

3 - Constructions

EE1030:Matrix Theory

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Question:3.2.21

Construct and give justification:

A right triangle when one side is 3.5 cm and sum other side and the hypotenuse is 5.5 cm.

Solution:

Actual Name	Assigned Variable	Given values
AB	c	-
BC	a	3.5 cm
$CA + AB$	k	5.5 cm
$\angle ABC$	$\angle B$	90°

Table 3.2.21.1 0: Variables and its values

Consider the right angle at **B**, so that $\angle B = 90^\circ$, $\cos(\angle B) = 0$, $\sin(\angle B) = 1$
In $\triangle ABC$, if **B** is considered as origin then the coordinates are represented by

$$\mathbf{A} = c \begin{pmatrix} \cos(\angle B) \\ \sin(\angle B) \end{pmatrix} \quad (0.1)$$

$$\mathbf{A} = \begin{pmatrix} 0 \\ c \end{pmatrix} \quad (0.2)$$

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad (0.3)$$

$$\mathbf{C} = \begin{pmatrix} a \\ 0 \end{pmatrix} \quad (0.4)$$

Using the formula to find c,

$$c = \frac{k^2 - a^2}{2(k - a \cos(\angle B))} \quad (0.5)$$

$$c = \frac{\frac{121}{4} - \frac{49}{4}}{2\left(\frac{11}{2} - 0\right)} \quad (0.6)$$

$$c = \frac{18}{11} \quad (0.7)$$

Therefore,

$$\mathbf{A} = \begin{pmatrix} 0 \\ 18 \\ 11 \end{pmatrix} \quad (0.8)$$

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad (0.9)$$

$$\mathbf{C} = \begin{pmatrix} 7 \\ 2 \\ 0 \end{pmatrix} \quad (0.10)$$

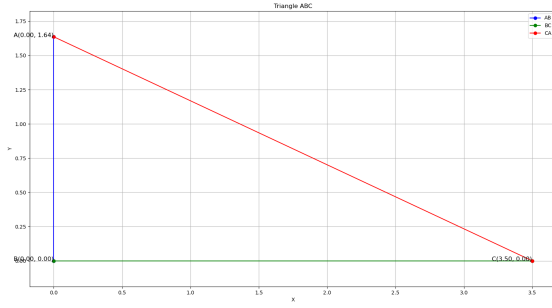


Fig. 0.1: Triangle ABC