

If the points $(2a, b)$, $(a, 2b)$ and (a, b) enclose a triangle of area 18 sq. units, the possible value(s) of the centroid of the triangle is/are:

- (A) $(-8, -8)$ (B) $(-8, 8)$ (C) $(4, 4)$ (D) $(8, 8)$

Solution

$$\text{Area of triangle} = \frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)| = 18$$

$$\Rightarrow |2a \times b + a \times 0 + a \times (-b)| = 36 \text{ Or } |ab| = 36$$

$$\Rightarrow ab = \pm 36$$

$$\text{Centroid} \equiv \left(\frac{4a}{3}, \frac{4b}{3} \right)$$

Let's check each option for possible coordinates.

Checking option (A)

$$\text{If } \frac{4a}{3} = -8, a = -6 \text{ \& if } \frac{4b}{3} = -8, b = -6$$

$a = -6$ & $b = -6$ satisfy the condition $ab = \pm 36$

Thus, option (A) shows possible coordinates

Checking option (B)

$$\text{If } \frac{4a}{3} = -8, a = -6 \text{ \& if } \frac{4b}{3} = 8, b = 6$$

$a = -6$ & $b = 6$ satisfy the condition $ab = \pm 36$

Thus, option (B) shows possible coordinates

Checking option (C)

$$\text{If } \frac{4a}{3} = 4, a = 3 \text{ \& if } \frac{4b}{3} = 4, b = 3$$

$a = 3$ & $b = 3$ do not satisfy the condition $ab = \pm 36$

Thus, option (C) does not show possible coordinates

Checking option (D)

$$\text{If } \frac{4a}{3} = 8, a = 6 \text{ \& if } \frac{4b}{3} = 8, b = 6$$

$a = 6$ & $b = 6$ satisfy the condition $ab = \pm 36$

Thus, option (D) shows possible coordinates

Thus, (A), (B) & (D)