(iv) **Rectangle:** Centre of gravity is at (8, 2)

Area of rectangle $= 16 \times 4 = 64$

Triangle: Centre of gravity is at (4, 5)

Area of triangle $= \frac{1}{2}(16)(3) = 24$

$$\left.\begin{matrix} 64 \text{ at } (8, 2) \\ 24 \text{ at } (8, 5) \end{matrix}\right\} = 88 \text{ at } (x, y)$$

$$64(8) + 24(8) = 88(x)$$

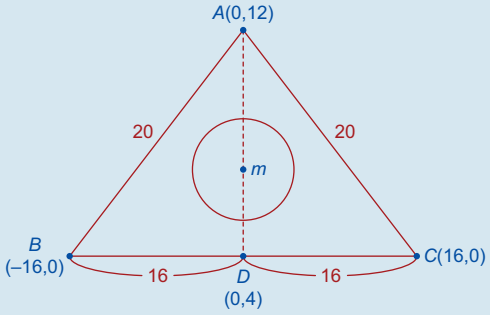
$$\Rightarrow x = 8$$

$$64(2) + 24(5) = 88(y)$$

$$\Rightarrow y = \frac{31}{11}$$

$\Rightarrow$ Centre of gravity of lamina is at $\left(8, \frac{31}{11}\right)$

Q. 5.



$$|AB|^2 = |BD|^2 + |AD|^2$$

$$\Rightarrow 20^2 = 16^2 + |AD|^2$$

$$\Rightarrow |AD| = 12$$

Triangle: Area $= \frac{1}{2}(32)(12)$

$= 192$

Taking D as the origin, the centre of gravity is at the centroid of $A(0, 12)$, $B(-16, 0)$ and $C(16, 0)$ which is at

$$\left(\frac{0 - 16 + 16}{3}, \frac{12 + 0 + 0}{3}\right) = (0, 4)$$

Circle: Area $= \pi r^2$

$$= \frac{22}{7} \times \frac{49}{4}$$

$$= \frac{77}{2}$$

$$= 38\frac{1}{2}$$

Centre of gravity is at $m(0, 6)$

The remainder: Area $= 192 - 38\frac{1}{2}$

$= 153\frac{1}{2}$

Centre of gravity is at (x, y)

$$\left.\begin{matrix} 153\frac{1}{2} \text{ at } (x, y)\} \\ 38\frac{1}{2} \text{ at } (0, 6) \end{matrix}\right\} = 192 \text{ at } (0, 4)$$

$$153\tfrac{1}{2}(x) + 38\tfrac{1}{2}(0) = 192\ (0)$$

$$\Rightarrow x = 0$$

$$153\tfrac{1}{2}(y) + 38\tfrac{1}{2}(6) = 192(4)$$

$$\Rightarrow y = \frac{1{,}074}{307}$$

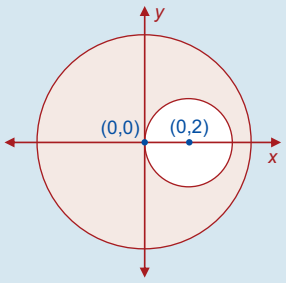
$= 3.5$ cm

Q. 6. Area of full disc $= \pi(5^2) = 25\pi$

Area of missing piece $= \pi(2^2) = 4\pi$

$\Rightarrow$ Area of remainder $= 25\pi - 4\pi$

$= 21\pi$



$$\left.\begin{matrix} 21\pi \text{ at } (x, y) \\ 4\pi \text{ at } (2, 0) \end{matrix}\right\} = 25\pi \text{ at } (0, 0)$$

Taking moments around the *y*-axis:

$$21\pi(x) + 4\pi(2) = 25\pi(0)$$

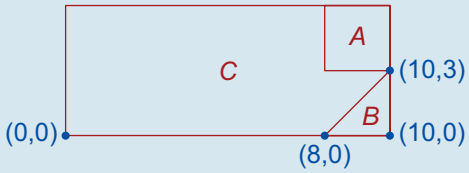
$$\Rightarrow 21x + 8 = 0$$

$$\Rightarrow 21x = -8$$

$$\Rightarrow x = -\frac{8}{21}$$

$\Rightarrow$ Centre of gravity of the remainder is $\frac{8}{21}$ m $= 38$ cm from O.

Q. 7.



A: Area is $3 \times 2 = 6$

Centre of gravity is at $\left(9, 4\frac{1}{2}\right)$

B: Area $= \frac{1}{2}(2)(3) = 3$