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MATRIX ASSIGNMENT

0.1 Problem:

Construct a triangle ABC in which BC=7cm, $\angle B = 75^0$ and AB + AC = 13 cm.

0.2 Solution

The input parameters for this construction are

Symbol	Value	Description
BC	a	where a is 7cm
AB	b	AB distance is b
AC	c	AC distance is c
$\angle BC$	75^0	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

termux commands :

    bash line.sh.........using shell command

Caluclating Other Coordinate:

Let the coordinates of A are X_2, Y_2 respectively.

Let $\mathbf{A} = \begin{pmatrix} \cos\theta \\ \sin\theta \end{pmatrix}$

Using the Cosine formula in ΔABC,

$$b^2 = a^2 + c^2 - 2ac\,cos\mathbf{B} \tag{1}$$

$$(b+c)(b-c) = a^2 - 2 \times a \times c\,cos\mathbf{B} \tag{2}$$

$$K(b-c) = a^2 - 2 \times a \times c\,cos\mathbf{B} \tag{3}$$

$$bk - ck + 2 \times a \times c \times cos\mathbf{B} = a^2 \tag{4}$$

$$bk - c(k + 2 acos\mathbf{B}) = a^2 \tag{5}$$

Upon Simplifaction we get:-

$$b - 1.26c = 3.76 \tag{6}$$

$$b + c = 13 \tag{7}$$

From the above, we obtain the matrix equation:-

$$\begin{pmatrix} 1 & -1.26 \\ 1 & 1 \end{pmatrix} \begin{pmatrix} b \\ c \end{pmatrix} = \begin{pmatrix} 3.76 \\ 13 \end{pmatrix}$$

$$\begin{pmatrix} b \\ c \end{pmatrix} = \begin{pmatrix} 5.333 \\ 7.66 \end{pmatrix}$$

The vertices of Δ ABC are

$$\mathbf{A} = c\begin{pmatrix} cos75 \\ sin75 \end{pmatrix} = \begin{pmatrix} 1.33 \\ 5.15 \end{pmatrix}$$

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

$$\mathbf{C} = \begin{pmatrix} 7 \\ 0 \end{pmatrix}$$

Below python code realizes the above construction :

    https://github.com/manasareddy442002/
    fwc-moudle1/blob/matrix-lines/matrix.py

0.3 Construction