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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	D
$\angle Z$	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 = Dcm.
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 'z' be the distance between X and Y.
Let the coordinates of X be X1,Y1 respectively.

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

And the coordinates of Z be X2,Y2 respectively.

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

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=D.
i.e., $||X-Y|| + ||Y-Z|| + ||Z-X||$ =D.
$\implies$ z + zcosθ+ zsinθ =D

$$\implies \text{z} = \frac{D}{1+cos\theta+sin\theta}$$

By solving we get 'z' , [$\because \theta = 30^0$ and D=11cm].

$$\therefore \text{z} = 4.64 \text{ .}$$

Calculating the required vertices:

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

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

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

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

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

0.3 Plot: