

CHAPTER-11
TRIANGLES

1 Exercise 11.2

Q5. Construct a right triangle whose base is $12cm$ and sum of its hypotenuse and other side is $18cm$

Solution: Let \mathbf{A}, \mathbf{B} and \mathbf{C} are the vertices of the right triangle with coordinates. Given $BC = 12cm$ (base). So the coordinates of vertices \mathbf{B}, \mathbf{C} are:

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} a \\ 0 \end{pmatrix} \quad (1)$$

Also given $\angle B = 90^\circ$, 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	12	BC
θ	90°	$\angle B$ in $\triangle ABC$
k	18	$AB + AC$ i.e $b + c$
\mathbf{e}_2	$\begin{pmatrix} 0 \\ 1 \end{pmatrix}$	Basis vector

Table 1: Parameters

Caluclating Other Coordinate:

$$\mathbf{A} = c \begin{pmatrix} \cos \theta \\ \sin \theta \end{pmatrix} \quad (2)$$

We know that

$$c = \frac{1}{2(1 - \frac{a \cos \theta}{k})} \mathbf{e}_2^\top \begin{pmatrix} 1 & 1 \\ -1 & 1 \end{pmatrix} \begin{pmatrix} \frac{a^2}{k} \\ k \end{pmatrix} \quad (3)$$

$$c = 5 \quad (4)$$

The vertices of $\triangle ABC$ are

$$\mathbf{A} = 5 \begin{pmatrix} \cos 90^\circ \\ \sin 90^\circ \end{pmatrix} = \begin{pmatrix} 0 \\ 5 \end{pmatrix} \quad (5)$$

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

$$\mathbf{C} = \begin{pmatrix} 12 \\ 0 \end{pmatrix} \quad (7)$$

Construction:

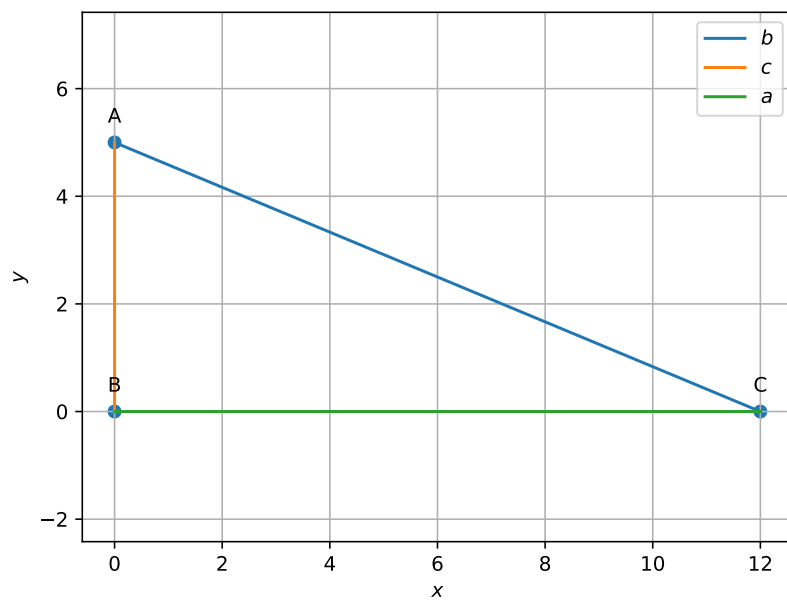


Figure 1: Triangle ABC