ASSIGNMENT-2

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Download all python codes from

https://github.com/BOJJAVOYINAANUSHA/Assignment−2/blob/main/ASSIGNMENT2/assignment2.py

and latex-tikz codes from

https://github.com/BOJJAVOYINAANUSHA/Assignment−2/blob/main/ASSIGNMENT2/main.tex

1 Question No. 2.42

Construct ABCD where $AB = 4, BC = 5, CD = 6.5, \angle B = 105°$ and $\angle C = 80°$.

2 SOLUTION

1) Let us assume vertices of given quadrilateral $ABCD$ as **A**,**B**,**C** and **D**.
2) Let us generalize the given data:

$$\angle B = 105° = \theta \tag{2.0.1}$$
$$\angle C = 80° = \alpha \tag{2.0.2}$$
$$\|\mathbf{A} - \mathbf{B}\| = 4 = p \tag{2.0.3}$$
$$\|\mathbf{C} - \mathbf{B}\| = 5 = q \tag{2.0.4}$$
$$\|\mathbf{D} - \mathbf{C}\| = 6.5 = r \tag{2.0.5}$$

- For this quadrilateral $ABCD$ we have,

$$\angle B + \angle C = 105° + 80° = 185° \tag{2.0.6}$$

- Let,

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 5 \\ 0 \end{pmatrix} \tag{2.0.7}$$

Lemma 2.1. *The coordinates of* **A** *and* **D** *can be written as follows:*

$$\mathbf{A} = p\mathbf{b} \quad \left(\because \mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}\right) \tag{2.0.8}$$
$$\mathbf{D} = \mathbf{C} + r\mathbf{c} \tag{2.0.9}$$

Let us define b,c as:

$$\mathbf{b} = \begin{pmatrix} \cos B \\ \sin B \end{pmatrix}, \mathbf{c} = \begin{pmatrix} \cos C \\ \sin C \end{pmatrix} \tag{2.0.10}$$

- For finding coordinates of A:-

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

$$\implies \mathbf{A} = 4\begin{pmatrix} \cos 105 \\ \sin 105 \end{pmatrix} \tag{2.0.11}$$
$$\implies \mathbf{A} = \begin{pmatrix} -1.03 \\ 3.86 \end{pmatrix} \tag{2.0.12}$$

- For finding coordinates of D:-

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

$$\implies \mathbf{D} = \begin{pmatrix} 5 \\ 0 \end{pmatrix} + 6.5\begin{pmatrix} \cos 80 \\ \sin 80 \end{pmatrix} \tag{2.0.13}$$
$$\implies \mathbf{D} = \begin{pmatrix} 5 \\ 0 \end{pmatrix} + \begin{pmatrix} 1.12 \\ 6.39 \end{pmatrix} \tag{2.0.14}$$
$$\implies \mathbf{D} = \begin{pmatrix} 6.12 \\ 6.39 \end{pmatrix} \tag{2.0.15}$$

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

$$\mathbf{A} = \begin{pmatrix} -1.03 \\ 3.86 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 5 \\ 0 \end{pmatrix}, \mathbf{D} = \begin{pmatrix} 6.12 \\ 6.39 \end{pmatrix} \tag{2.0.16}$$

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

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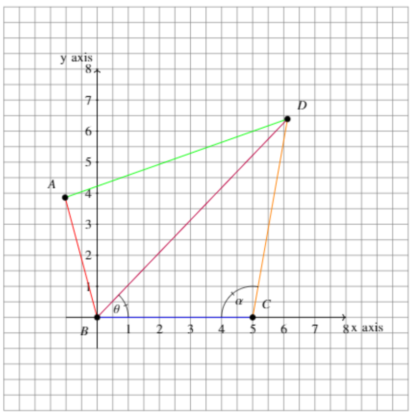

Fig. 2.1: Quadrilateral ABCD