

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 $AB = 4, BC = 5, CD = 6.5, \angle B = 105^\circ$ and $\angle C = 80^\circ$.

2 SOLUTION

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

$$\angle B = 105^\circ = \theta \quad (2.0.1)$$

$$\angle C = 80^\circ = \alpha \quad (2.0.2)$$

$$\|\mathbf{A} - \mathbf{B}\| = 4 = p \quad (2.0.3)$$

$$\|\mathbf{C} - \mathbf{B}\| = 5 = q \quad (2.0.4)$$

$$\|\mathbf{D} - \mathbf{C}\| = 6.5 = r \quad (2.0.5)$$

- For this quadrilateral $ABCD$ we have,

$$\angle B + \angle C = 105^\circ + 80^\circ = 185^\circ \quad (2.0.6)$$

- Let,

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 5 \\ 0 \end{pmatrix} \quad (2.0.7)$$

Lemma 2.1. *The coordinate of \mathbf{A} and \mathbf{D} can be written as follows:*

$$\Rightarrow \mathbf{A} = p \begin{pmatrix} \cos B \\ \sin B \end{pmatrix} \quad (2.0.8)$$

$$\Rightarrow \mathbf{D} = \begin{pmatrix} 5 \\ 0 \end{pmatrix} + r \begin{pmatrix} \cos C \\ \sin C \end{pmatrix} \quad (2.0.9)$$

- 3) For finding coordinates of \mathbf{A} :-

The vector equation of line is given by:

$$\mathbf{A} = \mathbf{B} + p\mathbf{b} \quad (2.0.10)$$

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

$$\Rightarrow \mathbf{A} = 4 \begin{pmatrix} \cos 105^\circ \\ \sin 105^\circ \end{pmatrix} \quad (2.0.11)$$

$$\Rightarrow \mathbf{A} = \begin{pmatrix} -1.03 \\ 3.86 \end{pmatrix} \quad (2.0.12)$$

- 4) For finding coordinates of \mathbf{D} :-

The vector equation of line is given by:

$$\mathbf{D} = \mathbf{C} + r\mathbf{c} \quad (2.0.13)$$

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

$$\Rightarrow \mathbf{D} = \begin{pmatrix} 5 \\ 0 \end{pmatrix} + 6.5 \begin{pmatrix} \cos 80^\circ \\ \sin 80^\circ \end{pmatrix} \quad (2.0.14)$$

$$\Rightarrow \mathbf{D} = \begin{pmatrix} 5 \\ 0 \end{pmatrix} + \begin{pmatrix} 1.12 \\ 6.39 \end{pmatrix} \quad (2.0.15)$$

$$\Rightarrow \mathbf{D} = \begin{pmatrix} 6.12 \\ 6.39 \end{pmatrix} \quad (2.0.16)$$

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

$$\mathbf{A} = \begin{pmatrix} -1.03 \\ 3.86 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 5 \\ 0 \end{pmatrix}, \mathbf{D} = \begin{pmatrix} 6.12 \\ 6.39 \end{pmatrix} \quad (2.0.17)$$

- 5) On constructing the quadrilateral $ABCD$ we get:

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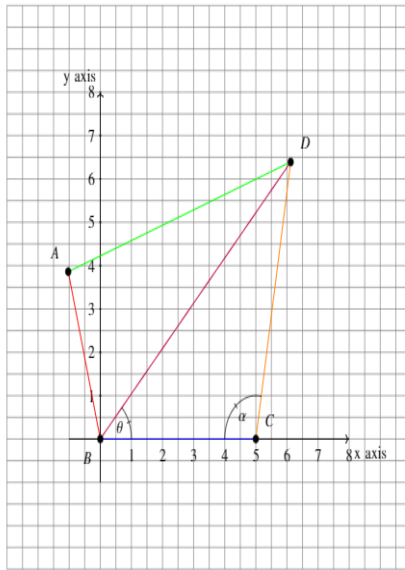


Fig. 2.1: Quadrilateral ABCD