

3-3.3-5

AI24BTECH11003 - Vijaya Sreyas

Question:

Construct a $\triangle ABC$ in which $CA = 6cm$, $AB = 5cm$ and $BAC = 45^\circ$.

Solution:

Information	Simplified Symbol	Value
CA	b	$6cm$
AB	c	$5cm$
BAC	A	45°

TABLE 0: Given Information

Using cosine formula in $\triangle ABC$,

$$a^2 = b^2 + c^2 - 2bc \cos A \quad (0.1)$$

$$\Rightarrow a^2 = 61 - 30\sqrt{2} \quad (0.2)$$

$$(0.3)$$

The value of a is slightly difficult to work with. To overcome this complication, we can express the coordinates of $\triangle ABC$ as

$$\mathbf{A} = \mathbf{O}, \mathbf{B} = c \begin{pmatrix} \cos A \\ \sin A \end{pmatrix}, \mathbf{C} = \begin{pmatrix} b \\ 0 \end{pmatrix} \quad (0.4)$$

$$\Rightarrow \mathbf{A} = \mathbf{O}, \mathbf{B} = \frac{5}{\sqrt{2}} \begin{pmatrix} 1 \\ 1 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 6 \\ 0 \end{pmatrix} \quad (0.5)$$

Using these values, we can now plot an example triangle with these sides on a graph.

Codes for plotting the triangle:

```
codes/triangle.c
codes/plot_triangle.py
```

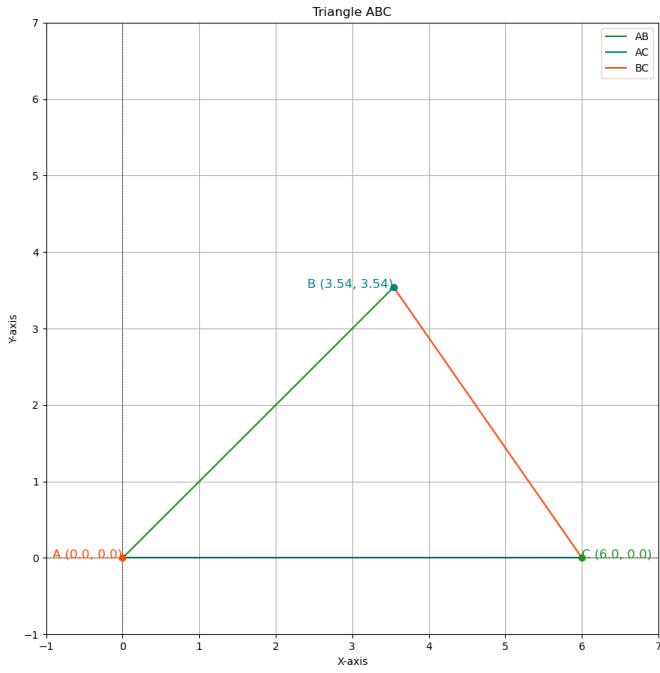


Fig. 0.1: Plot of the triangle