

Question 2. For a  $\triangle ABC$ , if

$$\angle A = \frac{2\pi}{3}, \quad b - c = 3\sqrt{3} \quad \text{and} \quad \text{ar}(\triangle ABC) = \frac{9\sqrt{3}}{2}$$

then find 'a'.

- (a) 4 cm
- (b) 9 cm
- (c) 15 cm
- (d) 8 cm

Solution.

$$\text{Given, area of } \triangle ABC = \frac{9\sqrt{3}}{2}$$

$$\Rightarrow \frac{1}{2} \times b \times c \times \sin A = \frac{9\sqrt{3}}{2}$$

$$\Rightarrow bc = \frac{9\sqrt{3}}{\sin \frac{2\pi}{3}}$$

$$\Rightarrow bc = 18 \quad \text{--- (1)}$$

Now, using Cosine Formula,

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

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$$\Rightarrow \cos\left(\frac{2\pi}{3}\right) = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\Rightarrow b^2 + c^2 - a^2 = (2bc) \times \left(-\frac{1}{2}\right)$$

$$\Rightarrow b^2 + c^2 + bc = a^2$$

$$\Rightarrow a^2 = (b^2 + c^2 - 2bc) + 3bc$$

$$= (b-c)^2 + 3bc$$

$$= (3\sqrt{3})^2 + 3 \times 18$$

$$a^2 = 81$$

$$\boxed{a = 9 \text{ cm}}$$

Ans:  
Option (b)