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=7cm. 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.

<u>Solution:</u>

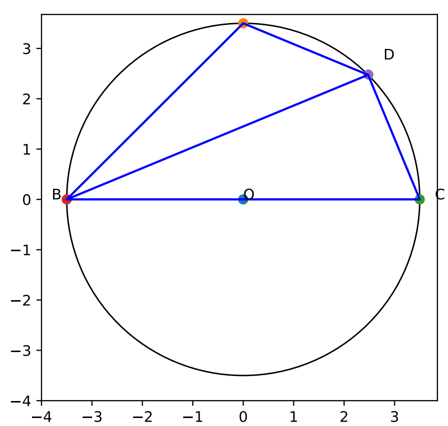

Fig. 1: figure shows the cyclic quadrilateral inscribed in the circle

Let O be the centre of the semicircle.

The diameter of the given semicircle is BC=7cm.
$\implies$ It's radius "r"= $\dfrac{7}{2}cm = 3.5cm.$

Clearly, A must lie on the perpendicular bisector of BC, as it is equidistant from B and C.
Construction: Join AD.
$\because$ 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,

$$\measuredangle BAC = 90^\circ \tag{1}$$

(Angle in a semicircle is 90°)

Also AB=AC (Given)

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

The sum of angles in a triangle is 180°.

$$\implies \angle ABC + \angle ACB + \angle BCA = 180^\circ. \tag{3}$$

Equations (1) and (2),

$$\implies x + x + 90^\circ = 180^\circ \tag{4}$$
$$\implies 2x + 90^\circ = 180^\circ \tag{5}$$
$$\implies 2x = 180^\circ - 90^\circ \tag{6}$$
$$\implies 2x = 90^\circ \tag{7}$$
$$\implies x = 45^\circ \tag{8}$$

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

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

$$\implies \angle ABC + \angle ADC = 180^\circ \tag{9}$$

Equation (8),

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

$$\implies 45° + \angle ADC = 180° \tag{10}$$

$$\implies \angle ADC = 135° \tag{11}$$

$\therefore$ $\boxed{\text{The measure of } \angle ADC \text{ is } 135°}$