Assignment 1

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Download all python codes from

https://github.com/Atlakeerthana/Assignment1/blob/main/Assignment1/assignment1.py

and latex-tikz codes from

https://github.com/Atlakeerthana/Assignment1/blob/main/Assignment1/main.tex

1 Question No. 2.5

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

2 Explanation

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

$$\tag{2.0.1}$$

$$\angle A + \angle B + \angle C = 180^\circ \tag{2.0.2}$$

$$105^\circ + 45^\circ + \angle C = 180^\circ \tag{2.0.3}$$

$$150^\circ + \angle C = 180^\circ \tag{2.0.4}$$

$$\angle C = 180^\circ - 150^\circ \tag{2.0.5}$$

$$\angle C = 30^\circ \tag{2.0.6}$$

$$\tag{2.0.7}$$

By law of sines

$$\tag{2.0.8}$$

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \tag{2.0.9}$$

$$\frac{\sin 105^\circ}{7} = \frac{\sin 45^\circ}{b} = \frac{\sin 30^\circ}{c} \tag{2.0.10}$$

$$\tag{2.0.11}$$

we have:

$$\tag{2.0.12}$$

$$\frac{\sin 105^\circ}{7} = \frac{\sin 45^\circ}{b} \tag{2.0.13}$$

$$\frac{\sqrt{3}+1}{14 \cdot \sqrt{2}} = \frac{1}{b \cdot \sqrt{2}} \tag{2.0.14}$$

$$\frac{\sqrt{3}+1}{14} = \frac{1}{b} \tag{2.0.15}$$

$$b(\sqrt{3}+1) = 14 \tag{2.0.16}$$

similarly,

$$\tag{2.0.17}$$

$$\frac{\sin 105^\circ}{7} = \frac{\sin 30^\circ}{c} \tag{2.0.18}$$

$$\frac{\sqrt{3}+1}{14 \cdot \sqrt{2}} = \frac{1}{c \cdot 2} \tag{2.0.19}$$

$$c(\sqrt{3}+1) = 7 \cdot \sqrt{2} \tag{2.0.20}$$

$$\tag{2.0.21}$$

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

$$\begin{pmatrix} \sqrt{3}+1 & 0 \\ 0 & \sqrt{3}+1 \end{pmatrix} \begin{pmatrix} b \\ c \end{pmatrix} = \begin{pmatrix} 14 \\ 7 \cdot \sqrt{2} \end{pmatrix} \tag{2.0.22}$$

By solving (2.0.22) , we get values :

$$\implies a = 7; \tag{2.0.23}$$

$$\implies b = 5.12; \tag{2.0.24}$$

$$\implies c = 3.62; \tag{2.0.25}$$

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

$$\mathbf{A} = \begin{pmatrix} 0 \\ c \end{pmatrix} = \begin{pmatrix} 0 \\ 3.62 \end{pmatrix} \tag{2.0.26}$$

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \tag{2.0.27}$$

$$\mathbf{c} = \begin{pmatrix} a \\ 0 \end{pmatrix} = \begin{pmatrix} 7 \\ 0 \end{pmatrix} \tag{2.0.28}$$

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

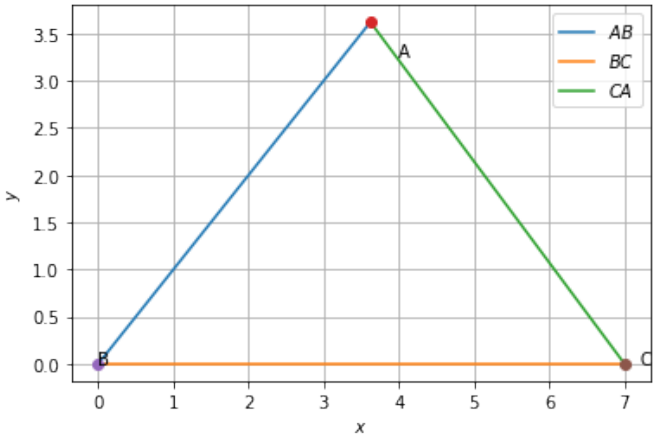

Fig. 2.1: $\triangle ABC$