

# Assignment 1

Atla keerthana

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>

we have:

$$(2.0.13)$$

$$\frac{\sin 105^\circ}{a} = \frac{\sin 45^\circ}{b} \quad (2.0.14)$$

$$b \sin 105^\circ = a \sin 45^\circ \quad (2.0.15)$$

$$a \sin 45^\circ - b \sin 105^\circ = 0 \quad (2.0.16)$$

$$a\left(\frac{1}{\sqrt{2}}\right) - b\left(\frac{\sqrt{3}+1}{2 \cdot \sqrt{2}}\right) = 0 \quad (2.0.17)$$

$$(2.0.18)$$

## 1 QUESTION No. 2.5

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

similarly,

$$(2.0.19)$$

$$\frac{\sin 105^\circ}{a} = \frac{\sin 30^\circ}{c} \quad (2.0.20)$$

$$c \sin 105^\circ = a \sin 30^\circ \quad (2.0.21)$$

$$a \sin 30^\circ - c \sin 105^\circ = 0 \quad (2.0.22)$$

$$a\left(\frac{1}{2}\right) - c\left(\frac{\sqrt{3}+1}{2 \cdot \sqrt{2}}\right) = 0 \quad (2.0.23)$$

## 2 EXPLANATION

Given,

$$\angle A = 105^\circ, \angle B = 45^\circ \text{ and } a = 7 \quad (2.0.1)$$

we first need to find  $\angle C$ :

Finding  $\angle C$

In  $\triangle ABC$ ,

$$\angle A + \angle B + \angle C = 180^\circ \quad (2.0.2)$$

$$105^\circ + 45^\circ + \angle C = 180^\circ \quad (2.0.3)$$

$$150^\circ + \angle C = 180^\circ \quad (2.0.4)$$

$$\angle C = 180^\circ - 150^\circ \quad (2.0.5)$$

$$\angle C = 30^\circ \quad (2.0.6)$$

$$(2.0.7)$$

$$(2.0.8)$$

By law of sines

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \quad (2.0.9)$$

$$\frac{\sin 105^\circ}{a} = \frac{\sin 45^\circ}{b} = \frac{\sin 30^\circ}{c} \quad (2.0.10)$$

$$(2.0.11)$$

$$(2.0.12)$$

Then,  $AX=B$

Which can be expressed as the matrix equation

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

by solving(2.0.24), we get values :

$$\Rightarrow a = 7; \quad (2.0.25)$$

$$\Rightarrow b = 5.12; \quad (2.0.26)$$

$$\Rightarrow c = 3.62; \quad (2.0.27)$$

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

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

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

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

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

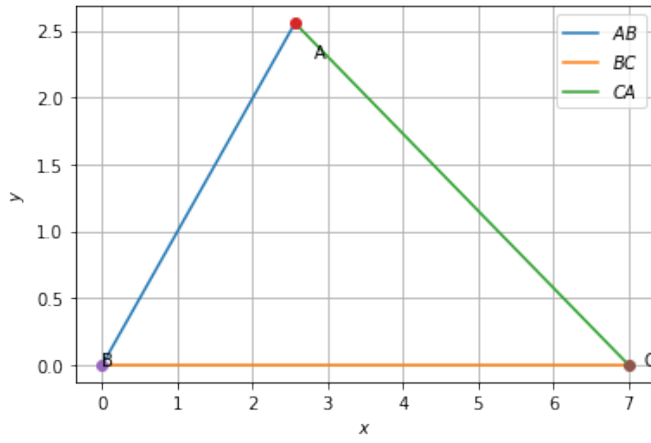


Fig. 2.1:  $\triangle ABC$