Name:SHAIK KHAJA MASTAN AHMED

Roll No.: FWC22052

19pa1a04e9@vishnu.edu.in

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भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

MATRIX: LINE ASSIGNMENT

0.1 Problem:

Construct a triangle XYZ in which $\angle Y = 30^0$, $\angle Z = 90^0$ and XY+YZ+ZX=11cm.

0.2 Solution:

Input Parameters:

Symbol	Value	Description
XY+YZ+ZX	11cm	Sum of Distances
$\angle Z$	90^0	Angle at Z
$\angle Y$	30^0	Angle at Y

Termux Command:

bash rncom.sh (Using Shell)

To Prove:

Given, $\angle Y = 30^0$, $\angle Z = 90^0$ and XY+YZ+ZX = 11cm.

if $\angle Y = 30^0$ and $\angle Z = 90^0$ then $\angle X = 60^0$

Let us consider the coordinates of Y are X0,Y0 be $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$

Let 'r' be the distance between X and Y.

Let the coordinates of X be X1,Y1 respectively.

$$\text{i.e., X} = r\begin{pmatrix} cos\theta \\ sin\theta \end{pmatrix}$$

And the coordinates of Z be X2,Y2 respectively.

$$\text{i.e., Z} = r\begin{pmatrix} cos\theta \\ 0 \end{pmatrix}$$

So, by finding the values of coordinates of the all sides we can form a required triangle.

Finding the Coordinates:
Given that XY+YZ+ZX=11.
i.e., $||X - Y|| + ||Y - Z|| + ||Z - X|| = 11$.

$\implies$ r + rcosθ+ rsinθ =11.

By solving we get 'r' , $[\because \theta = 30^0]$.

$$\therefore r = 4.64 .$$

Calculating the required vertices:

$$X = r\begin{pmatrix} cos\theta \\ sin\theta \end{pmatrix} = 4.64\begin{pmatrix} cos30^0 \\ sin30^0 \end{pmatrix} = \begin{pmatrix} 4.02 \\ 2.32 \end{pmatrix}$$

$$Z = r\begin{pmatrix} cos\theta \\ 0 \end{pmatrix} = 4.64\begin{pmatrix} cos30^0 \\ 0 \end{pmatrix} = \begin{pmatrix} 4.02 \\ 0 \end{pmatrix}$$

$\therefore$ The vertices of the required ΔXYZ are:

$$X = \begin{pmatrix} 4.02 \\ 2.32 \end{pmatrix}, \text{Y} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \text{Z} = \begin{pmatrix} 4.02 \\ 0 \end{pmatrix}$$

The below python code realizes construction:
https://github.com/19pa1a04e9/FWC-IITH/tree/main/Assignment-1/MATRICES/Line/line.py

0.3 Plot: