Assignment 1

AKKASANI YAGNESH REDDY
CS21BTECH11003
ICSE 2019 11c

May 16, 2022

LaTeX

Outline

Question

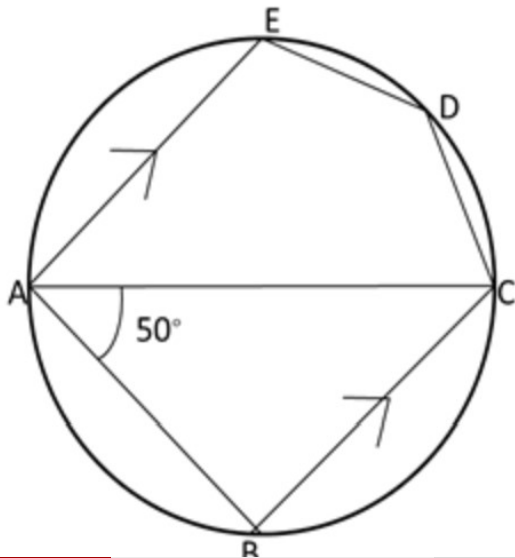### Question

In the given figure, $ABCDE$ is a pentagon inscribed in a circle such that AC is a diameter and side $BC//AE$. If $\angle BAC = 50°$, find giving reasons:

1. $\angle ACB$
2. $\angle EDC$
3. $\angle BDC$

Hence prove that BE is also a diametre.

figure

Solution

1. $\triangle ABC$, $\angle ABC = 90°$ (angle in a semicircle)

$$\angle CBA + \angle BCA + \angle CAB = 180° \qquad (1)$$
$$90° + \angle BCA + 50° = 180° \qquad (2)$$
$$\angle BCA = 40° \qquad (3)$$

Solution

2. $AE \backslash \backslash BC$

$$\angle CAE = \angle ACB = 40^\circ (pairofalternateangles) \qquad (4)$$

In cyclic quadrilateral $ACDE$

$$\angle CAE + \angle EDC = 180^\circ \qquad (5)$$

opposite angles of a cyclic quadrilateral add upto 180°

$$40^\circ + \angle EDC = 180^\circ \qquad (6)$$
$$\angle EDC = 140^\circ \qquad (7)$$

solution

③ $\angle BEC = \angle BAC = 50°$(angles in the same segment)

④ For the proof of diameter

$$\angle AEB = 90° - 50° = 50° \tag{8}$$
$$\angle EBC = 40° \tag{9}$$
$$\angle ECB = 90° \tag{10}$$

$\therefore$ BE is a diameter

steps for python plot

1. Let **O** be the origin

$$\mathbf{O} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \tag{11}$$

Draw a circle with centre at **O** and radius $r = 1$
Without losing generality lets assume AC to be along $x - axis$. This
gives points **A** and **C**.

$$\mathbf{A} = \begin{pmatrix} -1 \\ 0 \end{pmatrix} \tag{12}$$

$$\mathbf{C} = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \tag{13}$$

Plot the points A,B,O and join them.

steps for pyhton plot

2. The angle between OA and OB is $80°$. So, coordinates of **B** are

$$\mathbf{B} = \begin{pmatrix} -\cos(80°) \\ -\sin(80°) \end{pmatrix} \qquad (14)$$

Plot B.

steps for python plot

3. The angle between OC and OE is $80°$ So,cordinates of **E** are

$$\mathbf{E} = \begin{pmatrix} \cos(80°) \\ \sin(80°) \end{pmatrix} \tag{15}$$

Plot E.

steps for python plot

4. **D** can be anywhere between **E** and **C** lets plot the symmetric point then angle between OD and OC is $40°$.

$$\mathbf{D} = \begin{pmatrix} \cos(40°) \\ \sin(40°) \end{pmatrix} \tag{16}$$

Plot D.

5. Now join AB BC CD DE EA and BE.

genarated figure

The python figure obtained from following the above steps is

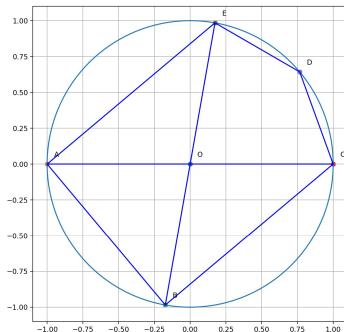Figure:

Table

The parameters required o construct the figure in python are given in the below table .

Symbol	Value	description
r	1	value of r does not change our results
θ	$40°$	$\angle EAC$,calculated
A	$\begin{pmatrix} -1 \\ 0 \end{pmatrix}$	assumed
C	$\begin{pmatrix} 1 \\ 0 \end{pmatrix}$	assumed
B	$\begin{pmatrix} -r\cos(2\theta) \\ -r\sin(2\theta) \end{pmatrix}$	calculated
E	$\begin{pmatrix} r\cos(2\theta) \\ r\sin(2\theta) \end{pmatrix}$	calculated
D	$\begin{pmatrix} r\cos(\theta) \\ r\sin(\theta) \end{pmatrix}$	calculated