# 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.

**Solution:**

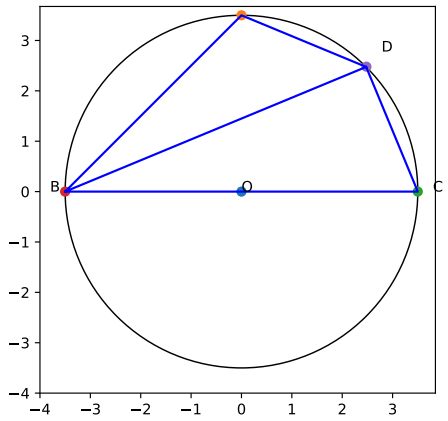


Fig. 1: figure shows the cyclic quadrilateral inscribed in the circle

Let O be the centre of the semicircle.
The diameter of the given semicircle is BC=7cm.
It's radius "r"= $\frac{7}{2}cm$ =3.5$cm$.
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 (**??**) and (),

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

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

| Variable | Value | Input/Output |
|---|---|---|
| $r$ | 3.5 | Input |
| $\angle BAC = \theta$ | $90^\circ$ | 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.

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

Equation (8),

$$\implies 45^\circ + \angle ADC = 180^\circ \tag{10}$$
$$\implies \angle ADC = 135^\circ \tag{11}$$

$\therefore$ The measure of $\angle ADC$ is $135^\circ$