

MATRIX ASSIGNMENT

0.1 Problem:

Construct a triangle ABC in which $BC = 7\text{cm}$, $\angle B = 75^\circ$ and $AB + AC = 13\text{ cm}$

0.2 Solution:

Theory:

Construct a triangle ABC in which $BC = 7\text{cm}$, $\angle B = 75^\circ$ and $AB + AC = 13$

To Prove:

- Draw base $BC = 7\text{cm}$, and at point, B make an angle $\angle B = 75^\circ$ using a protractor.
- With B as center and radius $BD = 13\text{ cm}$, draw an arc to intersect ray BX at D.
- Join DC.
- Let's construct a perpendicular bisector of DC. With D and C as the center and radius greater than half of DC, draw arcs above and below the line DC to intersect ray BX at A.
- Join AC.

ABC is the required triangle.

Verification:

On measuring we see that, $BC = 7\text{cm}$, $\angle B = 75^\circ$ and $AB + AC = 13\text{cm}$

0.3 TermuxCommands:

python3 matrix.py

To Prove:

Given BC length is $a = 7\text{cm}$, so the coordinates of B are $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$

X_1, Y_1 respectively and the coordinates of C are, $\begin{pmatrix} a \\ 0 \end{pmatrix}$

X_3, Y_3 respectively and also given the angle is $B = 75^\circ$, so by finding the coordinates of the other side we can form a required triangle.

Calculating Other Coordinate:

Let the coordinates of A are X_2, Y_2 respectively.

Let $A = \begin{pmatrix} \sin\theta \\ \cos\theta \end{pmatrix}$ Using the Cosine formula in $\triangle ABC$,

$$b^2 = a^2 + c^2 - 2ac\cos B.$$

$$\Rightarrow (b+c)(b-c) + 7^2 - 2 \times 7 \times 0.9217c$$

$$\Rightarrow b - 1.99c = 3.76 \dots 1$$

Upon Simplification we get:-

$$b + c = 7 \dots 2$$

and the above 2 equations can be written as:-

$$\begin{pmatrix} 1 & -1.99 \\ 1 & -1 \end{pmatrix} \begin{pmatrix} b \\ c \end{pmatrix} = \begin{pmatrix} 3.76 \\ 13 \end{pmatrix}$$

$$\text{from this, } \begin{pmatrix} b \\ c \end{pmatrix} = \begin{pmatrix} 9.91 \\ -0.38 \end{pmatrix}$$

Thus, the vertices of $\triangle ABC$ are

$$A = 9.91 \begin{pmatrix} \cos 75^\circ \\ \sin 75^\circ \end{pmatrix}, B = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, C = \begin{pmatrix} 7 \\ 0 \end{pmatrix}$$

The below python code realizes the above construction:

<https://github.com/manasareddy442002/fwc-moudle1/blob/c70dd69787e4015345ac92e472d1d80a152f851d/matrix.py>

0.4 Construction

