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 **A**,**B** and **C** are the vertices of the right triangle with coordinates. Given $BC = 12cm$(base).So the coordinates of vertices **B**,**C** are:

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 12 \\ 0 \end{pmatrix} \tag{1}$$

Also given $\angle B = 90°$, 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
$\angle B$	$90°$	$\angle B$ 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:

$$\mathbf{A} = c \begin{pmatrix} \cos B \\ \sin B \end{pmatrix} \tag{2}$$

We know that

$$c = \frac{1}{2(1 - \frac{a \cos B}{k})} \mathbf{e_2}^\top \begin{pmatrix} 1 & 1 \\ -1 & 1 \end{pmatrix} \begin{pmatrix} \frac{a^2}{k} \\ k \end{pmatrix} \tag{3}$$

$$c = 5 \tag{4}$$

The vertices of $\triangle ABC$ are

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

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \tag{6}$$

$$\mathbf{C} = \begin{pmatrix} 12 \\ 0 \end{pmatrix} \tag{7}$$

Construction:

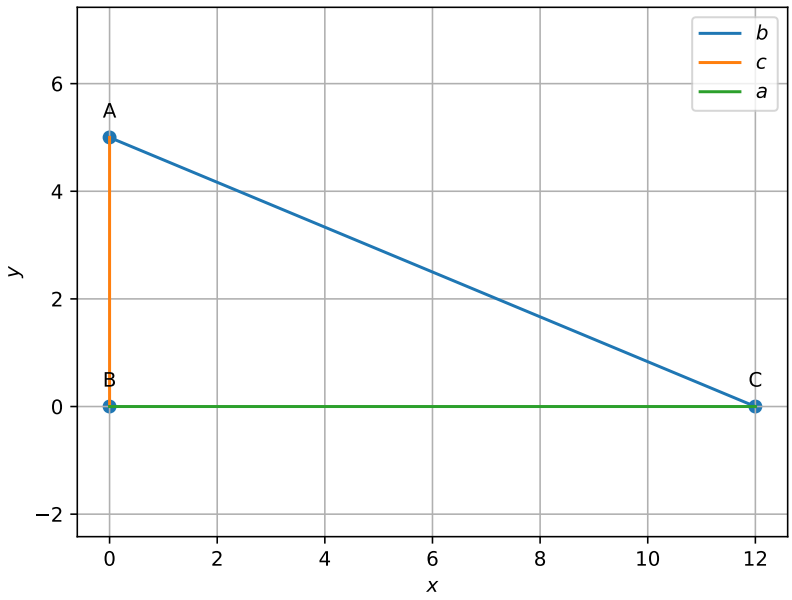

Figure 1: Triangle ABC