ASSIGNMENT-2

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Download all python codes from

```
https://github.com/v.nagajyothi/Assignment−2/blob
/main/ASSIGNMENT2/assignment2.py
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and latex-tikz codes from

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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:

$$\angle E = 60^\circ = \theta \tag{2.0.1}$$
$$\angle A = 90^\circ = \alpha \tag{2.0.2}$$
$$\|\mathbf{D} - \mathbf{E}\| = 4 = a \tag{2.0.3}$$
$$\|\mathbf{E} - \mathbf{A}\| = 5 = b \tag{2.0.4}$$
$$\|\mathbf{A} - \mathbf{R}\| = 4.5 = c \tag{2.0.5}$$

- For this quadrilateral $DEAR$ we have,

$$\angle E + \angle A = 60^\circ + 90^\circ = 150^\circ \tag{2.0.6}$$

- Let,

$$\mathbf{E} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{A} = \begin{pmatrix} 5 \\ 0 \end{pmatrix} \tag{2.0.7}$$

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

$$\mathbf{D} = a\mathbf{e} \quad \left(\because \mathbf{E} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}\right) \tag{2.0.8}$$
$$\mathbf{R} = \mathbf{A} + c\mathbf{a} \tag{2.0.9}$$

Let us define e,a as:

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

- For finding coordinates of D:-

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

$$\implies \mathbf{D} = 4\begin{pmatrix} \cos 60^\circ \\ \sin 60^\circ \end{pmatrix} \tag{2.0.11}$$
$$\implies \mathbf{D} = \begin{pmatrix} 2 \\ 3.46 \end{pmatrix} \tag{2.0.12}$$

- For finding coordinates of R:-

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

$$\implies \mathbf{R} = \begin{pmatrix} 5 \\ 0 \end{pmatrix} + 4.5\begin{pmatrix} \cos 90^\circ \\ \sin 90^\circ \end{pmatrix} \tag{2.0.13}$$
$$\implies \mathbf{R} = \begin{pmatrix} 5 \\ 0 \end{pmatrix} + \begin{pmatrix} 0 \\ 1 \end{pmatrix} \tag{2.0.14}$$
$$\implies \mathbf{R} = \begin{pmatrix} 5 \\ 1 \end{pmatrix} \tag{2.0.15}$$

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

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

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

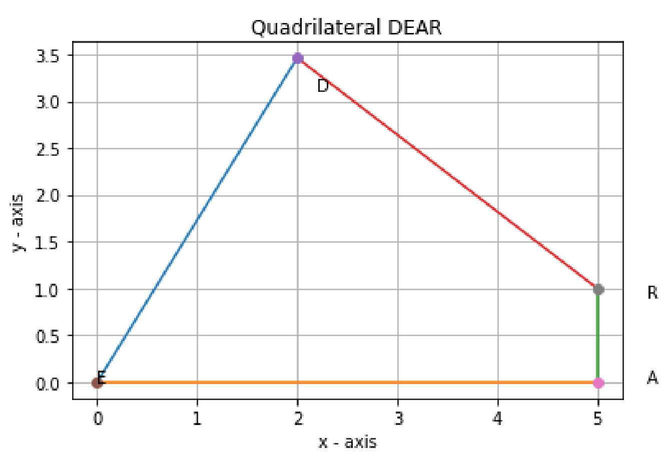

Fig. 2.1: Quadrilateral DEAR