ASSIGNMENT-2

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Download all python codes from

```
https://github.com/K.NIKHITHA/Assignment−2/
    blob/main/ASSIGNMENT2/assignment2.py
```

and latex-tikz codes from

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https://github.com/K.NIKHITHA/Assignment−2/
    blob/main/ASSIGNMENT2/main.tex
```

1 Question No. 2.44

Construct TRUE where $TR = 3.5, RU = 3, UE = 4, \angle R = 75^\circ$ and $\angle U = 120^\circ$.

2 Solution

1) Let us assume vertices of given quadrilateral $TRUE$ as **T**,**R**,**U** and **E**.
2) Let us generalize the given data:

$$\angle R = 75^\circ = \theta \tag{2.0.1}$$
$$\angle U = 120^\circ = \alpha \tag{2.0.2}$$
$$\|\mathbf{T} - \mathbf{R}\| = 3.5 = a \tag{2.0.3}$$
$$\|\mathbf{U} - \mathbf{R}\| = 3 = b \tag{2.0.4}$$
$$\|\mathbf{E} - \mathbf{U}\| = 4 = c \tag{2.0.5}$$

- For this quadrilateral $TRUE$ we have,

$$\angle R + \angle U = 75^\circ + 120^\circ = 195^\circ \tag{2.0.6}$$

- Let,

$$\mathbf{R} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{U} = \begin{pmatrix} 3 \\ 0 \end{pmatrix} \tag{2.0.7}$$

Lemma 2.1. *The coordinates of* **T** *and* **E** *can be written as follows:*

$$\mathbf{T} = C\mathbf{u} \quad \left(\because \mathbf{R} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}\right) \tag{2.0.8}$$
$$\mathbf{E} = \mathbf{U} + a\mathbf{r} \tag{2.0.9}$$

Let us define r,u as:

$$\mathbf{r} = \begin{pmatrix} \cos R \\ \sin R \end{pmatrix}, \mathbf{u} = \begin{pmatrix} \cos U \\ \sin U \end{pmatrix} \tag{2.0.10}$$

- For finding coordinates of T:-

Putting (2.0.1) and (2.0.3) in (2.0.8) we get,

$$\implies \mathbf{T} = 4\begin{pmatrix} \cos 120 \\ \sin 120 \end{pmatrix} \tag{2.0.11}$$
$$\implies \mathbf{T} = \begin{pmatrix} -2 \\ 3.46 \end{pmatrix} \tag{2.0.12}$$

- For finding coordinates of E:-

Putting (2.0.2) and (2.0.5) in (2.0.9) we get,

$$\implies \mathbf{E} = \begin{pmatrix} 3 \\ 0 \end{pmatrix} + 3.5\begin{pmatrix} \cos 75 \\ \sin 75 \end{pmatrix} \tag{2.0.13}$$
$$\implies \mathbf{E} = \begin{pmatrix} 3 \\ 0 \end{pmatrix} + \begin{pmatrix} 0.90 \\ 3.38 \end{pmatrix} \tag{2.0.14}$$
$$\implies \mathbf{E} = \begin{pmatrix} 3.39 \\ 3.38 \end{pmatrix} \tag{2.0.15}$$

- Now,the vertices of given Quadrilateral TRUE can be written as,

$$\mathbf{T} = \begin{pmatrix} -2 \\ 3.46 \end{pmatrix}, \mathbf{R} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{U} = \begin{pmatrix} 3 \\ 0 \end{pmatrix}, \mathbf{E} = \begin{pmatrix} 3.39 \\ 3.38 \end{pmatrix} \tag{2.0.16}$$

3) On constructing the quadrilateral $TRUE$ we get:

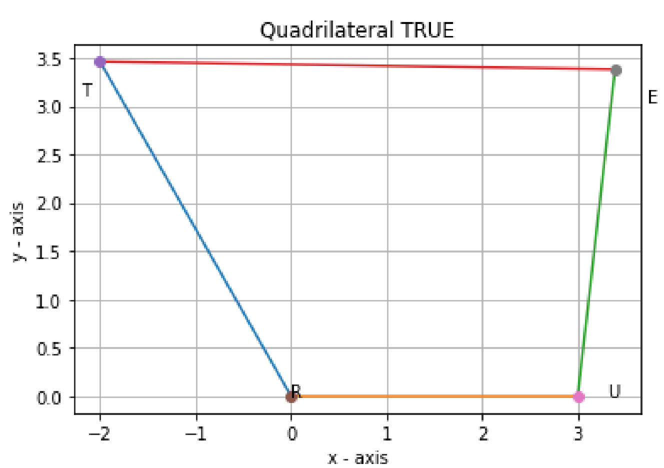

Fig. 2.1: Quadrilateral TRUE