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Ch = 10

Circles

Ex - 10.1

Q:1: Fill in the blanks-

(i) The centre of a circle lies in the interior of the circle.

(ii) A point, whose distance from the centre of a circle is greater than its radius lies in exterior of the circle.

(iii) The longest chord of a circle is a diameter of the circle.

(iv) An arc is semicircle when its ends are the ends of a diameter.

(v) Segment of a circle is the region between the arc and chord of the circle

(vi) A circle divides the plane, on which it lies, in 3(three) parts

Q:2: True/False -

(i) Line segment joining the centre to any point on the circle is a radius of the circle.

Ans: True. Any line segment drawn from the centre of the circle to any point on it, is radius of circle and will be equal of length.

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(ii) A circle has only finite of equal chord.

Ans→ False. There can be finite no. of equal chord of a circle.

(iii) If a circle is divided into three equal arcs, each is a major arc.

Ans→ False. for unequal arc, there can be major or minor arc so equal arc cannot be said as major or minor.

(iv) A chord of a circle, which is twice as long as its radius, is a diameter of the circle. called the

Ans→ True Any chord whose length is twice as long as the radius of the circle, always passes through centre.

(v) Sector is a region between the chord and its corresponding arc.

Ans→ False A sector is a region of circle between the arc and the 2 radii of circle.

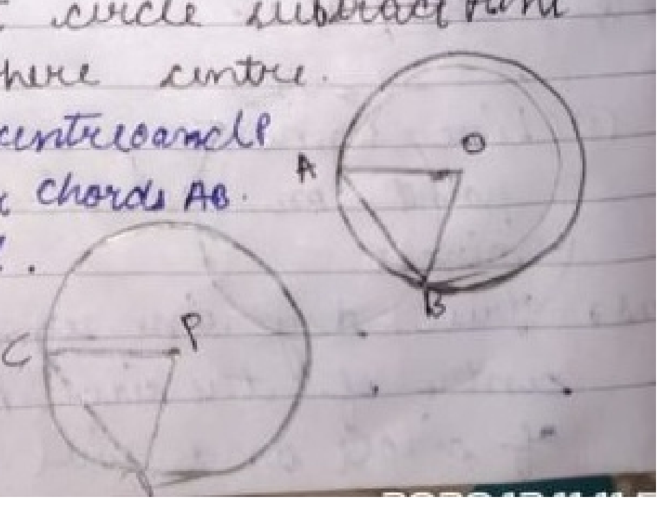
(vi) A circle is a plane figure.

Ans→ True. A circle is a 2d fig and it can be drawn on plane surface.

Ex.→ 10.2.

Q: 1. Recall that two circles are congruent, if they have the same radii, prove that equal chords of congruent circle subtract tant equal angles at there centre.

Ans→ Given→ Two circles with centre O and P are congruent. Their chords AB and CD are equal.



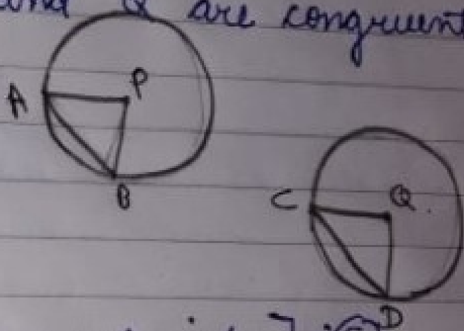
To prove: $\angle AOB = \angle CPD$.

Solution: In ΔAOB and ΔCPD.

$AO = CP$
$OB = PD$. [circles are congruent therefore radii are equal] - (S) - (S)
$AB = CD$ [Given] - (S).
$\because \Delta AOB \cong \Delta CPD$ [S.S.S]
$\therefore \angle AOB = \angle CPD$

Q:2: Prove that, if chords of congruent circle subtant equal angles at their centre, then the chords are equal.

Given: Two circles with centre P and Q are congruent
$\angle APB = \angle CQD$.



To prove: $AB = CD$

Solution In ΔAPB and ΔCQD.

$AP = CQ$ [Radii of congruent circles] - (S)
$\angle APB = \angle CQD$ [Given] - (A)
$PB = QD$ [Radii of congruent circle] - (S)
$\because \Delta APB \cong \Delta CQD$ [S.A.S]
$\therefore AB = CD$.

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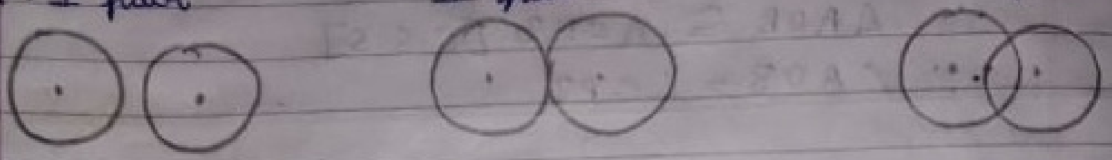
Exercise = 10.3

Q:1 Draw different pair of circles. How many points does each pair have in common? What is the maximum no. of common points?

Solution: I pair   II pair   III pair.

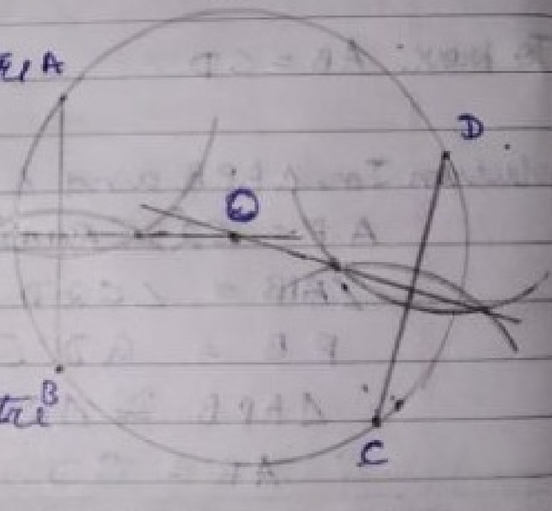


0 common points   1 common point   2 common points

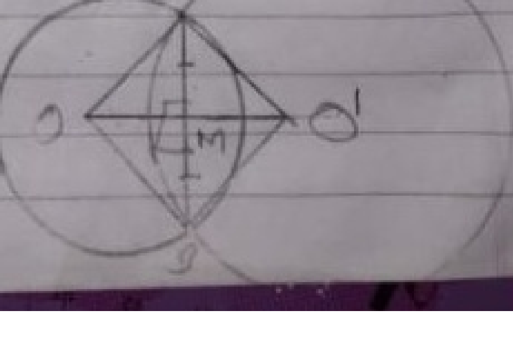
Q:2 Construction suppose you are given a circle. Give a construction to find its centre.

Construction to find centre of a circle -

1. Draw two equal chords.
2. Draw their perpendicular bisector.
3. The point on which they intersect will be the centre of the circle.



Q:3 If two circles intersect at two points, prove that their centre lie on the bisector of common chord.



Given: AB is a common chord of 2 circles

To prove → $\angle AMO = \angle BMO = 90^\circ$

$AM = BM$.

Construction: Join OA and OB. [Joining the radius of both circle]
Join O'A and O'B.

Proof: In $\Delta AOO'$ and $\Delta BOO'$

$OA = OB$ [radius of I^{st} circle]

$O'A = O'B$ [radius of 2^{nd} circle].

$OO' = OO'$ [common].

$\Delta AOO' \cong \Delta BOO'$ [SSS].

$\angle AOO' = \angle BOO'$ [By CPCT].

In ΔAMO and BMO.

$OA = OB$. [radius of circle].

$OM = OM$ [Common]

$\angle AOM = \angle BOM$ [$\angle AOO' = \angle BOO'$].

$\Delta AMO \cong \Delta BMO$ [SAS]

$\boxed{AM = BM \text{ [CPCT]}}$.

$\angle AMO = \angle BMO$ [CPCT]

$\angle AMO + \angle BMO = 180°$ [AB is line]

$\angle BMO + \angle BMO = 180°$. $\Rightarrow$ ~~$2\angle 1$~~

$= \cancel{2}\angle BMO = \cancel{180}\ 90°$

$\angle BMO = \angle AMO$.

$\boxed{\angle BMO = \angle AMO = 90°}$.

Exercise = 10.4.

Q1:- Two circles of radii 5 cm and 3 cm intersect at two points and the distance between their centres is 4 cm. Find the length of the common chord.

solution In OAO'

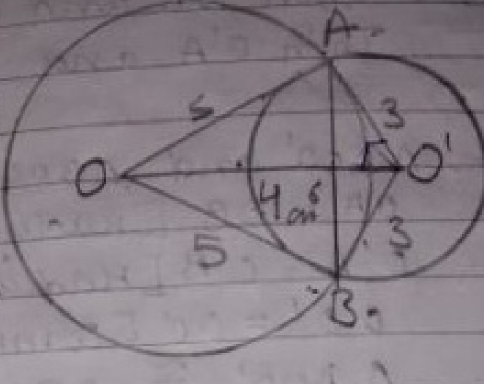
$OA^2 = (5)^2 = 25$ cm.

$(OO')^2 + (AO')^2 = (4)^2 + (3)^2$

$= 16 + 9 = 25.$

By pytha theorem

$\angle AO'O = 90°$ — (I)



In OBO'

$OB^2 = (5)^2 = 25$ cm.

$(OO')^2 + (BO') = (4)^2 + (3)^2$.

$= 16 + 9 = 25$ cm

$OB^2 = (OO')^2 + (BO')^2$

$\angle BO'O = 90°$ [phyta. theorm] — (II)

adding eq. (I) and (II)

$\angle AO'O + \angle BO'O = 180°$

$90 + 90 = 180°$

$\angle AO'B = 180°$

$AO'B$ will be a straight line.

$AB = O'A + O'B$

$= 3 + 3 = 6$ cm.

$\boxed{AB = 6 \text{ cm}}$

Q:2: If two chords of a circle intersect within the circle, prove that the segments of one chord are equal to corresponding segments of the other chords.

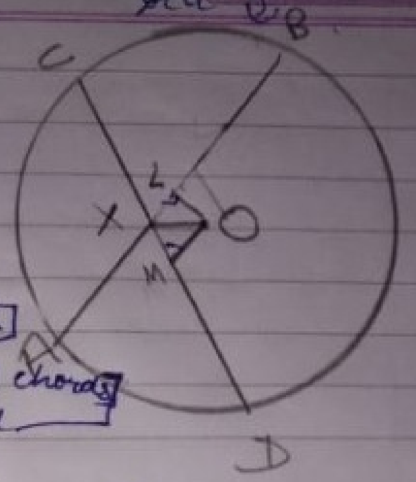
Given: $AB = CD$, and intersect at X.

To prove $= BX = DX$, $CX = AX$.

Rough area

Construction: Draw $OL \perp AB$

$OM \perp CD$.



Proof: In ΔOLX and ΔOMX.

R $\angle OLX = \angle OMX$ [90°].

H $OX = OX$ [Common]

S. $OL = OM$ [⊥ on equal chords are equal]

$\Delta OLX \cong \Delta OMX$ [RHS].

$LX = MX$ [CPCT]. - ①

$AB = CD$. [Given).

$\frac{1}{2} AB = \frac{1}{2} CD$.

$BL = MD$. [Perpendicular from centre bisects the chord] ②

Adding eq. ① and ②.

$$\begin{array}{r} LX = MX \\ + \; BL = MD \\ \hline \boxed{BX = DX} \end{array}$$ Add

$$\begin{array}{r} AB = CD \\ - \; BX = DX \\ \hline \boxed{AX = CX} \end{array}$$

$\boxed{AX = CX}$

Q.3. If two equal chords of a circle intersect within the circle, prove that the joining the points of intersection to the centre makes point equal angles with chords.

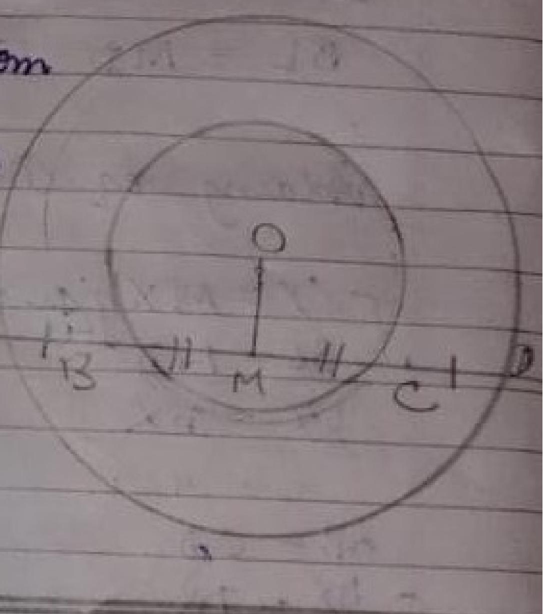
Given: AB = CD chords intersects at X.
To prove: $\angle OXL = \angle OXM$
Construction: $OL \perp AB$. $OM \perp CD$.
Proof → In $\triangle OLX$ and $\triangle OMX$
$\angle OLX = \angle OMX$ [90°]. R
OX = OX [common]. H
OL = OM [equal chords are equidistance from centre]. S
$\triangle OLX \cong \triangle OMX$ [RHS]
$\angle OXL = \angle OXM$ [CPCT]

Q.4. If a line intersect two concentric circles with centre O at A, B, C, D, prove AB = CD.

Construction → $OM \perp AD$.

BM = CM [Perpendicular from centre bisector the chord] - (I)

AM = DM - (II) ["] [10.3 theo.]



subtracting eq. (I) from (II).

AM = DM
- BM = CM
AB = CD.

5. Three girls Reshman, Salma and Mandip are playing a game by standing on a circle of radius 5 m drawn in a park. Reshma throws a ball to Salma, Salma to Mandip, Mandip to Reshma. If the distance between Reshma and

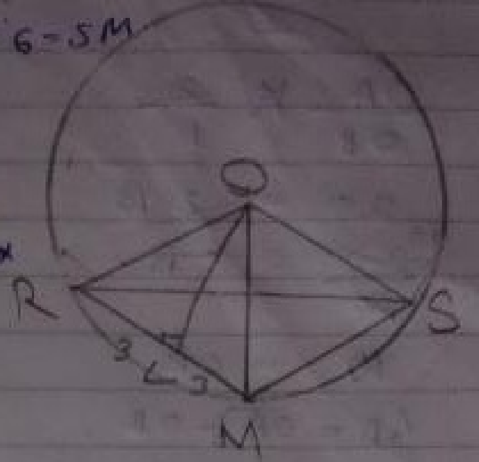
Salma and between Salma and Mandip is 6 m each. What is distance between Reshma and Mandip?

Given = $OR = OM = OS = 5m$. $RS = 6-SM$

Find = RM.

Const. → $OL \perp RS$.

Solution → $R = 6$. $RL = 3$ [⊥ from centre bisector the chord



In △OLR

$OR^2 = RL^2 + OL^2$

$5^2 = 3^2 + OL^2$

$25 = 9 + OL^2$

$25 - 9 = OL^2$

$\sqrt{16} = \sqrt{OL^2} = 4$.

$OL = 4$.

ar of ORS $= \frac{1}{2} \times B \times P$

$= \frac{1}{2} \times 6 \times 4 = \frac{1}{2} \times 5 \times RN$

$\frac{24}{5} = RN = 4.8\ m$.

$RN = MN$.

$RM = ~~4.8m~~ RN + MN$

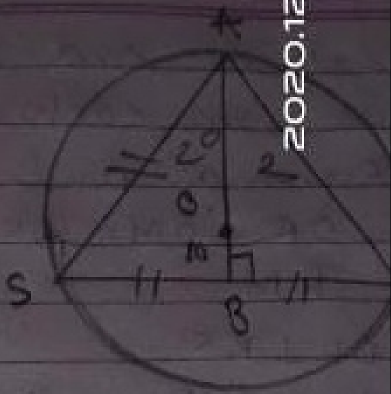
$RM = 4.8 + 4.8 = 9.6\ m$

Q:6. A circular park of radius 20 m is situated in a colony. Three boys Ankur, Syed and David are sitting at equal distance on its boundary each having a toys telephone in his hands to talk each other. Find the length of the strings of each phone.

Solution: $AS = SD.$

$AS = 2BS.$

$\frac{AS}{2} = BS. \quad — (1).$



$\frac{OA}{OB} = \frac{2}{1}$

$2O = 2OB$

$\frac{\cancel{20}^{10}}{\cancel{2}} = OB.$

$10 = OB.$

$AB = OA + OB.$

$= 20 + 10 = 30.$

$AB = 30.$

By phythag. theorm.

ΔABS

$AS^2 = AB^2 + BS^2.$

$= (30)^2 + \left(\frac{AS}{2}\right)^2$

$AS^2 = 900 + \frac{AS^2}{4}$

$AS^2 = \frac{3600 + AS^2}{4}$

$4AS^2 = 3600 + AS^2.$

$4AS^2 - AS^2 = 3600.$

$3AS^2 = 3600.$

$AS^2 = \frac{\cancel{3600}}{\cancel{3}} 1200.$

$\sqrt{AS^2} = \sqrt{1200} = 20\sqrt{3}.$

Ans $= \cancel{\sqrt{20}3}\ m\ 20\sqrt{3}.$