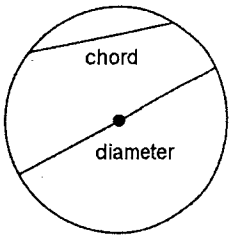
Grade 9 Math
Unit 7 – Circle Geometry

7.2 – Properties of Chords in a Circle

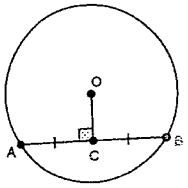
A line segment that joins two points on a circle is called a **chord**.

A chord that goes through the **centre** of a circle is called the **diameter**.

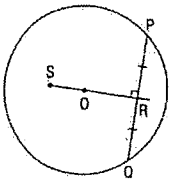


Chord Properties

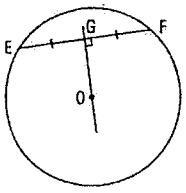
Property 1: The **perpendicular** from the **centre** of a circle to a **chord** bisects the chord. This means that the perpendicular divides the chord into two **equal** parts.



Property 2: The perpendicular **bisector** of a chord in a circle passes through the **centre** of the circle.



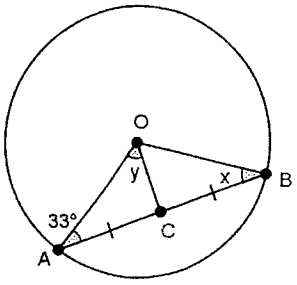
Property 3: A line that joins the **centre** of a circle and the **midpoint** of a chord is **perpendicular** to the chord.



Ex. 1 Point O is the centre of the circle, and the line segment OC bisects chord AB. $\angle OAC = 33°$. Determine the values of $x°$ and $y°$.

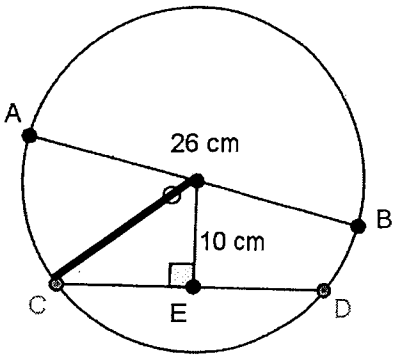
Answer:

Since AC = BC, OC bisects the chord AB.
Therefore, OC must be perpendicular to AB, and $\angle ACO = 90^0$.
Since OA and OB are both radii, they are equal, which makes this an isosceles triangle. Therefore, $\angle OAB = \angle OBC = 33^0$.
Therefore, $x° = 33^0$.



To find $y°$, all angles in ΔAOC add up to 180°.
$180 - 90 - 33 = 57°$
Therefore, $y° = 33°$

Ex. 2 Point O is the centre of a circle.
AB is a diameter with length 26 cm.
CD is a chord that is 10 cm from the centre of the circle.
What is the length of chord CD?

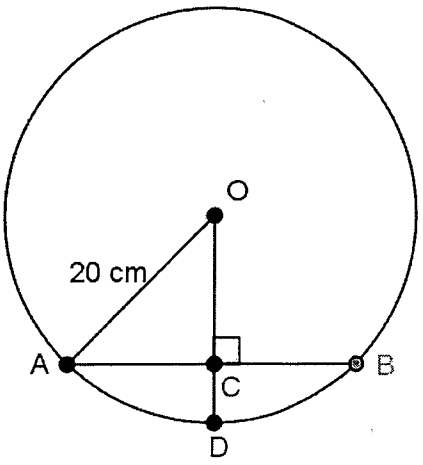


Answer: **AB is the diameter, so AO is the radius, which will be equal to OC.**
AO = OC = 13 cm.

Use Pythagorean's Theorem to find CE.
$x^2 + 10^2 = 13^2$
$x^2 = 169 - 100$
$x^2 = 69$
$x = \sqrt{69} = 8.3$ cm

CE = ED so CD = 2(8.3) = 16.6 cm

Ex. 3 A horizontal pipe has a circular cross section, with centre O. Its radius is 20 cm.
Water fills less than one-half of the pipe.
The surface of the water AB is 24 cm wide.
Determine the maximum depth of the water, which is the depth CD.



Answer: **CD = OD – OC**

Since OC is perpendicular to AB, it cuts AB in half, therefore, AC = ½ (24) = 12 cm

Use Pythagorean's Theorem to find OC:
$x^2 + 12^2 = 20^2$
$x^2 = 400 - 144$
$x^2 = 256$
$x = \sqrt{256} = 16$ cm

20 cm – 16 cm = 4 cm **Therefore, the water is 4 cm deep.**

Assignment	**Do #3 – 7, 10, 11, 14, 15, 17 p. 397**