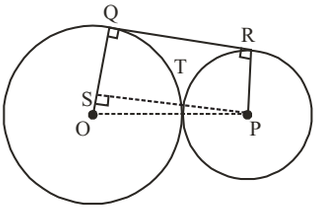
11 Circles

Multiple Choice Questions (MCQs)

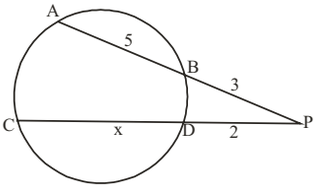
DIRECTIONS : *This section contains multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which only one is correct.*

1. Two circles with centres O and P, and radii 8 cm and 4 cm touch each other externally. Find the length of their common tangent QR.



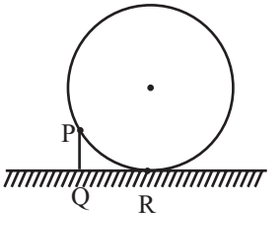
(a) 8 cm (b) 7 cm (c) $8\sqrt{2}$ cm (d) $7\sqrt{3}$ cm

2. Two chords AB and CD of a circle intersect each other at P outside the circle. If AB = 5 cm, BP = 3 cm and PD = 2 cm, find CD.



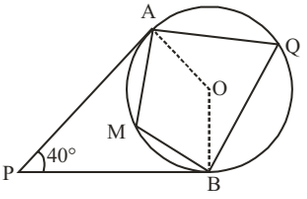
(a) 4 cm (b) 5 cm (c) 8 cm (d) 10 cm

3. A ball is in the rest position against a step PQ. If PQ = 10 cm and QR = 15 cm, then find diameter of the ball.



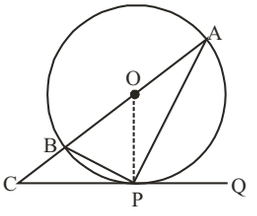
(a) 16 cm
(b) 32.5 cm
(c) 28 cm
(d) 42 cm

4. In the given figure, PA and PB are two tangents to the circle with centre O. If ∠APB = 40°, find ∠AQB and ∠AMB.



(a) ∠AQB = 70°, ∠AMB = 110°
(b) ∠AQB = 110°, ∠AMB = 70°
(c) ∠AQB = 100°, ∠AMB = 50°
(d) ∠AQB = 60°∠AMB = 40°

5. A tangent CQ touches a circle with centre O at P. Diameter AB is produced to meet the tangent at C. If ∠ACP = a° and ∠BPC = b°, the relation connecting a and b is



(a) a° + b° = 180° (b) a° + 2b° = 90°
(c) a° – b° = 60° (d) 2a° + b° = 100°

6. PQ is a tangent drawn from a point P to a circle with centre O and QOR is a diameter of the circle such that ∠POR = 120°, then ∠OPQ is

(a) 60° (b) 45° (c) 30° (d) 90°

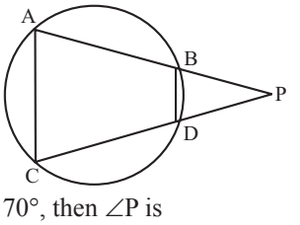
7. If a regular hexagon is inscribed in a circle of radius *r*, then its perimeter is

(a) 3*r* (b) 6*r* (c) 9*r* (d) 12*r*

8. AB and CD are two chords of a circle intersecting at the point P outside the circle. If PA = 12 cm, CD = 7cm and PC = 15 cm, then AB is equal to

(a) 15.5 cm (b) 4 cm
(c) 8 cm (d) 10 cm

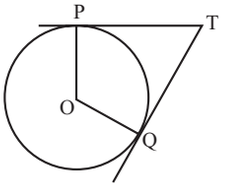
9. In the figure below (not to scale), AB = CD and $\overline{AB}$ and $\overline{CD}$ are produced to meet at the point *p*.



If ∠BAC = 70°, then ∠P is

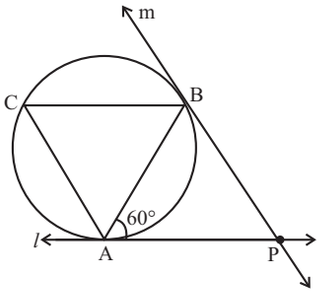
(a) 30° (b) 40° (c) 45° (d) 50°

10. In the adjoining figure, TP and TQ are the two tangents to a circle with centre O. If $\angle POQ = 110°$, then $\angle PTQ$ is



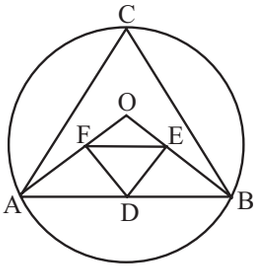
(a) 60° (b) 70° (c) 80° (d) 90°

11. In the diagram below, if *l* and m are two tangents and AB is a chord making an angle of 60° with the tangent *l*, then the angle between *l* and m is



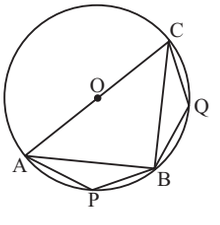
(a) 45° (b) 30° (c) 60° (d) 90°

12. In the diagram, O is the centre of the circle and D, E and F are mid points of AB, BO and OA respectively. If $\angle DEF = 30°$, then $\angle ACB$ is



(a) 30° (b) 60° (c) 90° (d) 120º

13. In the below diagram, O is the centre of the circle, AC is the diameter and if $\angle APB = 120°$, then $\angle BQC$ is



(a) 30° (b) 150° (c) 90° (d) 120°

14. In two concentric circles, if chords are drawn in the outer circle which touch the inner circle, then

(a) all chords are of different lengths.

(b) all chords are of same length.

(c) only parallel chords are of same length.

(d) only perpendicular chords are of same length.

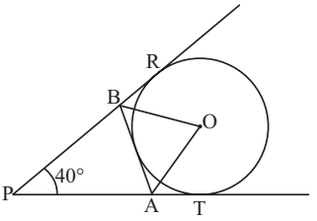
15. Number of tangents to a circle which are parallel to a secant, is

(a) 3 (b) 2 (c) 1 (d) infinite

16. AB and *CD* are two common tangents to circles which touch each other at a point *C*. If *D* lies on *AB* such that *CD* = 4 cm, then *AB* is

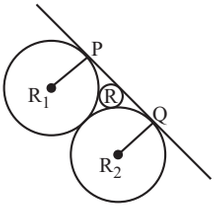
(a) 12 cm (b) 8 cm (c) 4 cm (d) 6 cm

17. In the figure, ΔAPB is formed by three tangents to the circle with centre O. If $\angle APB = 40°$, then the measure of $\angle BOA$ is



(a) 50° (b) 55° (c) 60° (d) 70°

18. Three circles with radii R_1, R_2 and *r* touch each other externally as shown in the adjoining figure. If PQ is their common tangent and $R_1 > R_2$, then which of the following relations is correct?



(a) $R_1 - R_2 = r$

(b) $R_1 + R_2 = 2r$

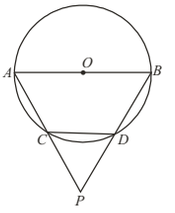
(c) $\frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{r}$

(d) $\frac{1}{\sqrt{R_1}} + \frac{1}{\sqrt{R_2}} = \frac{1}{\sqrt{r}}$

19. Two circles, both of radii *a* touch each other and each of them touches internally a circle of radius 2*a*. Then the radius of the circle which touches all the three circles is

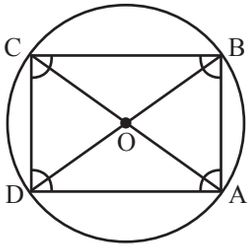
(a) $\frac{1}{2}a$ (b) $\frac{2}{3}a$ (c) $\frac{3}{4}a$ (d) a

20. In the figure, *O* is the centre of the circle and *OA* = *CD*, then $\angle CPD$ is



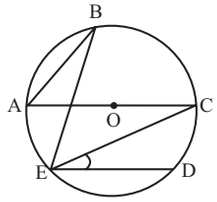
(a) 45° (b) 30° (c) 70° (d) 60°

21. In figure *ABCD* is a cyclic quadrilateral and $\angle ADC = 80°$, $\angle ACD = 50°$, then $\angle CBD$ is:



(a) 60° (b) 130° (c) 50° (d) 40°

22. In the given figure, AC is the diameter of the circle. ED || AC, ∠CBE = 65°, then ∠DEC is



(a) 35° (b) 25° (c) 65° (d) 30°

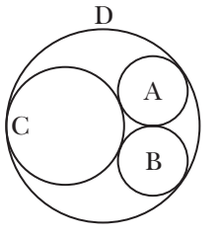
23. Let *ABCD* be a square of side length 1, and Γ a circle passing through *B* and *C*, and touching *AD*. The radius of Γ is

(a) $\frac{3}{8}$ (b) $\frac{1}{2}$ (c) $\frac{1}{\sqrt{2}}$ (d) $\frac{5}{8}$

24. Three circles of radii 1, 2 and 3 units respectively touch each other externally in the plane. The circumradius of the triangle formed by joining the centers of the circles is

(a) 1.5 (b) 2 (c) 2.5 (d) 3

25. Circles A, B and C are externally tangent to each other and internally tangent to circle D. Circles A and B are congruent. Circle C has radius 1 unit and passes through the centre of circle D. Then are radius of circle B is _____ units.



(a) $\frac{3}{7}$ (b) $\frac{6}{9}$ (c) $\frac{8}{9}$ (d) $\frac{9}{8}$

26. The length of tangent drawn from a point Q to a circle is 24 cm and distance of Q from the centre of circle is 25 cm. The radius of circle is

(a) 7 cm (b) 12 cm
(c) 15 cm (d) 24.5 cm

27. Which of the following is a cyclic quadrilateral?

(a) Rhombus (b) Rectangle
(c) Parallelogram (d) Trapezium

28. Which of the following is/are not correct?

(a) A secant is a line that intersects a circle in two distinct points.
(b) In a circle, the perpendicular from the centre to a chord bisects the chord.
(c) The point common to a circle and its tangent is called the point of contact.
(d) Adjacent angles of a cyclic quadrilateral are supplementary.

29. Which of the following statement(s) is / are not correct ?

(a) The length of tangent from an external point *P* on circle with centre *O* is always less than *OP*.
(b) The tangent to the circumcircle of an isosceles triangle ABC at *A*, in which *AB* = *AC*, is parallel to *BC*.
(c) If angle between two tangents drawn from a point *P* to a circle of radius 'a' and centre 'O'is 90°, then $OP = a\sqrt{2}$.
(d) None of these

30. Which of the following statement(s) is/are correct?

(a) If a chord *AB* subtends an angle of 60° at the centre of a circle, then angle between the tangents at A and B is also 60°.
(b) The length of tangent from an external point on a circle is always greater than the radius of the circle.
(c) If a number of circle touch a given line segment PQ at a point A, then their centres lie on the perpendicular bisector of *PQ*.
(d) None of these

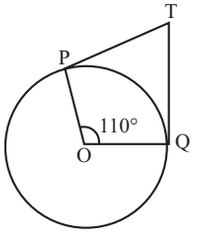
31. Which of the following statement(s) is/are incorrect?

(a) Angle between the tangent line and the radius at the point of contact is 90°.
(b) A circle can have two parallel tangents atmost.
(c) The distance between two parallel tangents drawn to a circle is equal to twice of radius.
(d) A line intersecting a circle in two points is called a chord.

32. A tangent PQ at a point P of a circle of radius 5 cm meets a line through the centre O at a point Q so that OQ = 12 cm. Length PQ is :

(a) 12 cm (b) 13 cm
(c) 8.5 cm (d) $\sqrt{119}$ cm

33. In fig. if TP and TQ are the two tangents to a circle with centre O so that ∠POQ = 110°, then ∠PTQ is equal to



(a) 60° (b) 70° (c) 80° (d) 90°

34. If tangents PA and PB from a point P to a circle with centre O are inclined to each other at an angle of 80°, then ∠POA is equal to

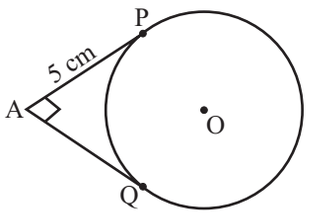
(a) 50° (b) 60° (c) 70° (d) 80°

35. If angle between two radii of a circle is 130°, the angle between the tangents at the ends of the radii is :

(a) 90° (b) 50° (c) 70° (d) 40°

36. In fig. the pair of tangents *AP* and *AQ* drawn from an external point *A* to a circle with centre *O* are perpendicular to each other and length of each tangent is 5 cm.

Then, the radius of the circle is



Case/Passage Based Questions

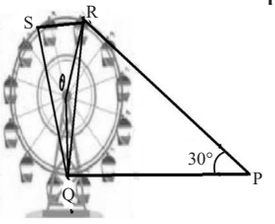
DIRECTIONS : *Study the given Case/Passage and answer the following questions.*

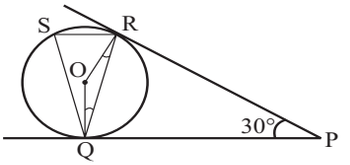
Case/Passage-I

A Ferris wheel (or a big wheel in the United Kingdom) is an amusement ride consisting of a rotating upright wheel with multiple passenger-carrying components (commonly referred to as passenger cars, cabins, tubs, capsules, gondolas, or pods) attached to the rim in such a way that as the wheel turns, they are kept upright, usually by gravity.

After taking a ride in Ferris wheel, Aarti came out from the crowd and was observing her friends who were enjoying the ride . She was curious about the different angles and measures that the wheel will form. She forms the figure as given below.

[From CBSE Question Bank 2021]





37. In the given figure find ∠ROQ

(a) 60 (b) 100

(c) 150 (d) 90

38. Find ∠RQP

(a) 75 (b) 60

(c) 30 (d) 90

39. Find ∠RSQ

(a) 60 (b) 75

(c) 100 (d) 30

40. Find ∠ORP

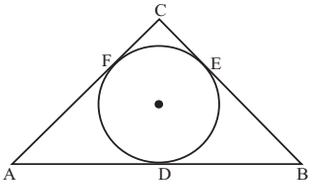
(a) 90 (b) 70

(c) 100 (d) 60

Case/Passage-II

Varun has been selected by his School to design logo for Sports Day T-shirts for students and staff . The logo design is as given in the figure and he is working on the fonts and different colours according to the theme.

In given figure, a circle with centre O is inscribed in a ΔABC, such that it touches the sides AB, BC and CA at points D, E and F respectively. The lengths of sides AB, BC and CA are 12 cm, 8 cm and 10 cm respectively. **[From CBSE Question Bank 2021]**



41. Find the length of AD

(a) 7 (b) 8

(c) 5 (d) 9

42. Find the Length of BE

(a) 8 (b) 5

(c) 2 (d) 9

43. Find the length of CF

(a) 9 (b) 5

(c) 2 (d) 3

44. If radius of the circle is 4cm, Find the area of ΔOAB

(a) 20 (b) 36

(c) 24 (d) 48

45. Find area of ΔABC

(a) 50 (b) 60

(c) 100 (d) 90

Assertion & Reason

DIRECTIONS : *Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.*

(a) If both **Assertion** and **Reason** are **correct** and Reason is the **correct explanation** of Assertion.

(b) If both **Assertion** and **Reason** are **correct**, but Reason is **not the correct explanation** of Assertion.

(c) If **Assertion** is **correct** but **Reason** is **incorrect**.

(d) If **Assertion** is **incorrect** but **Reason** is **correct**.

46. **Assertion:** If in a circle, the radius of the circle is 3 cm and distance of a point from the centre of a circle is 5 cm, then length of the tangent will be 4 cm.

Reason:$(\text{hypotenuse})^2 = (\text{base})^2 + (\text{height})^2$

47. **Assertion:** If in a cyclic quadrilateral, one angle is 40°, then the opposite angle is 140°

Reason: Sum of opposite angles in a cyclic quadrilateral is equal to 360°

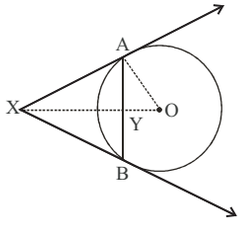
48. **Assertion:** If length of a tangent from an external point to a circle is 8 cm, then length of the other tangent from the same point is 8 cm.

Reason: length of the tangents drawn from an external point to a circle are equal.

Match the Following

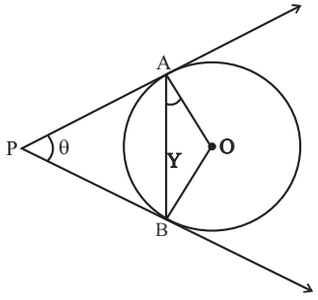
DIRECTIONS : *Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in Column-I have to be matched with statements (p, q, r, s) in Column-II.*

49. If AB is a chord of length 6 cm of a circle of radius 5cm, the tangents at A and B intersect at a point X (figure), then match the columns.



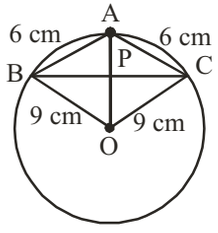
Column-I	Column-II
(A) AY	(p) 4 cm
(B) OY	(q) 3.75 cm
(C) XA	(r) 5 cm
(D) OA	(s) 3 cm

50. If two tangents PA and PB are drawn to a circle with centre O from an external point P (figure), then match the column.



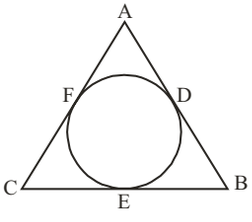
Column-I	Column-II
(A) $\angle$ PAB	(p) 90°
(B) $\angle$ OAP	(q) θ/2
(C) $\angle$ OAB	(r) $90° - \frac{\theta}{2}$
(D) $\angle$ AOB	(s) 180° – θ

51. If an isosceles ΔABC in which $AB = AC = 6$ cm is inscribed in a circle of radius 9 cm, then



Column-I	Column-II
(A) AP	(p) $8\sqrt{2}$
(B) CP	(q) $4\sqrt{2}$
(C) OB	(r) 2
(D) Area of ΔABC	(s) 9

52. A circle is inscribed in a ΔABC having sides AB = 8 cm, BC = 10 cm and CA = 12 cm as shown in figure. Observe the diagram and match the columns.



Column-I	Column-II
(A) AD	(p) 15
(B) BE	(q) 7 cm
(C) CF	(r) 3 cm
(D) AD + BE + CF	(s) 5 cm

53.

Column-I Definition	Column-II Term
(A) A line segment which join any two points on a circle.	(p) Secant
(B) A line which intersect the circle in two points.	(q) Tangent
(C) A line that intersects the circle at only one point.	(r) Chord

Fill in the Blanks

DIRECTIONS : *Complete the following statements with an appropriate word / term to be filled in the blank space(s).*

54. A tangent to a circle touches it at ..... point (s).

55. A line intersecting a circle at two points is called a .....

56. A circle can have ..... parallel tangents at the most.

57. The common point of a tangent to a circle and the circle is called ..... .

58. There is no tangent to a circle passing through a point lying ..... the circle.

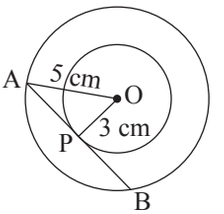
59. The tangent to a circle is ..... to the radius through the point of contact.

60. There are exactly two tangents to a circle passing through a point lying ..... the circle.

61. The lengths of the two tangents from an external point to a circle are ..... .

62. The tangents drawn at the ends of a diameter of a circle are ..... .

63. In given Fig., the length PB = ... cm.



True / False

DIRECTIONS : *Read the following statements and write your answer as true or false.*

64. The tangent to a circle is a special case of the secant.

65. The perpendicular at the point of contact to the tangent to a circle does not pass through the centre.

66. A circle can have at the most two parallel tangents.

67. If P is a point on a circle with centre C, then the line drawn through P and perpendicular to CP is the tangent to the circle at the point P.

68. The centre of the circle lies on the bisector of the angle between the two tangents.

69. A tangent to a circle is a line that intersects the circle at only one point.

70. Two equal chords of a circle are always parallel.

71. A line drawn from the centre of a circle to a chord always bisects it.

72. Line joining the centers of two intersecting circles always bisect their common chord.

73. In a circle, two chords PQ and RS bisect each other. Then PRQS is a rectangle.

ANSWER KEY & SOLUTIONS

1. **(c)** Join O to P and Q. Join P to R. Draw SP ⊥ OQ.

Now SP = QR, as they are opposite sides of rectangle PRQS.

OP = 8 cm + 4 cm = 12 cm; OS = 8 cm – 4 cm = 4 cm

In right triangle POS,

$SP = \sqrt{OP^2 - OS^2} = \sqrt{12^2 - 4^2} = 8\sqrt{2}$ cm

$\therefore$ QR = $8\sqrt{2}$ cm

2. **(d)** Since, two chords AB and CD of the circle are intersecting at P, when produced.

$\therefore$ PA. PB = PC.PD

[Each = (length of the tangent from P)^2]

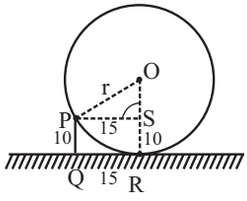
$\Rightarrow$ (AB + PB). (PB) = (PD + DC) · PD

$\Rightarrow$ (5 + 3) (3) = (2 + x) 2

$\Rightarrow$ 24 = (2 + x) (2) $\Rightarrow$ 12 = 2 + x

$\Rightarrow$ x = 10 $\Rightarrow$ CD = 10 cm

3. **(b)** In right ΔOSP,



$OP^2 = PS^2 + OS^2$

$r^2 = 225 + (r - 10)^2$

$\Rightarrow$ $r^2 = 225 + r^2 - 20r + 100$

$\Rightarrow$ 20 r = 325 $\Rightarrow$ 2r = 32.5

Hence, diameter = 32.5 cm.

4. **(a)** Since, OA ⊥ PA and OB ⊥ PB,

$\therefore$ In quadrilateral AOBP,

$\Rightarrow$ 40° + 90° + 90° + ∠AOB = 360°

$\Rightarrow$ ∠AOB = 140°

Also, $\angle AQB = \frac{1}{2}$ of ∠AOB = 70° and $\angle AMB = \frac{1}{2}$

of reflex $\angle AOB = \frac{1}{2} \times (360° - 140°) = \frac{1}{2} \times 220 = 110°$

[$\because$ The angle subtended by an arc at the centre is double the angle subtended by the arc at any point on the remaining part of the cirlce.]

5. **(b)** Given, ∠BPC = b° and ∠ACP = a°.

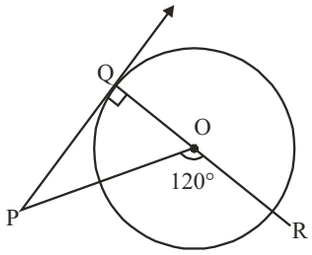
Also, ∠OPA = ∠OAP = b° (Angles in an isosceles triangle OAP, angle in alternate segment.)

∠CPO = 90° $\therefore$ ∠CPA = 90° + b°

In Δ ACP, ∠ACP = 180° – [(b° + 90°) + b°]

$\Rightarrow$ a° + 2b° = 90°

6. **(c)** Since, PQ is tangent from a point P



$\therefore$ ∠OQP = 90° $\Rightarrow$ ∠POR = 120°

$\therefore$ ∠POR + ∠POQ = 180° [linear pair]

∠POQ = 180° – 120° = 60°

In ΔOPQ

$\Rightarrow$ ∠OPQ + ∠OQP + ∠ POQ = 180°

[$\because$ Sum of angles of Δ = 180°]

$\therefore$ ∠OPQ + 90° + 60° = 180° $\Rightarrow$ ∠OPQ = 30°

7. **(b)** Side of the regular hexagon inscribed in a circle of radius r is also r, the perimeter is 6r.

8. **(a)**

9. **(b)** Exterior angle of a cyclic quadrilateral is equal to its interior opposite angle.

∠BAC = ∠DCA and proceed.

10. **(b)** [**Hint.** OP ⊥ PT, OQ ⊥ QT.

In quad. OPTQ, ∠POQ + ∠OPT + ∠PTQ + ∠OQT = 360°

$\Rightarrow$ 110° + 90° + ∠PTQ + 90° = 360°

$\Rightarrow$ ∠ PTQ = 70°]

11. **(c)** Tangents drawn to a circle from an external point are equal.

12. **(b)** (i) ADEF is a parallelogram.

(ii) ∠FAD = 30° and ∠OAD = ∠OBA

(angles opposite to equal sides)

13. **(b)** (i) APBC is a cyclic quadrilateral.

(ii) ∠ABC is an angle in a semi circle.

(iii) ABQC is a cyclic quadrilateral.

14. **(b)** All chords are of same length.

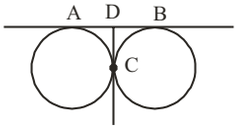
15. **(b)** Only two tangents are parallel to a secant.

16. **(b)** $AD = CD$

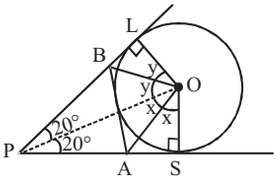
and $BD = CD$

$\therefore AB = AD + BD = CD + CD$

$= 2CD = 2 \times 4 = 8$ cm



17. **(d)** We redraw the figure.



In ΔOPS, using Pythagoras theorem, $\angle POS = 70°$

and In ΔPOL, $\angle POL = 70°$

From figure, $2x + 2y = 140°$

$\angle BOA = x + y = 70°$

18. **(d)** Here, PQ is the common tangent to the three circles

So, $PR = \sqrt{(R_1 + r)^2 - (R_1 - r)^2} = \sqrt{4R_1 r}$ ...(i)

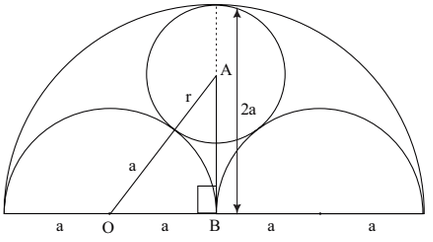
$RQ = \sqrt{4R_2 r}$ ....(ii) $PQ = \sqrt{4R_1 R_2}$ ....(iii)

We know that PQ = PR + RQ

$\Rightarrow \sqrt{4R_1R_2} = \sqrt{4R_1r} + \sqrt{4R_2r}$ ($\because$ From (i), (ii) and (iii))

$\Rightarrow \sqrt{R_1R_2} = \sqrt{R_1r} + \sqrt{R_2r}$ $\therefore \dfrac{1}{\sqrt{r}} = \dfrac{1}{\sqrt{R_2}} + \dfrac{1}{\sqrt{R_1}}$

19. **(b)**



Since, in figure, ΔAOB is a right angled triangle

$\therefore \quad OA^2 = AB^2 + OB^2$

$\Rightarrow \quad (a + r)^2 = (2a - r)^2 + a^2$

$\Rightarrow \quad a^2 + 2ar + r^2 = 4a^2 + r^2 - 4ar + a^2$

$\Rightarrow \quad 6ar = 4a^2 \Rightarrow r = \dfrac{2a}{3}$

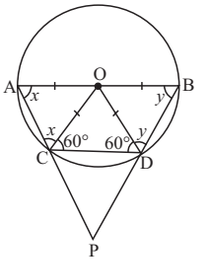
20. **(d)** In the given figure, ODC is equilateral triangle

$\Rightarrow \angle ODC = \angle OCD = 60°$

Now, in quadrilateral $ABCD$

$\Rightarrow x + x + 60° + y + y + 60° = 360°$

$\Rightarrow x + y = 120°$



In ΔABP,

$\angle APB = 180° - (x + y) = 60°$

21. **(c)** In cyclic quadrilateral ABCD,

$\angle ADC = 80°$ and $\angle ABC = 100°$

($\because$ opposite angles of a cyclic quadrilateral are supplementary)

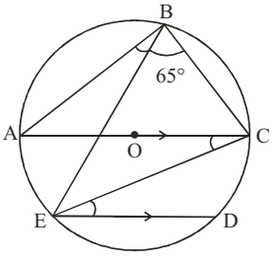
Now, $\angle ACD = \angle DBA = 50°$

(angles in same segment of a circle are equal).

$\therefore \angle CBD = \angle ABC - \angle ABD = 50°$

22. **(b)** $\angle ABC = \angle ABE + \angle CBE = 90°$

(angle in a semi circle is a right angle)



$\Rightarrow \angle ABE = 90° - 65° = 25°$

$\Rightarrow \angle ACE = \angle ABE = 25°$

($\because$ angles in same segment of a circle are equal)

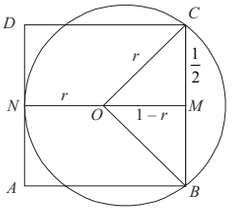
$\Rightarrow \angle ACE = \angle DEC = 25°$

[alternate interior angles are equal]

23. **(d)** $ABCD$ is a square of sides

$AB = BC = CD = AD = 1$ unit

A circle Γ passing through B and C and touching AD at N, where BC is chord of circle.



$\therefore \quad OM$ bisects the chord BC

$\therefore \quad CM = MB = \dfrac{1}{2}BC = \dfrac{1}{2}$ ($\because BC = 1$)

$\Rightarrow \quad OM = MN - ON = 1 - r$

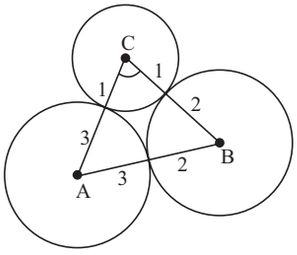
In ΔOMC, $OC^2 = OM^2 + CM^2$

$\Rightarrow \quad r^2 = (1 - r)^2 + \left(\dfrac{1}{2}\right)^2$

$\Rightarrow \quad r^2 = 1 - 2r + r^2 + \dfrac{1}{4} \Rightarrow r = \dfrac{5}{8}$

24. **(c)** Since, radii of circles are 1, 2 and 3 units.

$\therefore$ Side of ΔABC are $AB = 5$, $BC = 3$, $AC = 4$



$\therefore$ ΔABC is formed a right angled triangle, where AB is hypotenuse of triangle.

Since, circumradius of a right angled triangle is the half of the hypotenuse.

$\therefore$ Circumradius $= \frac{1}{2} \times AB = \frac{1}{2} \times 5 = 2.5$

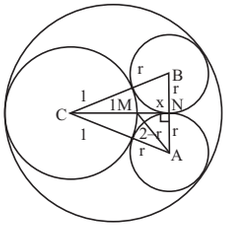
25. **(c)** In ΔMAN

$(2 - r)^2 = x^2 + r^2$

$\Rightarrow \quad 4 + r^2 - 4r = x^2 + r^2$

$4(1 - r) = x^2 \Rightarrow 4 - 4r = x^2$

$\Rightarrow \quad r = \frac{4 - x^2}{4}$



In ΔCAN, $(1 + x)^2 + r^2 = (1 + r)^2$

$1 + x^2 + 2x + r^2 = 1 + r^2 = 2r$

$\Rightarrow \quad x^2 + 2x = 2r \Rightarrow x^2 = 2r - 2x$

$\Rightarrow \quad x^2 = 2\left(\frac{4 - x^2}{4}\right) - 2x$

$\Rightarrow x^2 = \frac{4 - x^2}{2} - 2x$

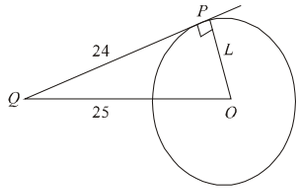
$\Rightarrow \quad 2x^2 = 4 - x^2 - 4x \Rightarrow 3x^2 + 4x - 4 = 0$

$\Rightarrow \quad 3x^2 + 6x - 2x - 4 = 0 \Rightarrow 3x(x + 2) - 2(x + 2) = 0$

$\Rightarrow \quad x = \frac{2}{3}, \; x = -2.$

$$r = 4 - \frac{\left(\frac{2}{3}\right)^2}{4} = \frac{4 - \frac{4}{9}}{4} \Rightarrow \frac{36 - 4}{36} = \frac{32}{36} \Rightarrow \frac{8}{9}.$$

26. **(a)** Here, O is the centre of circle.



Let r be the radius of circle $r = \sqrt{(25)^2 - (24)^2}$

$= \sqrt{625 - 576} = \sqrt{49}$

$= 7$ cm

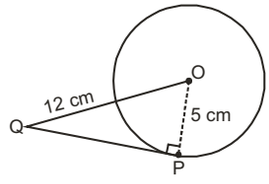
27. **(b)** **28.** **(d)**

29. **(d)** All the three statements are correct.

30. **(d)** All the three statements are false.

31. **(d)**

32. **(d)** O is the centre of the circle. The radius of the circle is 5 cm.



PQ is tangent to the circle at P. Then,

OP = 5 cm and $\angle OPQ = 90°$.

We are given that OQ = 12 cm.

By Pythagoras Theorem, we have

$PQ^2 = OQ^2 - OP^2 = (12)^2 - (5)^2 = 144 - 25 = 119$

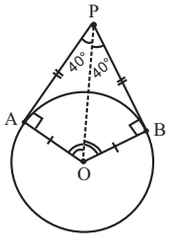
$\Rightarrow \quad PQ = \sqrt{119}$ cm .

33. **(b)** In figure, TPOQ is a quadrilateral.

Here, $\angle OPT = \angle OQT = 90° \Rightarrow \angle PTQ + \angle POQ = 180°$

$\Rightarrow \quad \angle PTQ + \angle 110° = 180° \Rightarrow \angle PTQ = 70°.$

34. **(a)** In figure



$\Delta OAP \cong \Delta OBP$ (SSS congruence)

$\Rightarrow \quad \angle POA = \angle POB = - \angle AOB$ ... (i)

Also, $\angle AOB + \angle APB = 180°$

$\Rightarrow \quad \angle AOB + 80° = 180°$

$\Rightarrow \quad \angle AOB = 100°$ ... (ii)

Then, from (i) and (ii),

$$\angle POA = \frac{1}{2} \times 100° = 50°.$$

35. (b)

36. (c)

37. (c) $\because \angle ROQ + \angle RPQ = 180°$

$\Rightarrow \angle ROQ = 180° - 30° = 150°$

38. (a) $\because \angle RQP = \angle QRP$

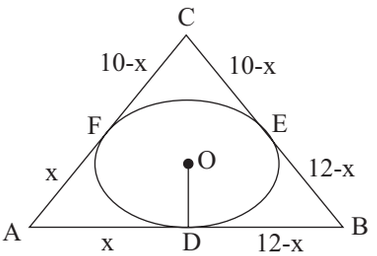
and $\angle RQP + \angle QRP + \angle QPR = 180°$

$\Rightarrow 2\angle RQP = 180° - 30° \Rightarrow \angle RQP = 75°$

39. (b) $\angle RSQ = \frac{1}{2}\angle ROQ = \frac{1}{2} \times 150° = 75°$

40. (a) 90° [$\because$ OR $\perp$ RP]

Sol. (41-45)



BC = 10 – x + 12 – x = 8

$\Rightarrow$ x = 7.

41. (a) AD = 7 cm

42. (b) BE = 12 – x = 12 – 7 = 5 cm

43. (d) CF = 10 – x = 10 – 7 = 3 cm

44. (c) Ar $\Delta OAB = \frac{1}{2} \times AB \times OD$

$$= \frac{1}{2} \times 12 \times 4 = 24 \text{ cm}^2$$

45. (b) Ar ΔABC = Ar ΔAOB + Ar ΔOBC + Ar ΔAOC

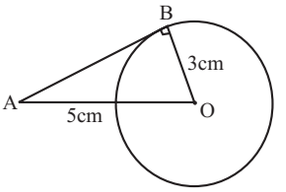
$$= 24 + \frac{1}{2} \times 8 \times 4 + \frac{1}{2} \times 10 \times 4 = 60 \text{ cm}^2$$

46. (a) $(OA)^2 = (AB)^2 + (OB)^2$

AB = $\sqrt{25-9}$ = 4 cm.

Both Assertion and Reason are correct.

Also, Reason is the correct explanation of the Assertion.



47. (c) Angle + 40° = 180°

Angle = 180° – 40° = 140°.

48. (a)

49. (A) $\rightarrow$ (s); (B) $\rightarrow$ (p); (C) $\rightarrow$ (q); (D) $\rightarrow$ (r)

50. (A) $\rightarrow$ (r); (B) $\rightarrow$ (p); (C) $\rightarrow$ (q); (D) $\rightarrow$ (s)

51. (A) $\rightarrow$ (r); (B) $\rightarrow$ (q); (C) $\rightarrow$ (s); (D) $\rightarrow$ (p)

$OP \perp BC$, Let $AP = x$ cm and $PB = CP = y$ cm

On applying Pythagoras in ΔAPB and ΔOPB, we have

$36 = y^2 + x^2$ and $81 = (9 - x)^2 + y^2$

On solving these, we get, $x = 2$ cm and $y = 4\sqrt{2}$ cm.

Area of $\Delta ABC = \frac{1}{2}(BC \times AP) = \frac{1}{2} \times 8\sqrt{2} \times 2 = 8\sqrt{2}$ cm^2.

52. (A) $\rightarrow$ (s); (B) $\rightarrow$ (r); (C) $\rightarrow$ (q); (D) $\rightarrow$ (p)

$AD = AF = x$ cm, $BD = BE = y$ cm, $CE = CF = z$ cm

($\because$ tangents drawn from an exterior point to a circle are equal in length).

$AB = 8$ cm $\Rightarrow AD + BD = 8 \Rightarrow x + y = 8$ ... (i)

Similarly, $BE + CE = 10$

$\Rightarrow \quad y + z = 10$ ... (ii)

and $z + x = 12$ ... (iii)

Adding equations (i) + (ii) + (iii),

$\Rightarrow \quad x + y + z = 15$ ... (iv)

Thus, on solving (i), (ii), (iii) and (iv)

we get, $AD = x$ cm = 5 cm

$BE = y$ cm = 3 cm

$CF = z$ cm = 7 cm

53. (A) $\rightarrow$ (r); (B) $\rightarrow$ (p); (C) $\rightarrow$ (q)

54. One

55. Secant

56. Two

57. Point of contact

58. inside

Circles

59. perpendicular

60. outside

61. equal

62. Parallel

63. 4 cm

$PB = AP = \sqrt{5^2 - 3^2}$ ($\because$ $OP \perp AB$)

$= \sqrt{25 - 9} = 4$ cm

64. True **65.** False **66.** True **67.** True

68. True **69.** True **70.** False **71.** False

72. True **73.** True