ASSIGNMENT-1

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Download all python codes from

https://github.com/BOJJAVOYINAANUSHA/assignmnt−1/blob/main/ASSIGNMENT1/assignment1.py

and latex-tikz codes from

https://github.com/BOJJAVOYINAANUSHA/assignmnt−1/blob/main/ASSIGNMENT1/main.tex

1 QUESTION NO-2.6

$\triangle ABC$ is right angled at B . If $a = 12$ and $b + c = 18$.Find b,c and draw the triangle.

2 SOLUTION

Let,

$$\mathbf{A} = \begin{pmatrix} 0 \\ c \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} a \\ 0 \end{pmatrix} \tag{2.0.1}$$

Given,

$$a = 12, \ c + b = 18 \tag{2.0.2}$$

From $\triangle ABC$, we use the Baudhayana sutra,

$$b^2 = c^2 + a^2 \tag{2.0.3}$$

$$\implies a^2 = b^2 - c^2 \tag{2.0.4}$$

$$\implies a^2 = (b + c)(b - c) \tag{2.0.5}$$

$$Fromequation(2.0.2) \implies b - c = 8 \tag{2.0.6}$$

and we have,

$$b + c = 18 \tag{2.0.7}$$

which can be expressed as the matrix equation

$$\begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix} \begin{pmatrix} b \\ c \end{pmatrix} = \begin{pmatrix} 18 \\ 8 \end{pmatrix} \tag{2.0.8}$$

By applying row reduction

$$\sim \left[\begin{array}{cc|c} 1 & 1 & 18 \\ 1 & -1 & 8 \end{array}\right] \xrightarrow{R_2 \to R_2 - R_1}$$

$$\sim \left[\begin{array}{cc|c} 1 & 1 & 18 \\ 0 & -2 & -10 \end{array}\right] \xrightarrow{R_1 \to 2R_1 + R_2}$$

$$\sim \left[\begin{array}{cc|c} 2 & 0 & 26 \\ 0 & -2 & -10 \end{array}\right] \xrightarrow[R_2 \to (-1/2)R_2]{R_1 \to (1/2)R_1}$$

$$\sim \left[\begin{array}{cc|c} 1 & 0 & 13 \\ 0 & 1 & 5 \end{array}\right]$$

Therefore,

$$\begin{pmatrix} b \\ c \end{pmatrix} = \begin{pmatrix} 13 \\ 5 \end{pmatrix} \tag{2.0.9}$$

Now, Vertices of given $\triangle ABC$ can be written as,

$$\mathbf{A} = \begin{pmatrix} 0 \\ c \end{pmatrix} = \begin{pmatrix} 0 \\ 5 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{c} = \begin{pmatrix} a \\ 0 \end{pmatrix} = \begin{pmatrix} 12 \\ 0 \end{pmatrix} \tag{2.0.10}$$

Now, $\triangle ABC$ can be plotted using vertices AB ,BC and CA .
Plot the right angle $\triangle ABC$:

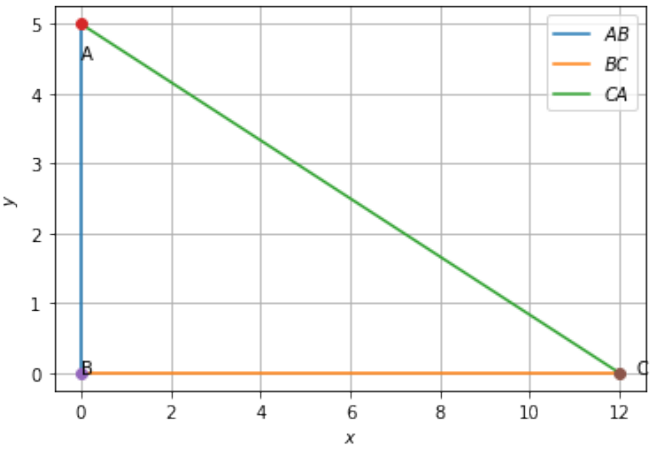

Fig. 2.1: $\triangle ABC$