

CHAPTER-11
TRIANGLES

1 Exercise 11.2

Q2. Construct a triangle ABC in which $BC = 8cm, \angle B = 45^\circ$ and $AB - AC = 3.5cm$.

Solution:

Let \mathbf{A}, \mathbf{B} and \mathbf{C} are the vertices of the triangle with coordinates. Given $BC = 8cm$. So the coordinates of vertices \mathbf{B}, \mathbf{C} are:

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 8 \\ 0 \end{pmatrix}$$

Also given $\angle B = 45^\circ$, so by finding the coordinates of the other side we can form a required triangle.

The input parameters for this construction are

Symbol	Value	Description
a	8	BC
$\angle B$	45°	$\angle B$ in $\triangle ABC$
k	3.5	$AB - AC$ i.e $c - b$
\mathbf{e}_2	$\begin{pmatrix} 0 \\ 1 \end{pmatrix}$	Basis vector

Table 1: Parameters

Calculating Other Coordinate:

$$\mathbf{A} = c \begin{pmatrix} \cos B \\ \sin B \end{pmatrix} \tag{1}$$

We know that

$$c = \frac{1}{2(1 - \frac{a \cos B}{k})} \mathbf{e}_2^\top \begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix} \begin{pmatrix} \frac{-a^2}{k} \\ -k \end{pmatrix} \tag{2}$$

$$c = 12 \tag{3}$$

The vertices of $\triangle ABC$ are

$$\mathbf{A} = 12 \begin{pmatrix} \cos 45^\circ \\ \sin 45^\circ \end{pmatrix} = \begin{pmatrix} 6\sqrt{2} \\ 6\sqrt{2} \end{pmatrix} \tag{4}$$

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad (5)$$

$$\mathbf{C} = \begin{pmatrix} 8 \\ 0 \end{pmatrix} \quad (6)$$

Construction:

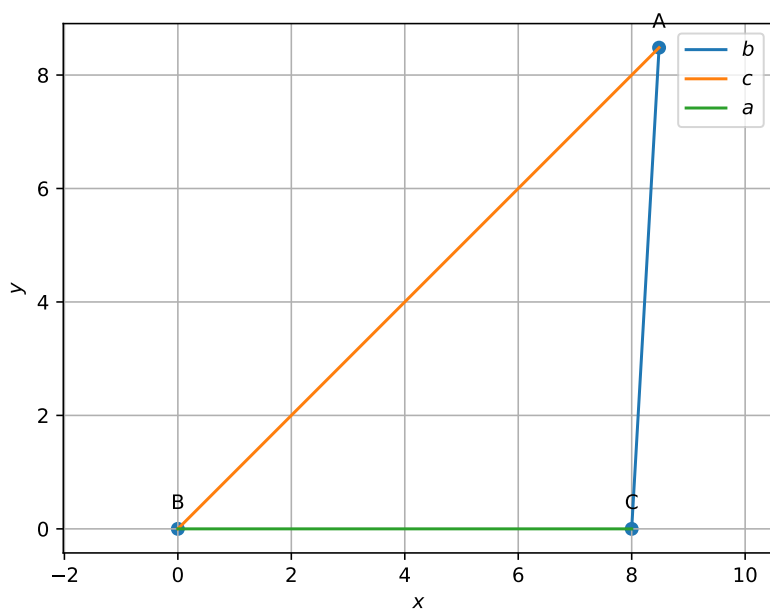


Figure 1: Triangle ABC