General directions for students: whatever be the notes provided, everything must be copied in the Maths copy and then do the HOME WORK in the same copy.

Circle : A circle is the locus of a point which moves in a plane in such a way that its distance from a given fixed point is always constant.

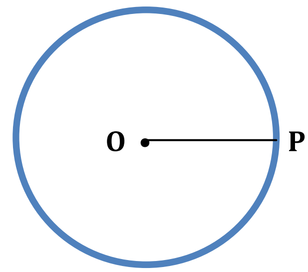
The fixed point is called the centre.

The constant distant is called the radius of the circle.

A circle with centre O and radius r is denoted by $C(O, r)$.

The radius of the circle is always positive.

All radii of a circle are equal.



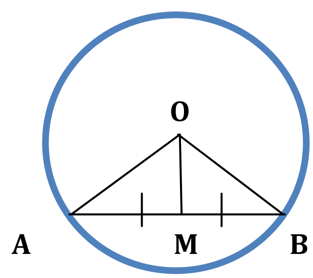
Theorem 15.1

Statement : The straight line drawn from the centre of a circle to bisect a chord, which is not a diameter, is perpendicular to the chord.

Given : M is the mid point of the chord AB of a circle.

To prove : $OM \perp AB$

Construction: we join OA and OB.



Proof : In ΔOAM and ΔOBM,

$OA = OB$ (Radii)

$OM = OM$ (Common)

$AM = BM$ (given)

$\Delta OAM \cong \Delta OBM$ (SSS congruence Rule)

$\therefore \angle OMA = \angle OMB$ (CPCT) …………..(i)

$\angle OMA + \angle OMB = 180°$

$\Rightarrow \angle OMA + \angle OMA = 180°$ Using (i)

$\Rightarrow 2\angle OMA = 180°$

$\Rightarrow \quad \angle OMA = 90°$

$\therefore \quad OM \perp AB$ **Proved.**

....

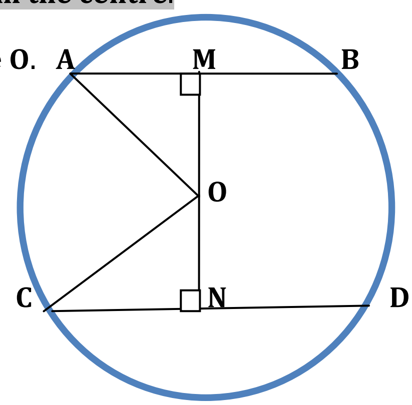
Theorem 15.2 (Converse of theorem 15.1)

Statement : The perpendicular to a chord from the centre of the circle bisects the chord.

....

Theorem 15.3

Statement : Equal chords of a circle are equidistant from the centre.



Given : AB and CD are two chords of a circle with centre O.

and AB = CD

To Prove : OM = ON

Contruction : we join OA and OC

Proof :: In Δ OAM and Δ OCN ,

$OA = OC$ **(Radii)**

$AM = CN$ $\left(AB = CD \Rightarrow \frac{1}{2} AB = \frac{1}{2} CD \Rightarrow AM = CN \right)$

$\angle OMA = \angle OMB$ **(OM $\perp$ AB and ON $\perp$ CD)**

$\Delta OAM \cong \Delta OCN$ **(RHS congruence Rule)**

$\therefore \quad OM = ON$ **(CPCT)** **Proved**

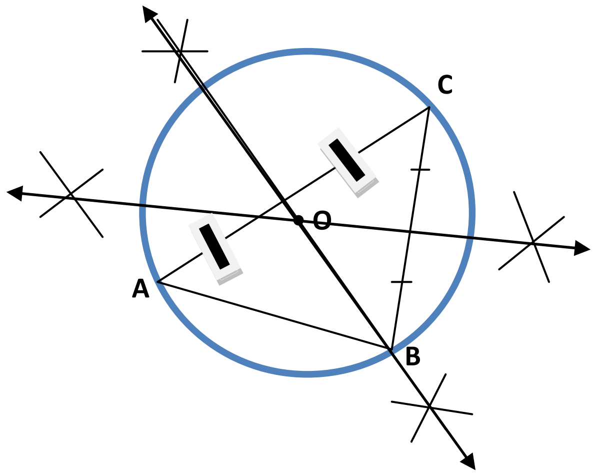
....

Theorem 15.4 (Converse of theorem 15.3)

Statement : Chords of a circle that are equidistant from the centre of the circle are equal

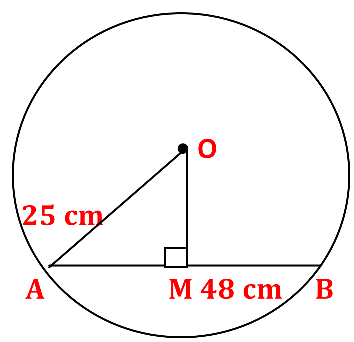
Theorem 15.5

Statement : There is one and only one circle passing through three given non – collinear points



Exercise – 15.1

2. A chord of length 48 cm is drawn in a circle of radius 25 cm. calculate its distance from the centre of the circle.



Solution: Chord $AB = 48$ cm, Radius $OA = 25$ cm

From O, draw $OM \perp AB$

$\because OM \perp AB \quad \therefore$ AB is bisected at M

$\therefore \quad AM = \frac{1}{2}AB = \frac{1}{2} \times 48 = 24$ cm

In ΔOAM, $\angle OMA = 90°$

$OA^2 = OM^2 + AM^2$ [By Pythagoras Theorem]

$\Rightarrow \quad 25^2 = OM^2 + 24^2$

$\Rightarrow \quad OM^2 = 625 - 576 = 49$

$\Rightarrow \quad OM = \sqrt{49} = 7$ cm Ans.

6. In a circle of radius 5 cm, AB and CD are two parallel chords of length 8 cm and 6 cm respectively. calculate the distance between the chords, if they are on

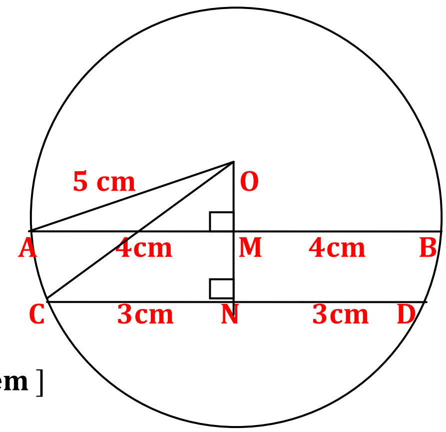
(i) the same side of the circle (ii) the opposite sides of the centre

Solution: (i) The same side of the circle.

Chord AB = 8 cm, chord CD = 6 cm and radius = 5 cm

From O, draw $OM \perp AB$ and $ON \perp CD$

$\therefore$ AB and CD is bisected at M and N respectively.



In Δ OAM, $\angle OMA = 90°$

$OA^2 = OM^2 + AM^2$ [By Pythagoras Theorem]

$\Rightarrow \quad 5^2 = OM^2 + 4^2$ [Radius OA = 5 cm and $AM = \frac{1}{2}AB = \frac{1}{2} \times 8 = 4$ cm]

$\Rightarrow \quad OM^2 = 25 - 16 = 9$

$\Rightarrow \quad OM = \sqrt{9} = 3$ cm

In Δ OCN, $\angle ONC = 90°$ radius OC = 5 cm

$OC^2 = ON^2 + CN^2$ [By Pythagoras Theorem]

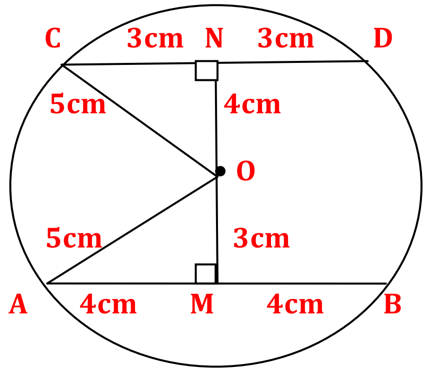
$\Rightarrow \quad 5^2 = ON^2 + 3^2$ [Radius OC = 5 cm and $CN = \frac{1}{2}CD = \frac{1}{2} \times 6 = 3$cm]

$\Rightarrow \quad OM^2 = 25 - 9 = 16$

$\Rightarrow \quad OM = \sqrt{16} = 4$ cm

$MN = ON - OM = 4 - 3 = 1$ cm Ans.

(ii) The opposite sides of the centre



$MN = OM + ON$

$= 4 + 3 = 7$ cm Ans.

HOMEWORK

EXERCISE 15.1

QUESTION NUMBERS: $\mathbf{3,\ 5,\ 7(a),(b)}$ **and** $\mathbf{8}$

****