

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:

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 12 \\ 0 \end{pmatrix}$$

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	$BC$
$\angle B$	$90^\circ$	$\angle B$ 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:

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

We know that

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

$$c = 5 \tag{3}$$

The vertices of  $\triangle ABC$  are

$$\mathbf{A} = 5 \begin{pmatrix} \cos 90^\circ \\ \sin 90^\circ \end{pmatrix} = \begin{pmatrix} 0 \\ 5 \end{pmatrix} \tag{4}$$

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

$$\mathbf{C} = \begin{pmatrix} 12 \\ 0 \end{pmatrix} \quad (6)$$

Construction:

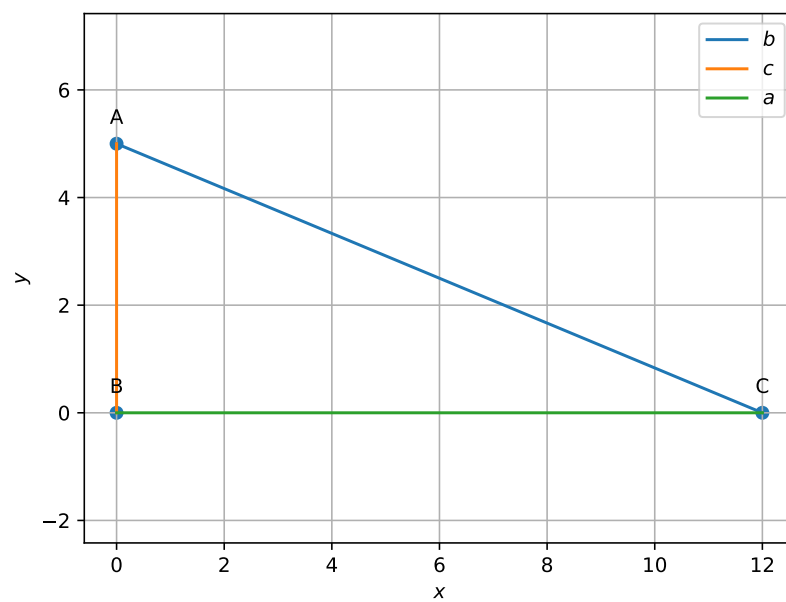


Figure 1: Triangle ABC