

Assignment 1

AI1110: Probability and Random Variables

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29 March 2022

ICSE 2019 Class 10

Question 8(c) 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

$$\angle ACD$$

and write it down.

Solution.

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 AB and AC .

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

$$\angle ABC$$

Now, by using basic geometry, we can write,

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

(Angle in a semicircle is 90°)

Also $AB=AC$ (Given)
 $\implies \angle ABC = \angle ACB = x(\text{say})$

The sum of angles in a triangle is 180° .

$$\begin{aligned} \implies \angle ABC + \angle ACB + \angle BCA &= 180^\circ. \\ \implies 2x + 90^\circ &= 180^\circ \\ \implies 2x &= 90^\circ \\ \implies x &= 45^\circ \end{aligned}$$

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

$$\begin{aligned} \implies \angle ABC + \angle ADC &= 180^\circ \\ \implies 45^\circ + \angle ADC &= 180^\circ \\ \implies \angle ADC &= 135^\circ \end{aligned}$$