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MATRIX ASSIGNMENT

0.1 Problem:

Construct a triangle ABC in which BC=8cm, $\angle B = 45^0$ and AB - AC = 3.5 cm.

0.2 Solution

The input parameters for this construction are

Symbol	Value	Description
BC	a	where a is 8cm
AB	b	AB distance is denoted as c
AC	c	AC distance is deoted as b
$\angle BC$	45^0	ΔABC
C	$\begin{pmatrix} a \\ 0 \end{pmatrix}$	BC length is equal to a
A	$\begin{pmatrix} cos\theta \\ sin\theta \end{pmatrix}$	using the cosine formula in ΔABC

Caluclating Other Coordinate:
The coordinates of B and C are X_2,Y_2 respectively.
Let $\mathbf{A} = \begin{pmatrix} \cos\theta \\ \sin\theta \end{pmatrix}$
Using the Cosine formula in ΔABC,

$$b^2 = a^2 + c^2 - 2accos\mathbf{B} \quad (1)$$

$$(b+c)(b-c) = a^2 - 2 \times a \times 0.707c \quad (2)$$

Upon Simplifaction we get:-

$$(7 - 16\sqrt{2})b + 7c = -128 \quad (3)$$

$$c - b = 3.5 \quad (4)$$

From the above, we obtain the matrix equation:-

$$\begin{pmatrix} 7-16\sqrt{2} & 7 \\ -1 & 1 \end{pmatrix} \begin{pmatrix} c \\ b \end{pmatrix} = \begin{pmatrix} -128 \\ 3.5 \end{pmatrix}$$

$$\begin{pmatrix} c \\ b \end{pmatrix} = \begin{pmatrix} 11.99 \\ 8.49 \end{pmatrix}$$

The vertices of Δ ABC are

$$\mathbf{A} = 11.99\begin{pmatrix} cos45 \\ sin45 \end{pmatrix} = \begin{pmatrix} 8.4 \\ 8.4 \end{pmatrix}$$

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

$$\mathbf{C} = \begin{pmatrix} 8 \\ 0 \end{pmatrix}$$

Below python code realizes the above construction :

`https://github.com/kedareswari200/fwc-moudle1/blob/Matri_lines/triangle.py`

0.3 Construction