

Assignment 1

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Abstract—This document contains the solution for Assignment 1 (ICSE Class 10 Maths 2019 Q.8(C))

8(C) [ICSE 10 2019]: Using a ruler and a compass only construct a semicircle with diameter $BC=7\text{cm}$. Locate a point A on the circumference on the semicircle such that A is equidistant from B and C . Complete the cyclic quadrilateral $ABCD$, such that D is equidistant from AB and BC . Measure $\angle ADC$ and write it down.

Solution:

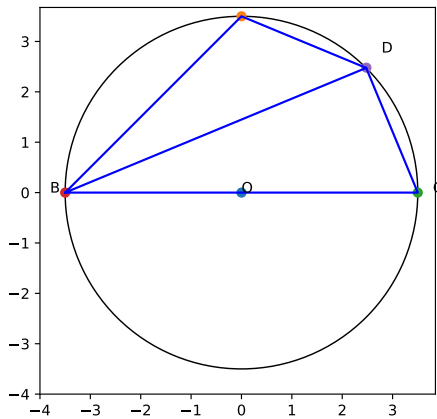


Fig. 1: figure shows the cyclic quadrilateral inscribed in the circle

Let O be the centre of the semicircle.

The diameter of the given semicircle is $BC=7\text{cm}$.

It's radius " r " = $\frac{7}{2}\text{cm} = 3.5\text{cm}$.

Clearly, A must lie on the perpendicular bisector of BC , as it is equidistant from B and C .

Construction: Join AD .

$\therefore D$ is equidistant from AB and $BC \implies D$ lies on the angular bisector of $\angle ABC$.

Now, by using basic geometry, we can write,

$$\angle BAC = 90^\circ$$

(1)

(Angle in a semicircle is 90°)

Also $AB=AC$ (Given)

$$\implies \angle ABC = \angle ACB = x(\text{say}) \quad (2)$$

The sum of angles in a triangle is 180° .

$$\implies \angle ABC + \angle ACB + \angle BCA = 180^\circ. \quad (3)$$

Equations (1) and (2),

$$\implies x + x + 90^\circ = 180^\circ \quad (4)$$

$$\implies 2x + 90^\circ = 180^\circ \quad (5)$$

$$\implies 2x = 180^\circ - 90^\circ \quad (6)$$

$$\implies 2x = 90^\circ \quad (7)$$

$$\implies x = 45^\circ \quad (8)$$

The input and output parameters required for drawing the figure are available in the below table.

Variable	Value	Input/Output
r	3.5	Input
$\angle BAC = \theta$	90°	Input
$\angle ABC$	$\frac{180 - \theta}{2} = 45^\circ$	Calculated
$\angle DBC$	$\frac{180 - \theta}{4} = 22.5^\circ$	Calculated
O	0	Input
A	$\begin{pmatrix} 0 \\ 3.5 \end{pmatrix}$	Input
B	$\begin{pmatrix} -3.5 \\ 0 \end{pmatrix}$	Input
C	$\begin{pmatrix} 3.5 \\ 0 \end{pmatrix}$	Input
D	$\begin{pmatrix} 2r \cos \frac{180 - \theta^\circ}{4} \\ 2r \sin \frac{180 - \theta^\circ}{4} \end{pmatrix}$	Output

We know that the opposite angles in a cyclic quadrilateral are supplementary.

$$\implies \angle ABC + \angle ADC = 180^\circ \quad (9)$$

Equation (8),

$$\implies 45^\circ + \angle ADC = 180^\circ \quad (10)$$

$$\implies \angle ADC = 135^\circ \quad (11)$$

\therefore The measure of $\angle ADC$ is 135°