

ASSIGNMENT-2

v.nagajyothi

Download all python codes from

<https://github.com/v.nagajyothi/Assignment-2/blob/main/ASSIGNMENT2/assignment2.py>

and latex-tikz codes from

<https://github.com/v.nagajyothi/Assignment-2/blob/main/ASSIGNMENT2/main.tex>

1 QUESTION No. 2.43

Construct DEAR where $DE = 4, EA = 5, AR = 4.5, \angle E = 60^\circ$ and $\angle A = 90^\circ$.

2 SOLUTION

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

$$\angle E = 60^\circ = \theta \quad (2.0.1)$$

$$\angle A = 90^\circ = \alpha \quad (2.0.2)$$

$$\|\mathbf{D} - \mathbf{E}\| = 4 = a \quad (2.0.3)$$

$$\|\mathbf{E} - \mathbf{A}\| = 5 = b \quad (2.0.4)$$

$$\|\mathbf{A} - \mathbf{R}\| = 4.5 = c \quad (2.0.5)$$

- For this quadrilateral DEAR we have,

$$\angle E + \angle A = 60^\circ + 90^\circ = 150^\circ \quad (2.0.6)$$

- Let,

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

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

$$\mathbf{D} = a\mathbf{e} \quad \left(\because \mathbf{E} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \right) \quad (2.0.8)$$

$$\mathbf{R} = \mathbf{A} + c\mathbf{a} \quad (2.0.9)$$

Let us define \mathbf{e}, \mathbf{a} as:

$$\mathbf{e} = \begin{pmatrix} \cos E \\ \sin E \end{pmatrix}, \mathbf{a} = \begin{pmatrix} \cos A \\ \sin A \end{pmatrix} \quad (2.0.10)$$

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

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

$$\Rightarrow \mathbf{D} = 4 \begin{pmatrix} \cos 60^\circ \\ \sin 60^\circ \end{pmatrix} \quad (2.0.11)$$

$$\Rightarrow \mathbf{D} = \begin{pmatrix} 2 \\ 3.46 \end{pmatrix} \quad (2.0.12)$$

- For finding coordinates of \mathbf{R} :-

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

$$\Rightarrow \mathbf{R} = \begin{pmatrix} 5 \\ 0 \end{pmatrix} + 4.5 \begin{pmatrix} \cos 90^\circ \\ \sin 90^\circ \end{pmatrix} \quad (2.0.13)$$

$$\Rightarrow \mathbf{R} = \begin{pmatrix} 5 \\ 0 \end{pmatrix} + \begin{pmatrix} 0 \\ 1 \end{pmatrix} \quad (2.0.14)$$

$$\Rightarrow \mathbf{R} = \begin{pmatrix} 5 \\ 1 \end{pmatrix} \quad (2.0.15)$$

Now, the vertices of given Quadrilateral DEAR can be written as,

$$\mathbf{D} = \begin{pmatrix} 2 \\ 3.46 \end{pmatrix}, \mathbf{E} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{A} = \begin{pmatrix} 5 \\ 0 \end{pmatrix}, \mathbf{R} = \begin{pmatrix} 5 \\ 1 \end{pmatrix} \quad (2.0.16)$$

- 3) On constructing the quadrilateral DEAR we get:

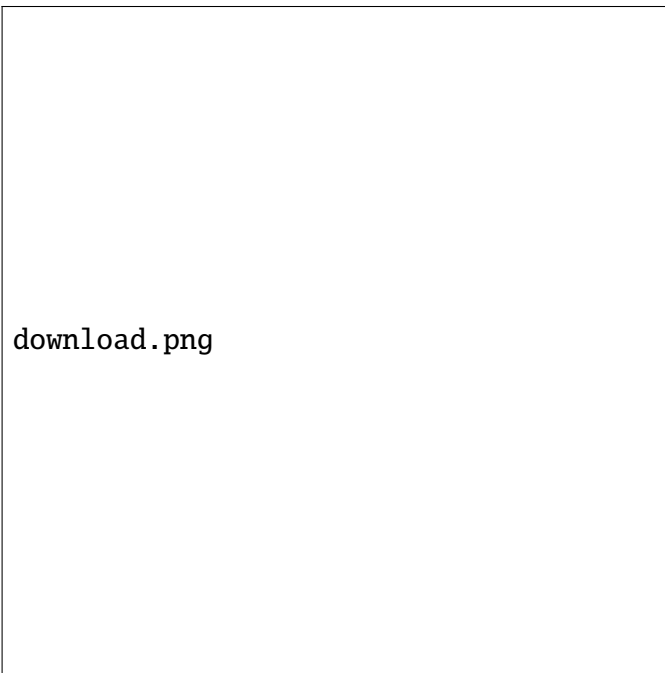


Fig. 2.1: Quadrilateral DEAR