Assignment 1

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1 QUESTION No. 2.5

Draw a $\triangle ABC$ with side $a = 7$cm, $\angle B = 45°$, $\angle A = 105°$.

2 EXPLANATION

Given,

$$\angle A = 105°, \angle B = 45° \text{ and } a = 7 \qquad (2.0.1)$$

we first need to find $\angle C$:
Finding $\angle C$
In $\triangle ABC$,

$$\qquad (2.0.2)$$
$$\angle A + \angle B + \angle C = 180° \qquad (2.0.3)$$
$$105° + 45° + \angle C = 180° \qquad (2.0.4)$$
$$150° + \angle C = 180° \qquad (2.0.5)$$
$$\angle C = 180° - 150° \qquad (2.0.6)$$
$$\angle C = 30° \qquad (2.0.7)$$
$$\qquad (2.0.8)$$

By law of sines

$$\qquad (2.0.9)$$
$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \qquad (2.0.10)$$
$$\frac{\sin 105°}{a} = \frac{\sin 45°}{b} = \frac{\sin 30°}{c} \qquad (2.0.11)$$
$$\qquad (2.0.12)$$

we have:

$$\qquad (2.0.13)$$
$$\frac{\sin 105°}{a} = \frac{\sin 45°}{b} \qquad (2.0.14)$$
$$b \sin 105° = a \sin 45° \qquad (2.0.15)$$
$$a \sin 45° - b \sin 105° = 0 \qquad (2.0.16)$$
$$a\left(\frac{1}{\sqrt{2}}\right) - b\left(\frac{\sqrt{3}+1}{2 \cdot \sqrt{2}}\right) = 0 \qquad (2.0.17)$$
$$\qquad (2.0.18)$$

similarly,

$$\qquad (2.0.19)$$
$$\frac{\sin 105°}{a} = \frac{\sin 30°}{c} \qquad (2.0.20)$$
$$c \sin 105° = a \sin 30° \qquad (2.0.21)$$
$$a \sin 30° - c \sin 105° = 0 \qquad (2.0.22)$$
$$a\left(\frac{1}{2}\right) - c\left(\frac{\sqrt{3}+1}{2 \cdot \sqrt{2}}\right) = 0 \qquad (2.0.23)$$

Then, AX=B
Which can be expressed as the matrix equation

$$\begin{pmatrix} 1 & 0 & 0 \\ \frac{1}{\sqrt{2}} & -\frac{\sqrt{3}+1}{2\cdot\sqrt{2}} & 0 \\ \frac{1}{2} & 0 & -\frac{\sqrt{3}+1}{2\cdot\sqrt{2}} \end{pmatrix} \begin{pmatrix} a \\ b \\ c \end{pmatrix} = \begin{pmatrix} 7 \\ 0 \\ 0 \end{pmatrix} \qquad (2.0.24)$$

by solving(2.0.24) ,we get values :

$$\implies a = 7; \qquad (2.0.25)$$
$$\implies b = 5.12; \qquad (2.0.26)$$
$$\implies c = 3.62; \qquad (2.0.27)$$

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

$$\mathbf{A} = \begin{pmatrix} 0 \\ c \end{pmatrix} = \begin{pmatrix} 0 \\ 3.62 \end{pmatrix} \qquad (2.0.28)$$

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \qquad (2.0.29)$$

$$\mathbf{C} = \begin{pmatrix} a \\ 0 \end{pmatrix} = \begin{pmatrix} 7 \\ 0 \end{pmatrix} \qquad (2.0.30)$$

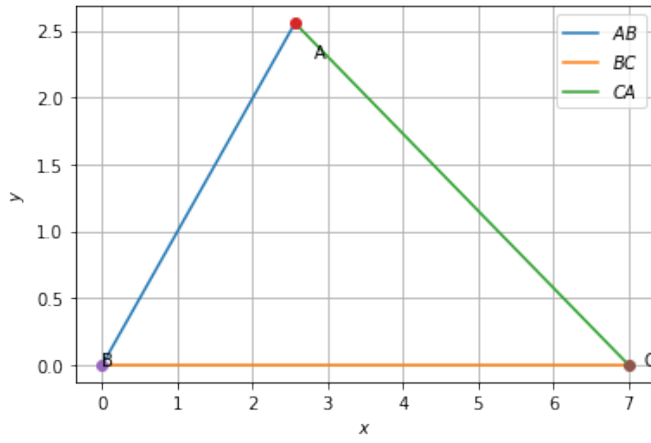Now,$\triangle ABC$ can be plotted using vertices a ,b and c
Plot of the angle $\triangle ABC$:

Fig. 2.1: $\triangle ABC$