

### 3.3.13

SAMYAK GONDANE - AI25BTECH11029

# Question

Draw a triangle  $ABC$  with  $BC = 7\text{ cm}$ ,  $\angle B = 45^\circ$  and  $\angle C = 60^\circ$ .

# Solution

## Given

- $BC = a = 7 \text{ cm}$
- $\angle B = 45$
- $\angle C = 60$

Let **B** be the origin

$$\angle A = 180 - (45 + 60) = 75 \quad (1)$$

$$K = \frac{a \sin C}{\sin A} = \frac{7 \sin(60)}{\sin(75)} = \frac{7 \times \frac{\sqrt{3}}{2}}{\frac{1}{\sqrt{2}} \times \frac{\sqrt{3}+1}{2}} = \frac{7\sqrt{6}}{\sqrt{3}+1} \quad (2)$$

# Solution

$$c = \frac{K^2 - a^2}{2(K - a \cos B)} = \frac{\left(\frac{7\sqrt{6}}{\sqrt{3}+1}\right)^2 - 49}{2\left(\frac{7\sqrt{6}}{\sqrt{3}+1} - 7 \times \frac{1}{\sqrt{2}}\right)} = -3.64 \quad (3)$$

Let:

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \quad \mathbf{C} = \begin{pmatrix} a \\ 0 \end{pmatrix} = \begin{pmatrix} 7 \\ 0 \end{pmatrix} \quad (4)$$

# Solution

Direction of **A** is along angle  $B = 45$ :

$$\mathbf{A} = c \begin{pmatrix} \cos B \\ \sin B \end{pmatrix} = c \times \frac{1}{\sqrt{2}} \begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad (5)$$

$$A = c \begin{pmatrix} \cos B \\ \sin B \end{pmatrix} = -3.64 \begin{pmatrix} 0.7071 \\ 0.7071 \end{pmatrix} \approx \begin{pmatrix} -2.574 \\ -2.574 \end{pmatrix} \quad (6)$$

## Final Coordinates

$$\mathbf{A} = \begin{pmatrix} -2.574 \\ -2.574 \end{pmatrix}, \quad \mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \quad \mathbf{C} = \begin{pmatrix} 7 \\ 0 \end{pmatrix} \quad (7)$$

# Plot

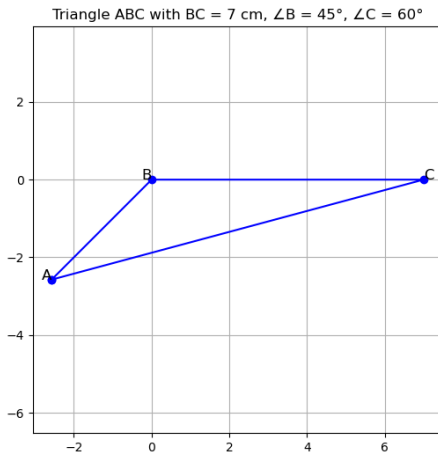


Figure: