

# Assignment 1

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Download all python codes from

<https://github.com/Sowmyabandi99/Assignment1/blob/main/Assignment1.py>

and latex-tikz codes from

<https://github.com/Sowmyabandi99/Assignment1/blob/main/main.tex>

Therefore,

$$\begin{pmatrix} c \\ b \end{pmatrix} = \begin{pmatrix} 11.99 \\ 8.49 \end{pmatrix} \quad (2.0.10)$$

So, the vertices of  $\triangle ABC$  are

$$\mathbf{A} = 11.99 \begin{pmatrix} \cos 45^\circ \\ \sin 45^\circ \end{pmatrix} = \begin{pmatrix} 5.9\sqrt{2} \\ 5.9\sqrt{2} \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 8 \\ 0 \end{pmatrix} \quad (2.0.11)$$

Plot of the  $\triangle ABC$ :

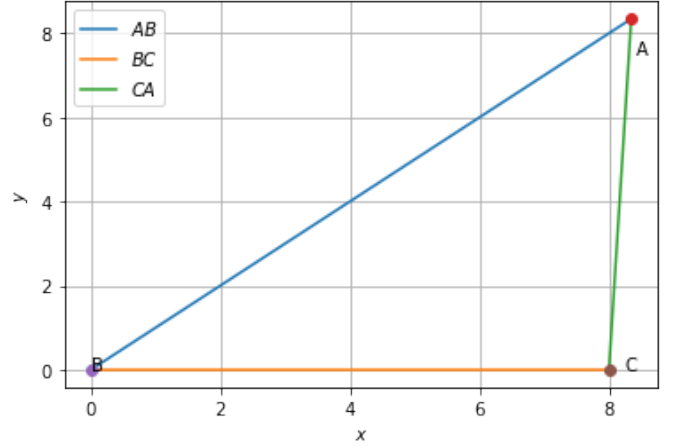


Fig. 2.1:  $\triangle ABC$

## 1 QUESTION No.2.7

In  $\triangle ABC$ ,  $a = 8$ ,  $\angle B = 45^\circ$  and  $c - b = 3.5$ . Sketch  $\triangle ABC$ .

## 2 SOLUTION

The vertex  $\mathbf{A}$  can be expressed in *polar coordinate form* as

$$\mathbf{A} = c \begin{pmatrix} \cos \theta \\ \sin \theta \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} a \\ 0 \end{pmatrix}, \quad (2.0.1)$$

From  $\triangle ABC$ , we use the law of cosines:

$$b^2 = a^2 + c^2 - 2ac \cos B \quad (2.0.2)$$

$$c^2 - b^2 + a^2 - 2ac \cos B = 0 \quad (2.0.3)$$

$$(c + b)(c - b) + 8^2 - 2(8) \left( \frac{1}{\sqrt{2}} \right) c = 0 \quad (\because \angle B = 45^\circ) \quad (2.0.4)$$

$$\frac{7}{2}(c + b) + 64 - 8\sqrt{2}c = 0 \quad (\because c - b = 3.5) \quad (2.0.5)$$

$$\Rightarrow (7 - 16\sqrt{2})c + 7b = -128 \quad (2.0.6)$$

And we have,

$$\Rightarrow c - b = 3.5 \quad (2.0.7)$$

$$c - b = \frac{7}{2} \quad (2.0.8)$$

which can be expressed as the matrix equation

$$\begin{pmatrix} 7 - 16\sqrt{2} & 7 \\ 1 & -1 \end{pmatrix} \begin{pmatrix} c \\ b \end{pmatrix} = \begin{pmatrix} -128 \\ \frac{7}{2} \end{pmatrix} \quad (2.0.9)$$