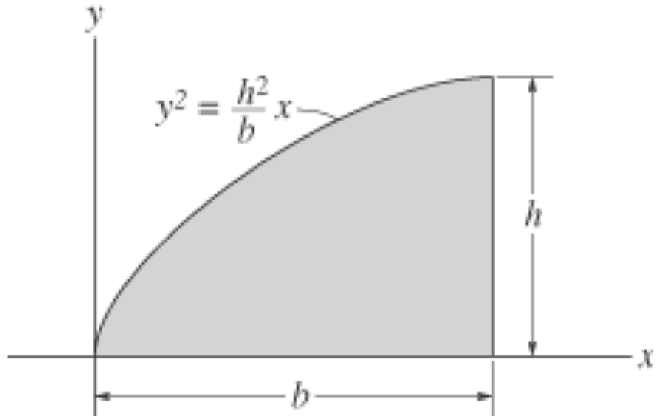


23

Determine the moment of inertia for the thin strip of area about the x axis. The strip is oriented at an angle θ from the x axis. Assume that $t << l$.

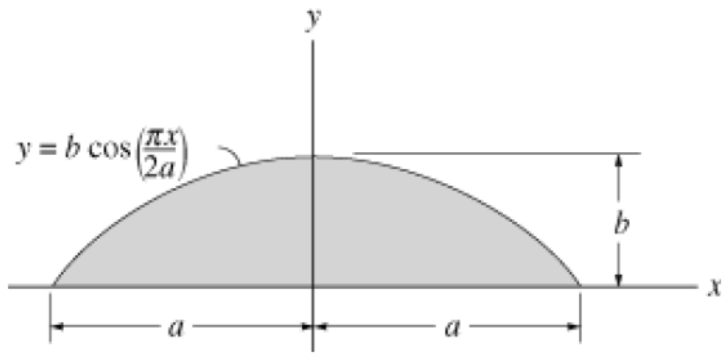


24 Determine the moment of inertia for the shaded area about the x axis.



25

Determine the moment of inertia for the shaded area about the y axis.



26

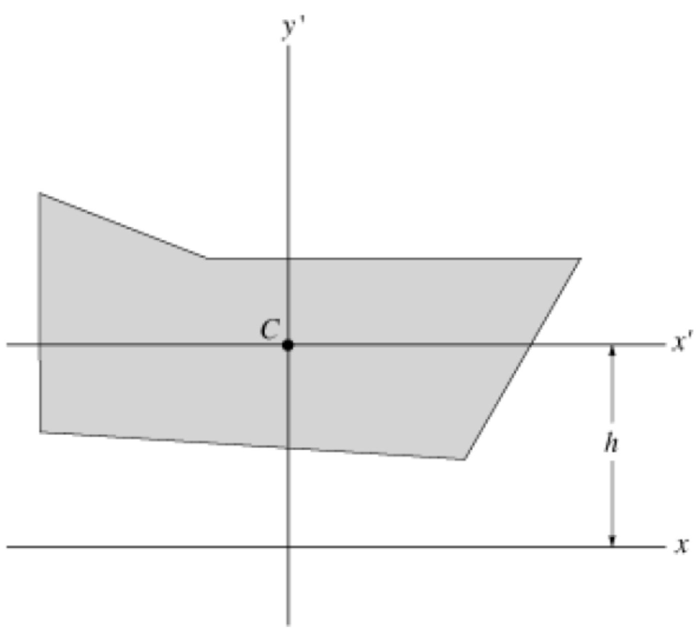
The polar moment of inertia for the area is J_{cc} about the z' axis passing through the centroid C. If the moment of inertia about the y' axis is $I_{y'}$ and the moment of inertia about the x axis is I_x. Determine the area A.

$J_{cc} = 548 \times 10^6\ \text{mm}^4$

$I_{y'} = 383 \times 10^6\ \text{mm}^4$

$I_x = 856 \times 10^6\ \text{mm}^4$

$h = 250\ \text{mm}$



27

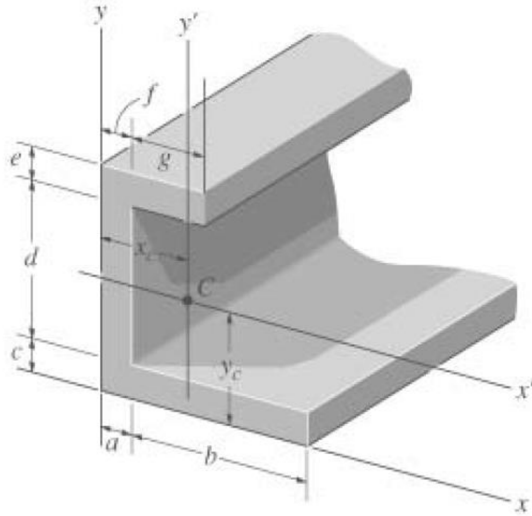
Determine the distance y_c to the centroid C of the beam's cross-sectional area and then compute the moment of inertia $I_{cx'}$ about the x' axis.

$a = 30$ mm $\quad e = 30$ mm

$b = 170$ mm $\quad f = 30$ mm

$c = 30$ mm $\quad g = 70$ mm

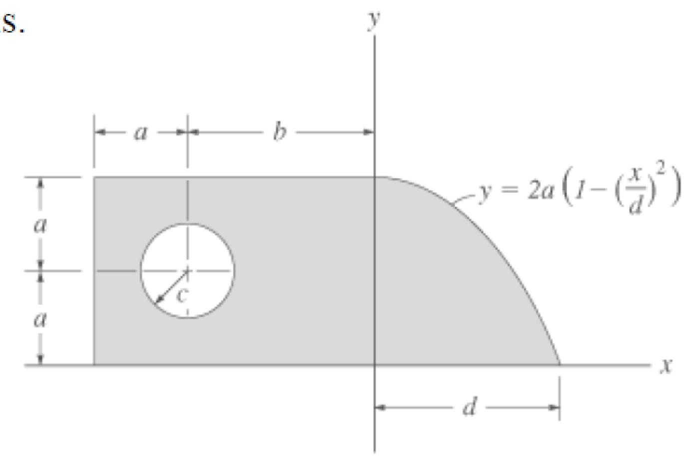
$d = 140$ mm



28

Determine the moment of inertia of the composite area about the x axis.

a=2 cm
b=4 cm
c=1 cm
d=4 cm



29

Determine the product of inertia for the cross-sectional area with respect to the x and y axes that have their origin located at the centroid C.

$a = 20$ mm

$b = 80$ mm

$c = 100$ mm