

## 3.3.11

AI25BTECH11027 - NAGA BHUVANA

**Question:**

Construct a triangle in which  $AB = 6\text{cm}$ ,  $\angle A = 30^\circ$  and  $\angle B = 60^\circ$

**Solution:**

Let  $\mathbf{A}$  be  $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$  as  $AB = c = 6\text{cm}$  position vector of  $\mathbf{B}$  be  $\begin{pmatrix} 6 \\ 0 \end{pmatrix}$

**Property:**

Sum of angles in a triangle is  $180^\circ$

$$\angle A + \angle B + \angle C = 180^\circ \quad (1)$$

$$30^\circ + 60^\circ + \angle C = 180^\circ \quad (2)$$

$$\angle C = 90^\circ \quad (3)$$

$$a \cos B + b \cos A = c \quad (4)$$

$$a \sin B - b \sin A = 0 \quad (5)$$

$$\mathbf{P} = \begin{pmatrix} \cos B & \cos A \\ \sin B & -\sin A \end{pmatrix}, \mathbf{x} = \begin{pmatrix} a \\ b \end{pmatrix}, \mathbf{Q} = \begin{pmatrix} c \\ 0 \end{pmatrix} \quad (6)$$

Consider the augmented matrix for solving  $\mathbf{Px} = \mathbf{Q}$

$$\begin{pmatrix} \cos B & \cos A & c \\ \sin B & -\sin A & 0 \end{pmatrix} \quad (7)$$

$$\begin{pmatrix} \frac{1}{2} & \frac{\sqrt{3}}{2} & 6 \\ \frac{\sqrt{3}}{2} & -\frac{1}{2} & 0 \end{pmatrix} \quad (8)$$

By doing Row operations

$$\begin{pmatrix} \frac{1}{2} & \frac{\sqrt{3}}{2} & 6 \\ 0 & -2 & -6\sqrt{3} \end{pmatrix} \quad (9)$$

On solving

$$BC = a = 3, AC = b = 3\sqrt{3} \quad (10)$$

$$\mathbf{C} = \begin{pmatrix} 3\sqrt{3} \cos 30^\circ \\ 3\sqrt{3} \sin 30^\circ \end{pmatrix} \quad (11)$$

$$\mathbf{C} = \begin{pmatrix} \frac{9}{2} \\ \frac{3\sqrt{3}}{2} \end{pmatrix} \quad (12)$$

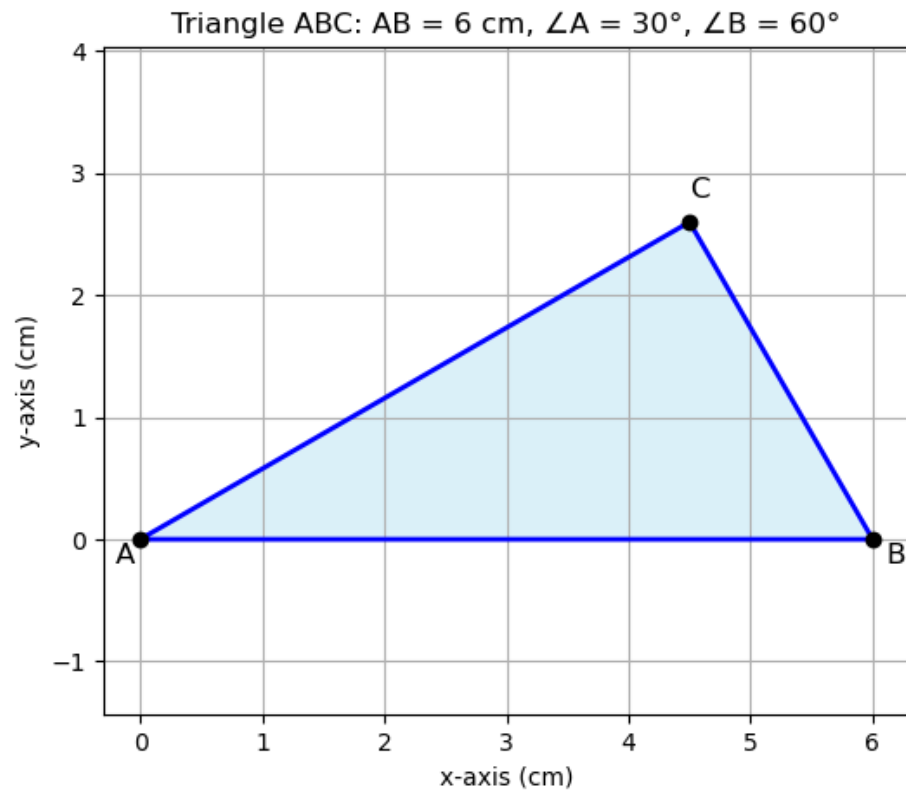


Fig. 1