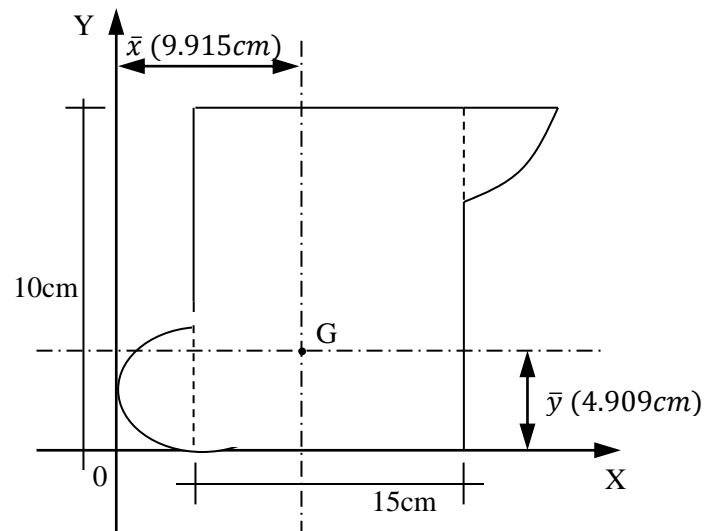
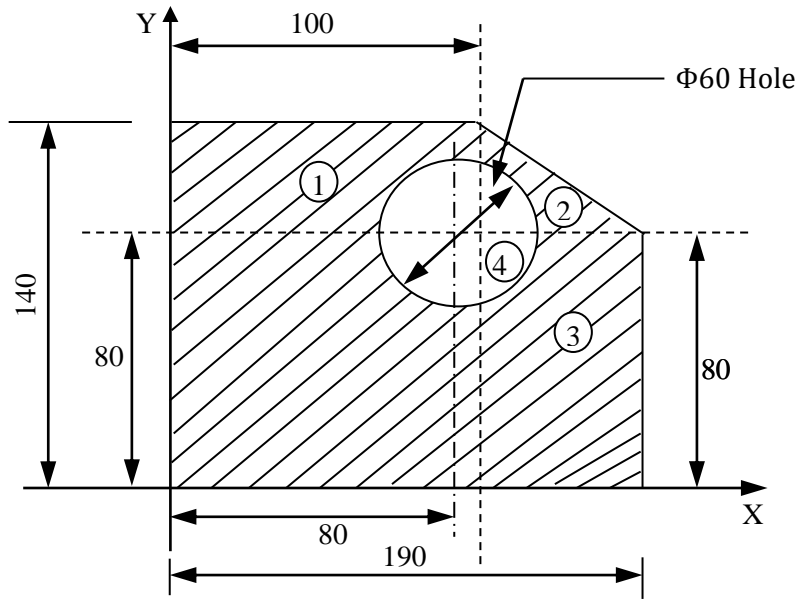


**Problem 2:** locate the centroid of the figure



**Problem 4:** Find the centroid of the lamina shown in fig. All dimensions are in mm.



## Solution

### Portion 1

$$\text{Area } a_1 = 100 \times 140 = 14000 \text{mm}^2$$

$$x_1 = \frac{100}{2} = 50 \text{mm}; y_1 = \frac{140}{2} = 70 \text{mm}$$

### Portion 2

$$\text{Area } a_2 = \frac{1}{2}bh = \frac{1}{2}(90 \times 60) = 2700 \text{mm}^2$$

$$x_2 = 100 + \frac{1}{3}(90) = 130 \text{mm}; y_2 = 80 + \frac{1}{3}(60) = 100 \text{mm}$$

### Portion 3

$$\text{Area } a_3 = 90 \times 80 = 7200 \text{mm}^2$$

$$x_3 = 100 + \left(\frac{90}{2}\right) = 145 \text{mm}; y_3 = \frac{80}{2} = 40 \text{mm}$$

### Portion 4

$$\text{Area } a_4 = \frac{\pi}{4}d^2 = \frac{\pi}{4} \times 60^2 = 2827.43 \text{mm}^2$$

$$x_4 = 80 \text{mm}; y_4 = 80 \text{mm}$$

$$\therefore \bar{x} = \frac{a_1x_1 + a_2x_2 + a_3x_3 - a_4x_4}{a_1 + a_2 + a_3 - a_4}$$

$$= \frac{(1400 \times 50) + (7200 \times 145) + (2700 \times 130) - (2827.43 \times 8)}{1400 + 7200 + 2700 - 2827.43}$$

$$\bar{x} = 88.68mm$$

$$\bar{y} = \frac{a_1y_1 + a_2y_2 + a_3y_3 - a_4y_4}{a_1 + a_2 + a_3 - a_4}$$

$$= \frac{(1400 \times 70) + (7200 \times 40) + (2700 \times 100) - (2827.43 \times 80)}{1400 + 7200 + 2700 - 2827.43}$$

$$\bar{y} = 62.25mm$$

∴ The co-ordinates of centroid G is (88.68mm, 65.25mm)