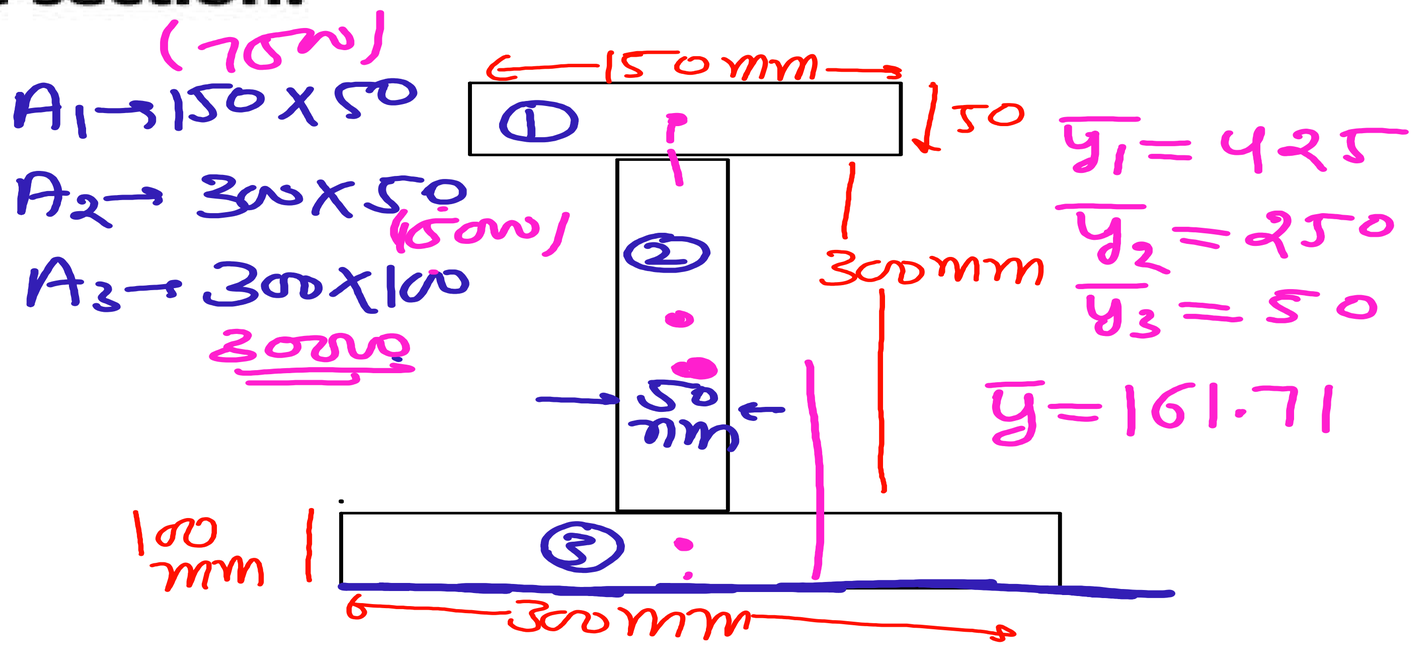
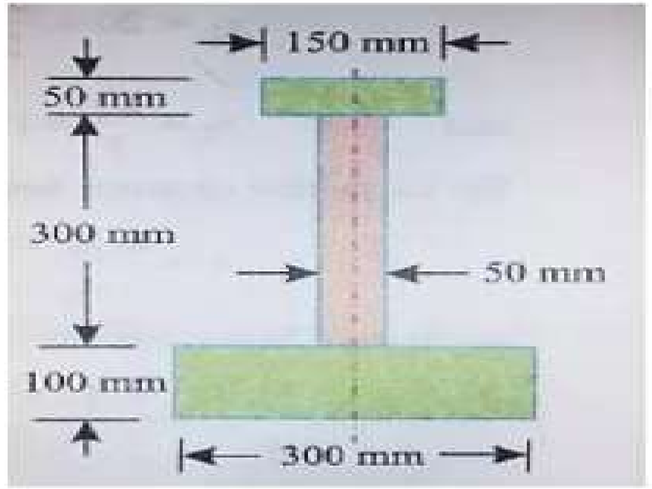
An I – section has the following dimensions in mm units:
Bottom flange = 300 × 100
Top flange = 150 × 50
Web = 300 × 50
Determine mathematically the position of centre of gravity of the section.



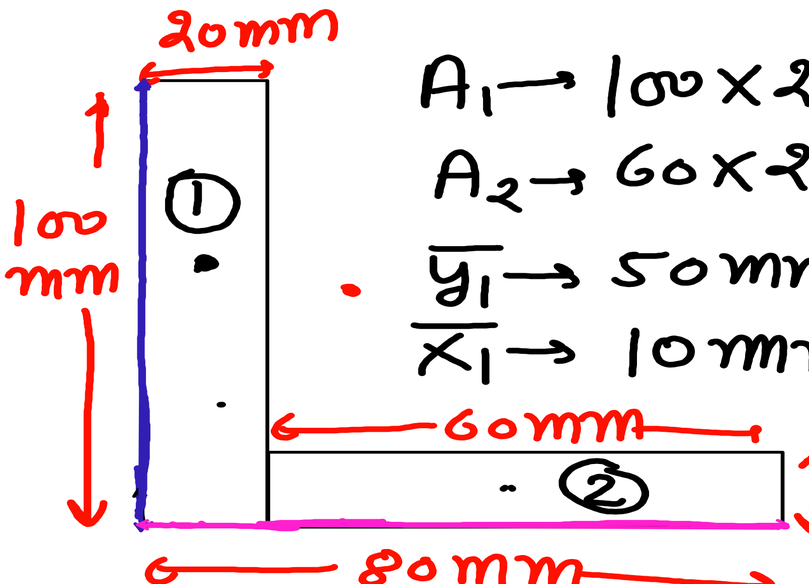


$\bar{x}$ ≠ TENSION X

$$\bar{y} = \frac{A_1 y_1 + A_2 y_2 + A_3 y_3}{A_1 + A_2 + A_3}$$

$$= 160.71$$

Find the centroid of an unequal angle section 100 mm × 80 mm × 20 mm.

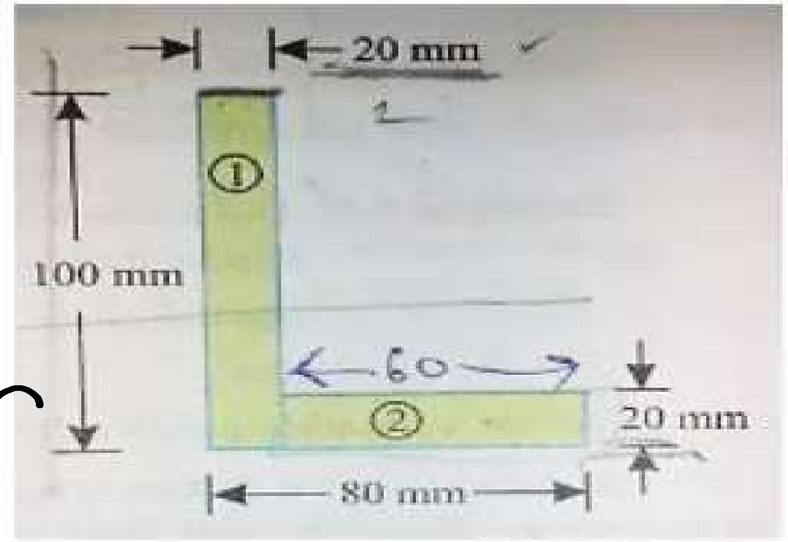


$A_1 \rightarrow 100 \times 20$ (2000)

$A_2 \rightarrow 60 \times 20$ (1200)

$\bar{y}_1 \rightarrow 50\,mm$ $\bar{y}_2 \rightarrow 10\,mm$

$\bar{x}_1 \rightarrow 10\,mm$ $\bar{x}_2 \rightarrow 50\,mm$

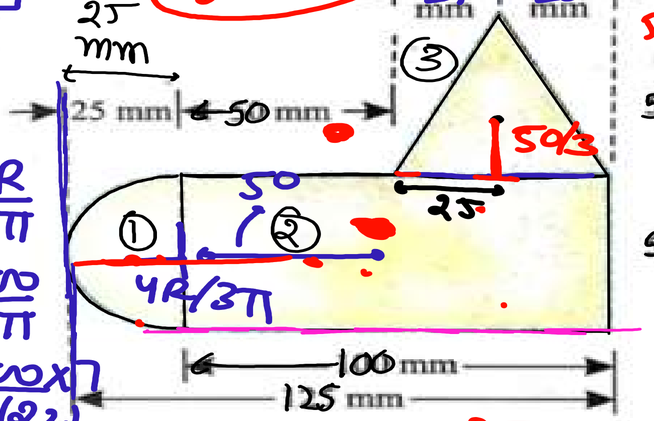


$$\bar{x} = \frac{A_1\bar{x}_1 + A_2\bar{x}_2}{A_1 + A_2}$$

$$\bar{y} = \frac{A_1\bar{y}_1 + A_2\bar{y}_2}{A_1 + A_2}$$

$\frac{2000(10) + 1200(50)}{3200}$ $\frac{2000(50) + 1200(10)}{3200}$

A inform lamina shown in fig. consists of a rectangle, a circle and a triangle.



$\bar{y} = 32.2$

$\frac{4R}{3\pi}$

$25 - \frac{4R}{3\pi}$

$25 - \frac{100}{3\pi}$

$25 - \frac{100 \times 7}{3(22)}$

$25 - \frac{700}{66} = 14.38$

$50 - \frac{50}{3}$

$50\left(\frac{4}{3\pi}\right)$

$A_1 \rightarrow \frac{\pi R^2}{2} = \frac{\pi}{2}(625)$

$\frac{22}{7} \times \frac{1}{2} \times 625$

$A_2 \rightarrow 100 \times 50 = 5000$

$A_3 \rightarrow \frac{1}{2} \times 50 \times 50 =$

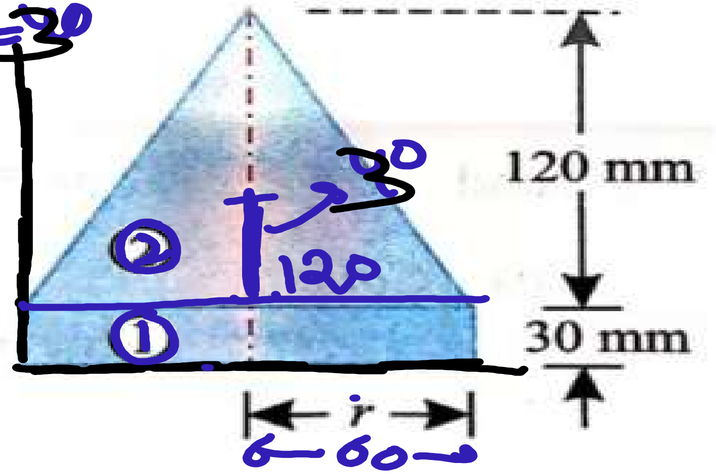
$\bar{x}_1 = 14.38$ $\bar{x}_2 = 75mm$

$\bar{y}_1 = 25mm$ $\bar{x}_3 = 100$

$\bar{y}_2 = 25mm$ $\bar{y}_3 = \frac{4}{3}(50)$

$\bar{x} = 71.1$

A solid body formed by joining the base of a right circular cone of height H to the equal base of a right circular cylinder of height h. calculate the distance of the centre of mass of the solid from its plane face, when H = 120 mm and h = 30 mm.



$\frac{120}{4} = 30$

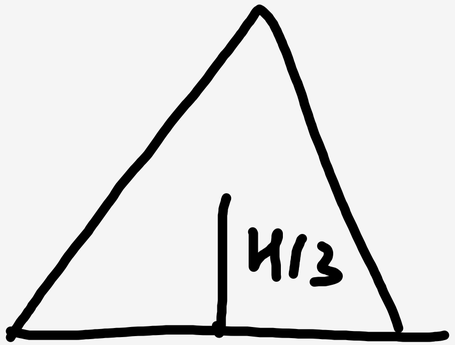
$V_1 = \pi r^2 (h)$

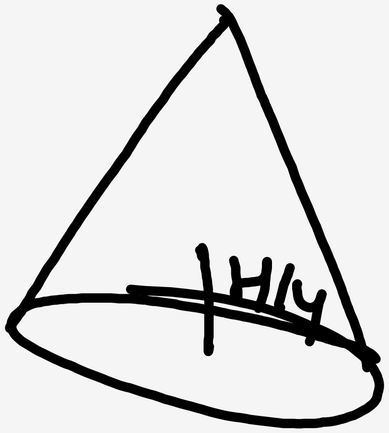
$V_1 = \pi (60)^2 (30)$

$V_2 = \frac{1}{3}\pi (60)^2 (120)$

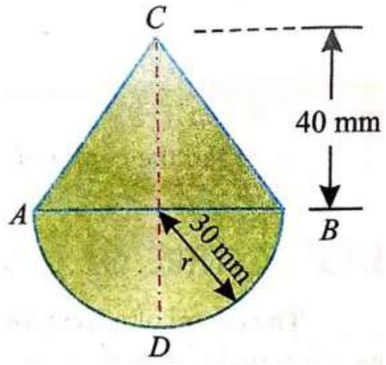
$\bar{y}_1 = 15 \qquad \bar{y}_2 = 60$

$$\bar{y} = \frac{V_1 \bar{y}_1 + V_2 \bar{y}_2}{V_1 + V_2}$$

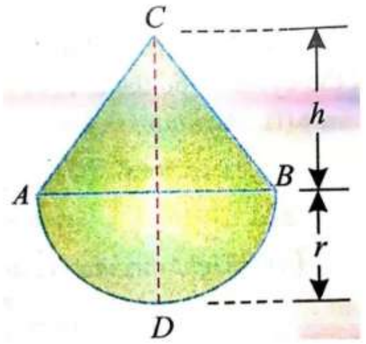




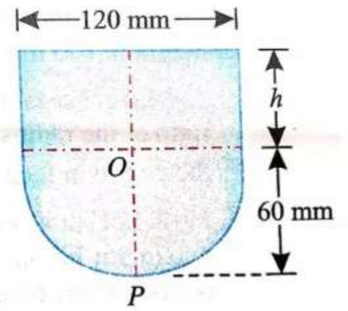
A body consists of a right circular solid cone of heiht 40 mm and radius 30 mm placed on a solid hemisphere of radius 30 mm of the same material. Find the position of centre of gravity of the body.



A body consisting of a cone and hemisphere of radius r fixed on the same base rests on a table, the hemisphere being in contact with the table. Find the greatest height of the cone, so that the combined body may stand upright.



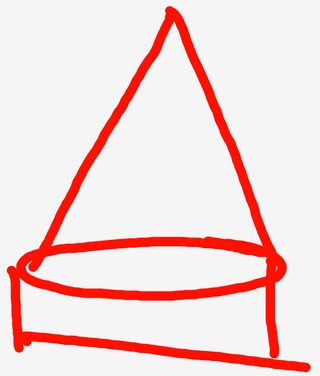
A right circular cylinder of 12 cm diameter is joined with a hemisphere of the same diameter face to face. Find the greatest height of the cylinder, so that centre of gravity of the composite section coincides with the plane of joining the two sections. The density of the material of hemisphere is twice that the material of cylinder.

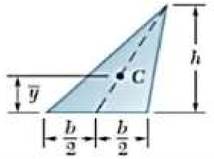
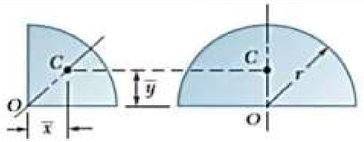
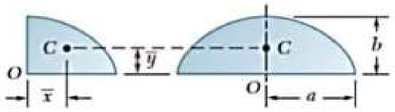


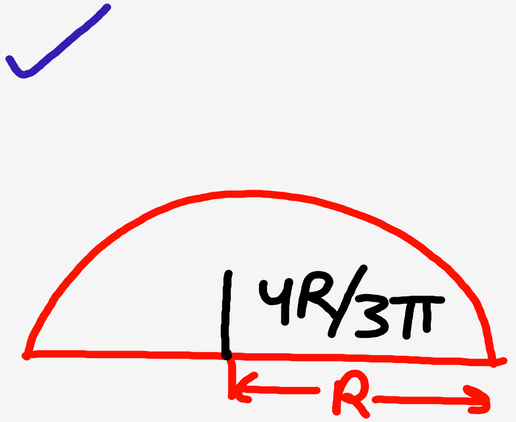
SOLID BODY

A → V

$$\bar{x} = \frac{V_1\bar{x}_1 + V_2\bar{x}_2 + \dots}{V_1 + V_2}$$



Shape		$\bar{x}$	$\bar{y}$	Area
Triangular area			$\frac{h}{3}$	$\frac{bh}{2}$
Quarter-circular area		$\frac{4r}{3\pi}$	$\frac{4r}{3\pi}$	$\frac{\pi r^2}{4}$
Semicircular area		0	$\frac{4r}{3\pi}$	$\frac{\pi r^2}{2}$
Quarter-elliptical area		$\frac{4a}{3\pi}$	$\frac{4b}{3\pi}$	$\frac{\pi ab}{4}$
Semielliptical area		0	$\frac{4b}{3\pi}$	$\frac{\pi ab}{2}$



$\bar{x} = X$

$\bar{y} =$