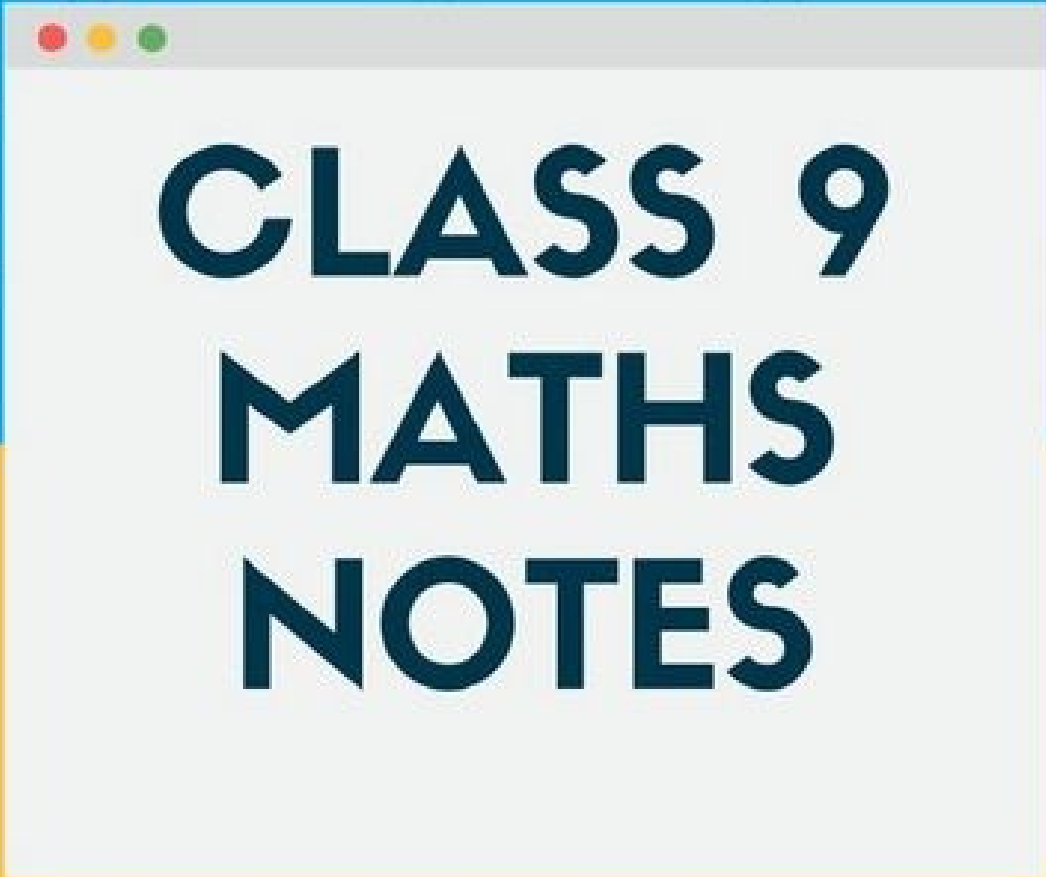


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CLASS 9 MATHS NOTES

CIRCLES

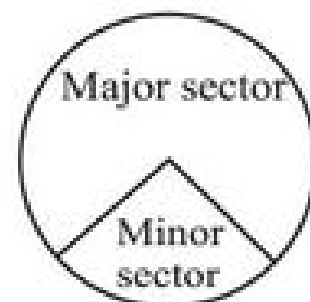
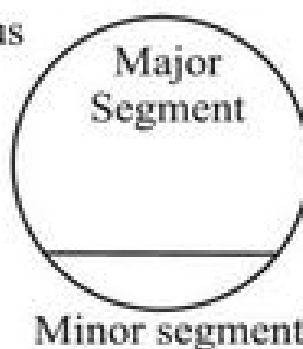
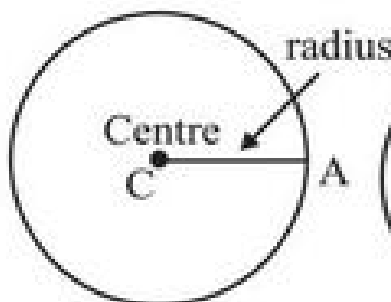
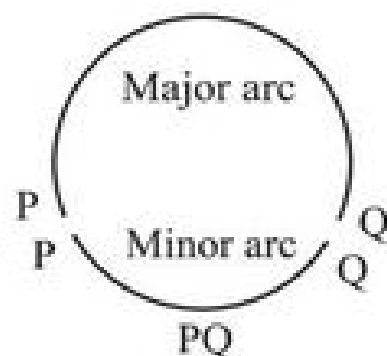
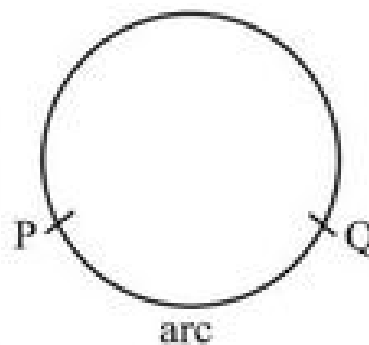
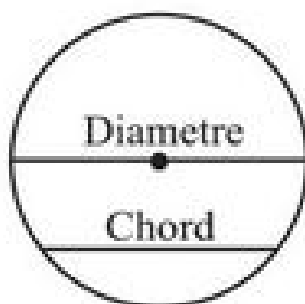
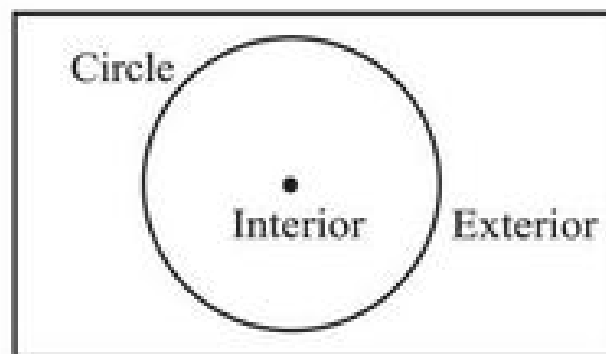
CHAPTER-10

CIRCLES

KEY POINTS

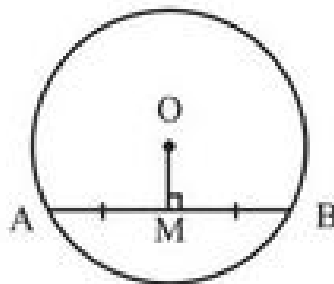
- The collection of those points in a plane which are at a fixed distance from a given fixed point is called a circle. That fixed point is called centre of the circle and that fixed distance is called radius.

Circle and related Terms !

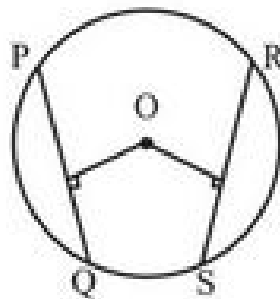


- There is one and only one circle passing through three non-collinear points.
- Equal chords of a circle subtends equal angles at centre.
- If angles subtended by chords at centre are equal then chords are equal.
- The perpendicular from centre to a chord of a circle, bisects the chord.

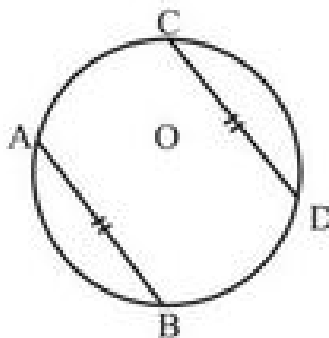
- The line joining the centre of a circle to the mid point of a chord is perpendicular to the chord.



- Equal chords of a circle are equidistant from centre.
- Chords equidistant from centre are equal in length.

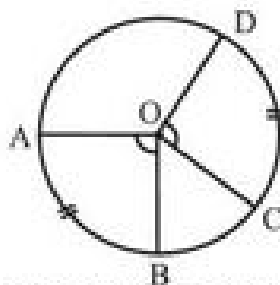


- If two chords of a circle are equal then corresponding arcs are equal.
- If arcs of a circle are equal then corresponding chord are also equal.



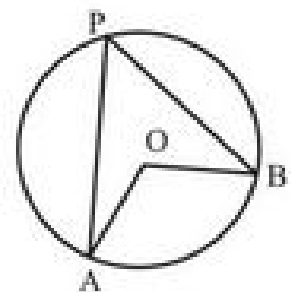
- Congruent arcs (or equal arcs) of a circle subtends equal angle at centre.

$$\Rightarrow \angle AOB = \angle COD$$



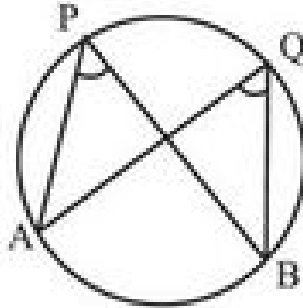
- The angle subtend by an arc at the centre of circle is twice the angle which is subtend at remaining part of the circle.

$$\Rightarrow \angle AOB = 2\angle APB$$



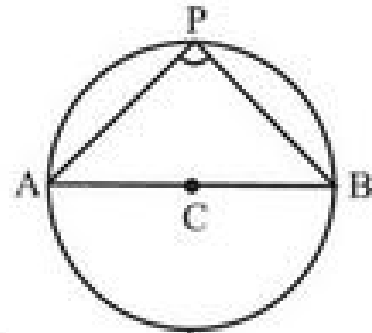
- Any two angles in the same segment of the circle are equal.

$$\Rightarrow \boxed{\angle APB = \angle AQB}$$



- Angle of semi circle is right angle.

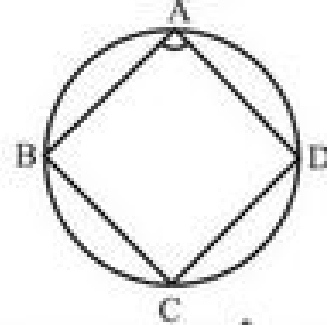
$$\Rightarrow \boxed{\angle APB = 90^\circ}$$



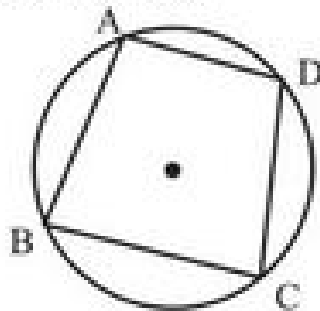
- In a cyclic quadrilateral the sum of opposite angles is 180° .

$$\Rightarrow \boxed{\angle A + \angle C = 180^\circ}$$

$$\Rightarrow \boxed{\angle B + \angle D = 180^\circ}$$



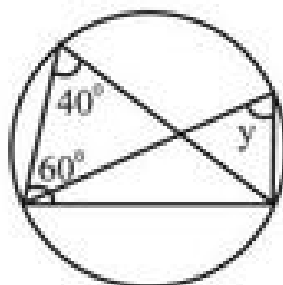
- If sum of opposite angles of a quadrilateral is 180° then that quadrilateral is cyclic quadrilateral.



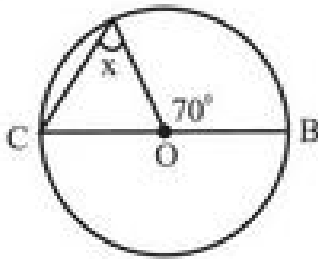
Important
Questions
with
Solutions

Part – A

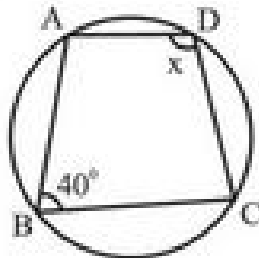
1. If the sum of a pair of opposite angles of a quadrilateral is 180° , then quadrilateral is _____.
2. A round pizza is cut into 4 equal pieces. What does each piece represent?
3. AD is a diameter of a circle and AB is a chord if AD = 34cm, AB=30 cm then find the distance of AB from the centre of chord.
4. Given two concentric circles with centre O. A line cut the circle at A, B, C and D respectively. If AB = 10cm, then find the length of CD.
5. Find y in given figure



6. Find x



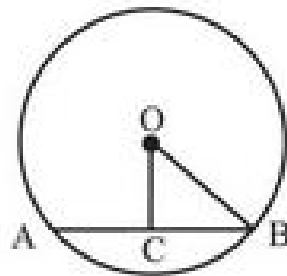
7. Find x



8. Diameter is the _____ Chord of a circle.

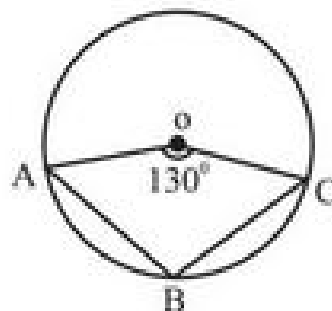
9. Circle having the same centre and different radii are called _____ circles.

10. In given figure OC is perpendicular segment drawn from centre O on chord AB. If $OB = 5\text{cm}$, and $OC = 3\text{cm}$ then find length of AB.

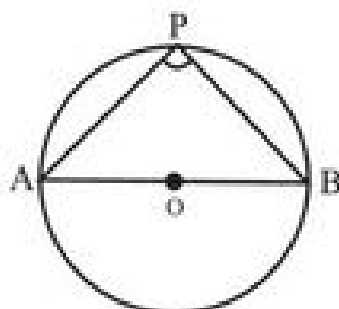


11. In given figure O is centre of circle.

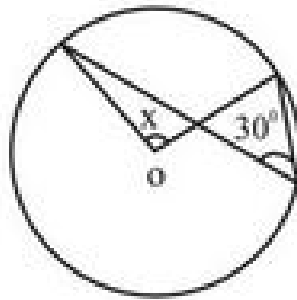
If $\angle AOC = 130^\circ$ then find $\angle ABC$



12. In given figure AOB is diameter of circle & P is any point on the circle. Find $\angle APB$.

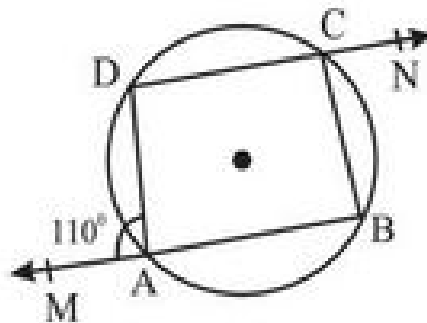


13. Find the value of x in given figure.

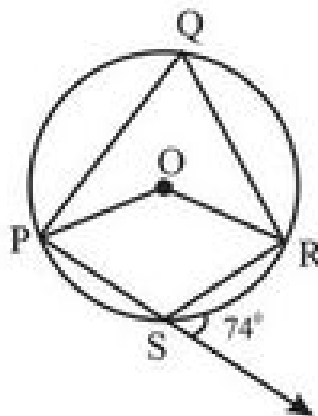


Part – B

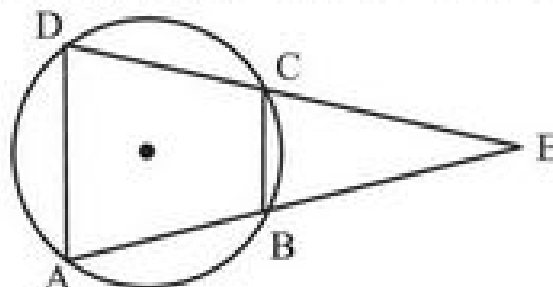
14. Prove that cyclic parallelogram is a rectangle.
15. A chord of a circle is equal to the radius of the circle. Find the angle subtended by the chord at a point on the minor arc and also at a point on the major arc.
16. In the following figure. Find the value of $\angle BCN$.



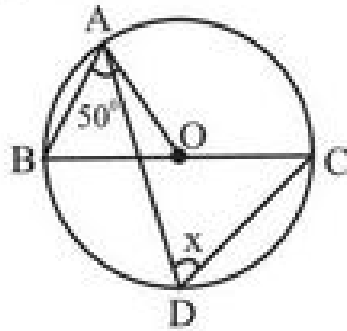
17. In the given figure. Find the value of reflex angle POR.



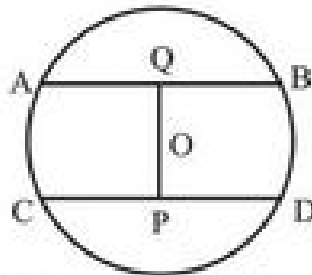
18. In given figure ABCD is a cyclic quadrilateral, chords AB and CD are produced to meet E, show that $EA \times EB = EC \times ED$.



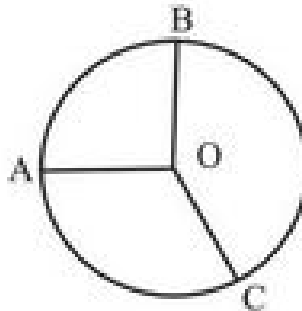
19. Find the value of x in figure if O is centre of circle and $\angle OAB = 50^\circ$.



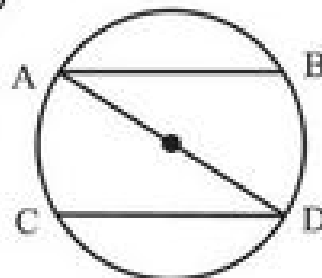
20. In the given figure, O is centre of the circle with radius 5 cm, $OP \perp CD$, $OQ \perp AB$, $AB \parallel CD$, $AB = 6$ cm and $CD = 8$ cm. Determine PQ .



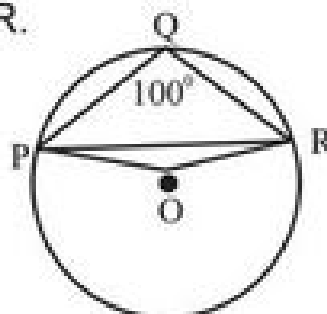
21. In the given figure, O is the centre of a circle, $\angle AOB = 90^\circ$, $\angle BOC = 120^\circ$, what is measure of $\angle ABC$?



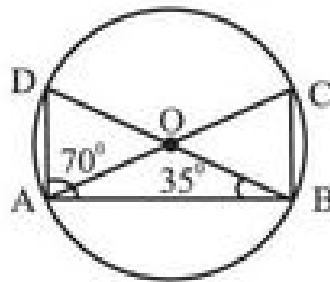
22. In the given figure AB and CD are parallel chords if the length of arc $AC = 14$ cm. What is length of BD ?



23. In given figure $\angle PQR = 100^\circ$ where P, Q & R are points on the circle with centre O . Find $\angle OPR$.

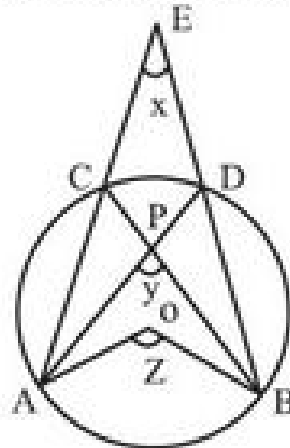


24. In the given figure O is centre of circle, if $\angle ABD = 35^\circ$ and $\angle BAD = 70^\circ$ find $\angle ACB$.



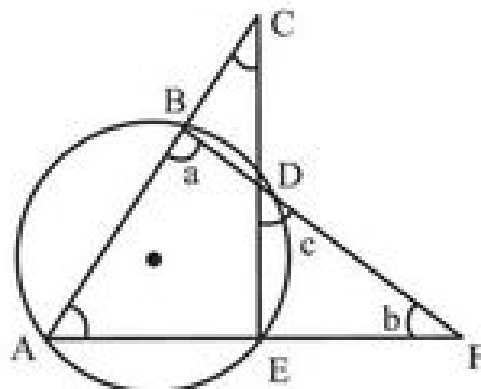
Part – C

25. In the given figure, O is the centre of a circle prove that $\angle x + \angle y = \angle z$.

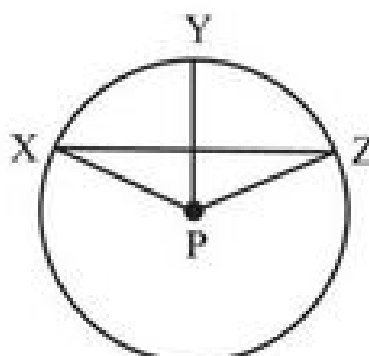


26. If two non parallel sides of a trapezium are equal prove that it is cyclic quadrilateral.

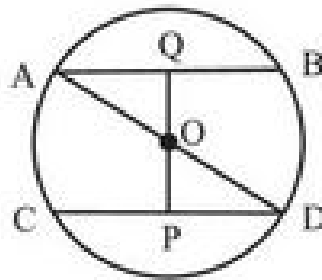
27. In the given figure determine a, b & c if $\angle BCD = 43^\circ$, $\angle BAF = 62^\circ$.



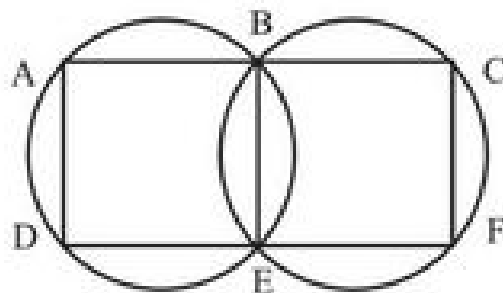
28. In the figure P is the centre prove that $\angle XPZ = 2(\angle XZP + \angle YXZ)$



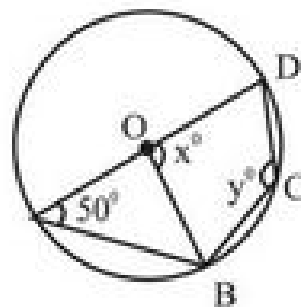
29. In the given figure AD is diameter of the circle whose centre is O and $AB \parallel CD$ prove that $AB = CD$.



30. In an equilateral triangle, prove that the centroid and the circum centre coincide.
31. In the given figure A, B, C and D, E, F are two sets of collinear points. Prove that $AD \parallel CF$.



32. In given figure, O is centre of circle and $\angle DAB = 50^\circ$, calculate the value of x and y.



33. If two equal chords of a circle intersect within the circle prove that the segment of one chord is equal to corresponding segment of other chord.
34. Prove that if a pair of opposite angles of a quadrilateral is supplementary then the quadrilateral is cyclic.

Part – D

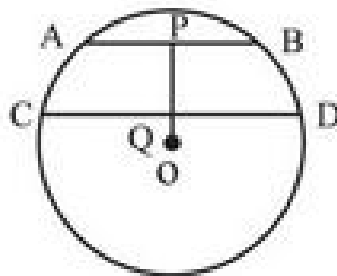
35. Bisector of angle A, B and C of a $\triangle ABC$ intersect its circum circle at D, E and F respectively, prove that the angles of a triangle DEF are

$$90^\circ - \frac{1}{2} A, 90^\circ - \frac{1}{2} B, 90^\circ - \frac{1}{2} C$$

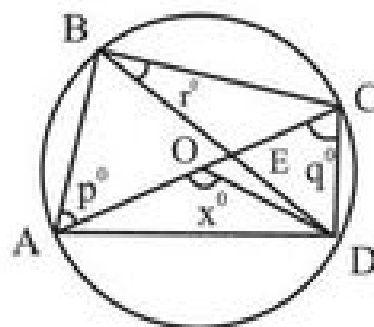
36. Find the sum of the angles in the four segments exterior to a cyclic quadrilateral.
37. Let the vertex of an angle ABC be located outside a circle and let the sides of the angle intersect equal chords AD and CE with the circle. Prove that $\angle ABC$ is equal to half the difference of the angles subtended by the chords AC and DE at the centre.

$$\angle ABC = \frac{1}{2} [\angle DOE - \angle AOC]$$

38. In the given figure O is centre of the circle of radius 5 cm, $OP \perp CD$, $AB \parallel CD$
 $AB = 6$ cm and $CD = 8$ cm
 Determine PQ

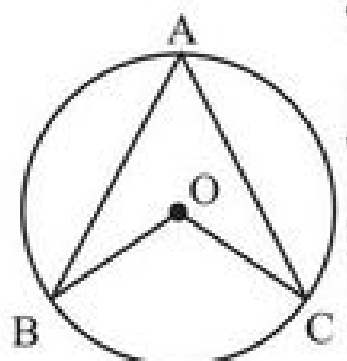


39. In the adjoining figure AC is diameter of a circle with centre O and chord $BD \perp AC$, intersecting each other at E . Find out the values of p , q , r in terms of x , if $\angle AOD = x^\circ$, $\angle BAC = p^\circ$, $\angle ACD = q^\circ$.

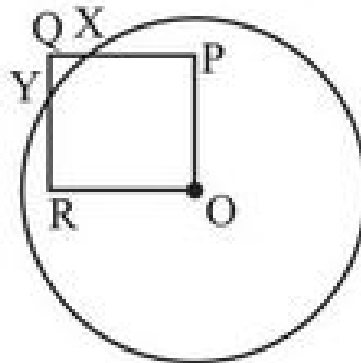


40. During a practical activity in maths lab students were using circular geo board. The angle subtended by an arc at the centre is $(2a+50^\circ)$. Pallavi calculated $\angle BAC$ as $(a+25^\circ)$.

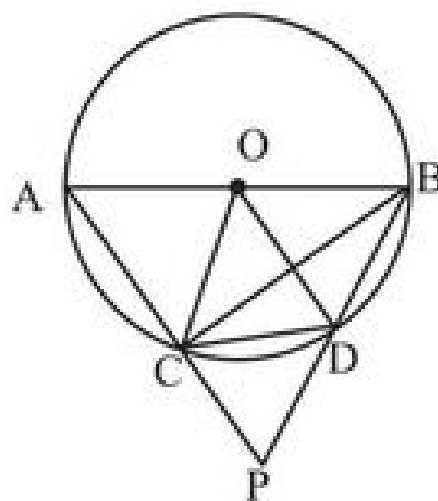
- Is her finding correct? Justify it.
- Find $\angle BAC$ if $a = 30^\circ$
- What will be the value of $\angle BOC$ for $a = 15^\circ$
- If $a = 30^\circ$ then find the measure of Reflex $\angle BOC$.



41. Show that if two chords of a circle bisect each other, they must be diameters of the circle.
42. Prove that the quadrilateral formed by angle bisectors of a cyclic quadrilateral is also cyclic.
43. Prove that there is one and only one circle can pass through three non-collinear points.
44. In the given figure $OPQR$ is a square. A circle drawn with centre O cuts the square in X and Y . Prove that $QX = QY$.

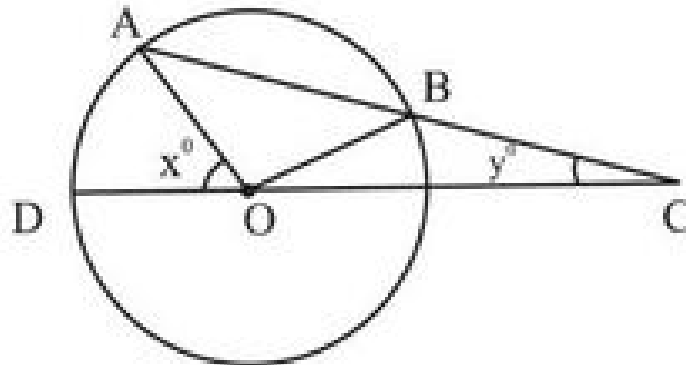


45. Prove that the opposite angles of a cyclic quadrilateral are supplementary.
46. In the given figure, AB is a diameter of a circle (o, r) and chord $CD =$ radius oc . If AC and BD when produced meet at P . Prove that $\angle APB$ is constant.

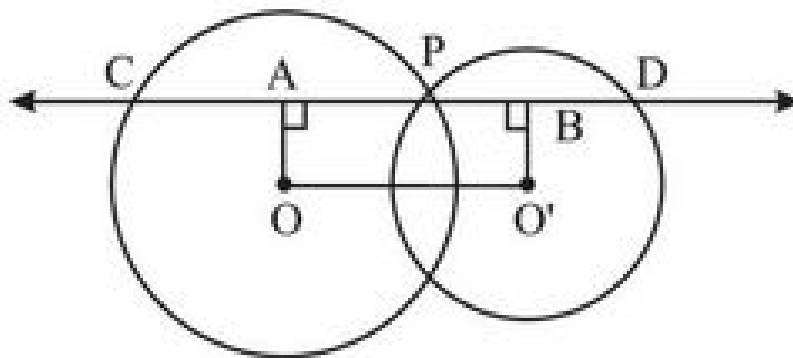


47. Prove that the angle subtended by an arc of a circle at the centre is double the angle subtended by it at any point on the remaining part of the circle.

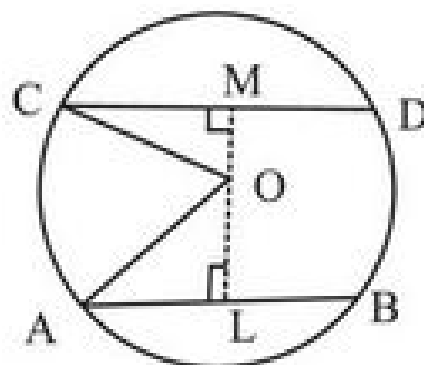
48. In the given figure, AB is a chord of a circle with centre O and AB is produced to C such that $BC = OB$. Also, CO is joined and produced to meet the circle in D. If $\angle ACD = y^\circ$ and $\angle AOD = x^\circ$. Prove that $x = 3y$.



49. Two circles whose centres are O and O' intersect at P. Through P, a line l parallel to OO', intersecting the circle at C and D is drawn. Prove that $CD = 2OO'$.



50. AB and CD are two parallel chords of a circle which are on opposite sides of the centre O such that $AB = 10\text{cm}$, $CD = 24\text{cm}$ and the distance between AB and CD is 17 cm. Find the radius of the circle.



CHAPTER-10

CIRCLES

ANSWERS

1. Cyclic quadrilateral
 2. Sector
 3. 8 cm
 4. 10 cm
 5. $y = 40^\circ$
 6. $x = 35^\circ$
 7. $x = 140^\circ$
 8. longest
 9. concentric
 10. 8 cm
 11. 115°
 12. 90°
 13. 60°
 15. $30^\circ, 150^\circ$
 16. 70°
 17. 212°
 19. 50°
 20. 7 cm
 21. 75°
 22. 14 cm
 23. 10°
 24. 75°
 27. $a = 105^\circ, b = 13^\circ, c = 62^\circ$
 32. $x = 100^\circ, y = 130^\circ$
 36. 540°
 38. 1 cm
 39. $p = 90^\circ - \frac{1}{2}x, q = \frac{1}{2}x, r = 90^\circ - \frac{1}{2}x$
 40. i) yes
ii) 55°
iii) 80°
(iv) 250°
 50. 13 cm
-

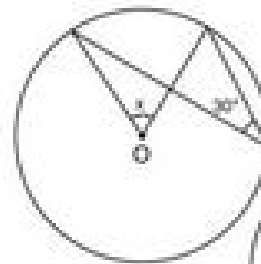
PRACTICE TEST

Time : 50 Min.

Circles

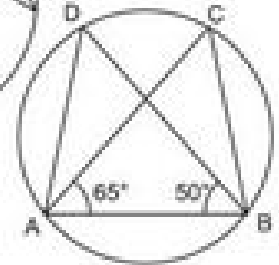
M.M. 20

1. Find the value of x in the given figure



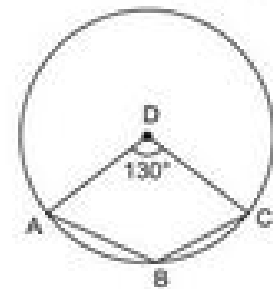
(1)

2. In the given figure : $\angle DAB = 60^\circ$ and $\angle ABD = 50^\circ$. then $\angle ACB = ?$



(1)

3. In given figure O is the centre of circle. If $\angle AOC = 130^\circ$ then find $\angle ABC$.



(2)

4. Prove that equal chords of a circle subtend equal angles at the centre.

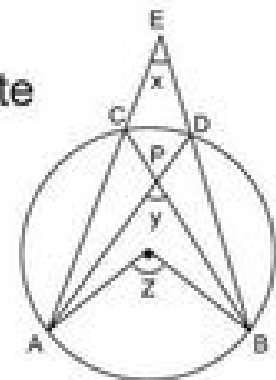
(2)

5. Prove that the sum of either pair of the opposite angles of a cyclic quadrilateral is 180° .

(3)

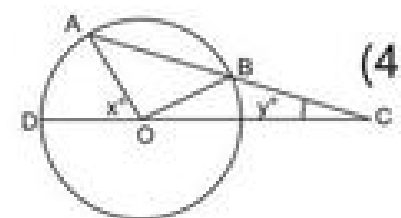
6. In the given figure, O is the centre of a circle prove that

$$\angle x + \angle y = \angle z$$



(3)

7. In the given figure, AB is a chord of a circle with centre O and AB is produced to C. Such that $BC = OB$ Also, CO is joined and produced to meet the circle in D.



(4)

If $\angle ACD = y^\circ$ and $\angle AOD = x^\circ$. Prove that $x = 3y$.

8. Prove that the angle subtended by an arc of a circle at the centre is double the angle subtended by it at any point on the remaining part of the circle.

(4)