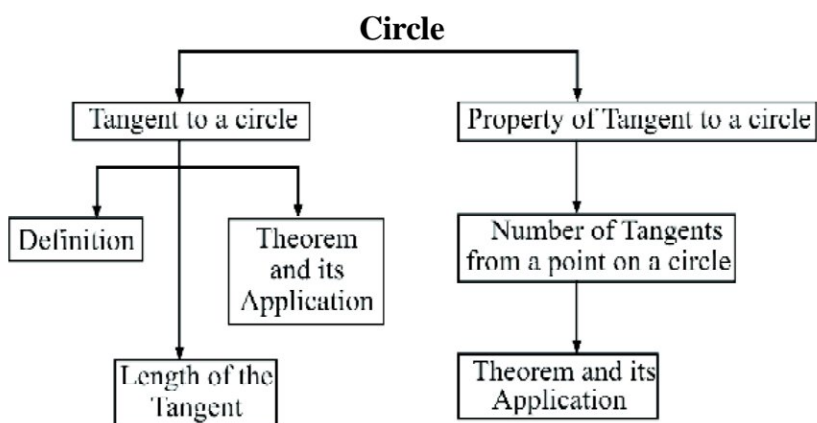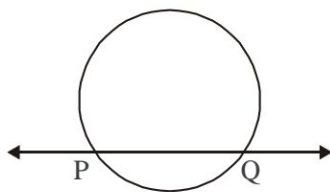# 10   Circles

Mind–Maping

KEY POINTS

1. A **circle** is a collection of all points in a plane which are at a constant distance from a fixed point. The fixed point is called the **centre** and constant distance is called the **radius**.

2. **Secant:** A line which intersects a circle in two distinct points is called a secant of the circle.

3. **Tangent**: It is a line that intersects the circle at only one point. The point where tangent touches the circle is called the point of contact.

   Here A is the point of contact.

Mathematics-X

P   A   B
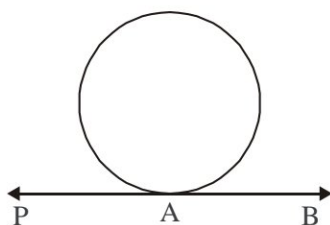
4. **Number of Tangent**: Infinitely many tangents can be drawn on a circle.

5. **Number of Secant**: There are infinitely many secants which can be drawn to a circle.

6. (i) (Prove) The tangent at any point of a circle is perpendicular to the radius through the point of contact.

   (ii) (Prove) The lengths of tangents drawn from an external point to a circle are equal.

7. The tangent to a circle is a special case of the secant, when the two end points of the corresponding chord coincide.

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

9. There is one and only one tangent to a circle passing through a point lying on the circle.

10. There are exactly two tangents to a circle through a point lying outside the circle.

## VERY SHORT ANSWER TYPE QUESTIONS

1. How many tangents can a circle have?
   (a) Only one
   (b) Two
   (c) None
   (d) Infinitely many

2. A tangent to a circle intersects it in:
   (a) Only one point
   (b) Two points
   (c) No point
   (d) Infinitely many points

3. In the given figure, if PQ is a tangent, then the value of $2(\angle POQ + \angle QPO)$ is:

Mathematics-X
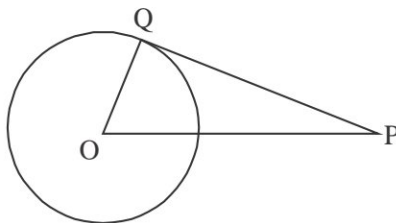
(a) 60°   (b) 90°

(c) 120°   (d) 180°

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

(a) 12 cm   (b) 13 cm

(c) 15 cm   (d) $\sqrt{119}$ cm

5. A circle can have _____ parallel tangents at the most.

(a) Two   (b) Four

(c) Six   (d) Infinitely many

6. In the given figure, PQ is Tangent to the circle centered at O. If ∠AOB = 95°, then the measure of ∠ABQ is:
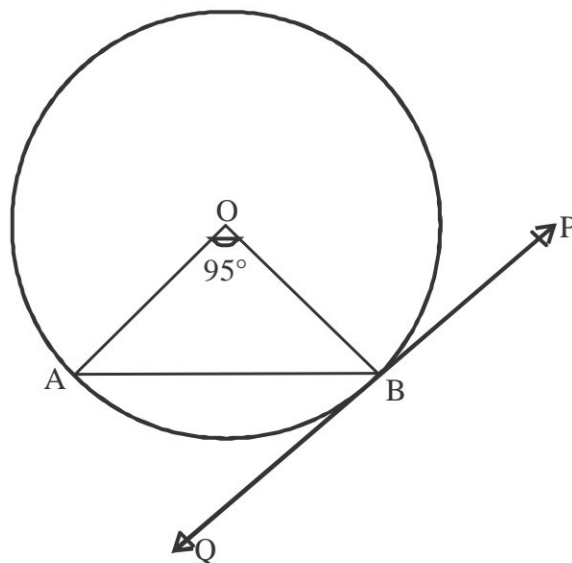
(a) 42.5°   (b) 47.5°

(c) 85°   (d) 95°

7. In the given figure, ΔABC is circumscribing a circle. Find the length of BC.
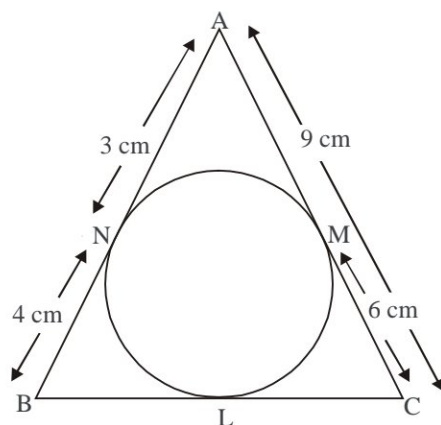
8. If the length of the tangent to a circle from a point P, which is 25 cm away from the centre, is 24 cm, then find the radius of the circle.

9. In the given figure, ABCD is a cyclic quadrilatreral. If ∠BAC = 50° and ∠DBC = 60°, then find ∠BCD.
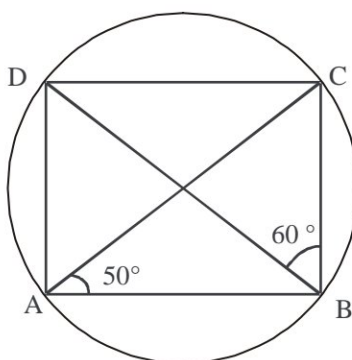

10. In figure, O is the centre of a circle, PQ is a chord and the tangent PR at P makes an angles of 50° with PQ. Find ∠POQ.
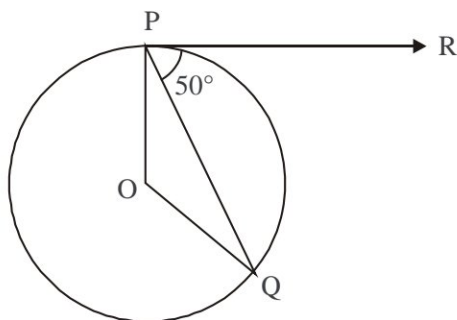

11. If two tangents inclined at an angle of 60° are drawn to a circle of radius 3 cm, then find the length of each tangent.

Mathematics-X

12. If radii of two concentric circles are 4 cm and 5 cm, then find the length of the chord of that circle which is tangent to the other circle.

13. In the given figure, PQ is tangent to outer circle and PR is tangent to inner circle. If PQ = 4cm, OQ = 3 cm and OR = 2 cm then find the length of PR.
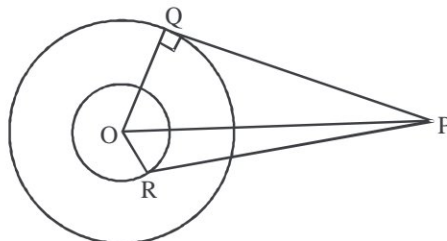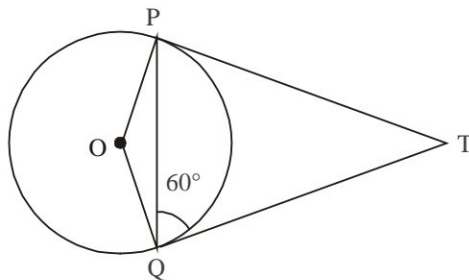

14. In the given figure, O is the centre of the circle, PA and PB are tangents to the circle. Find ∠AQB. **(CBSE 2016)**
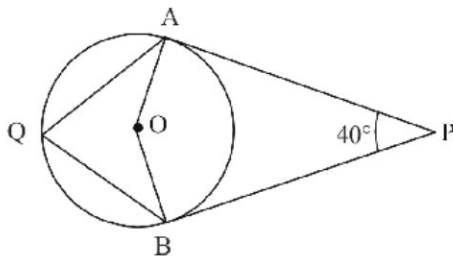

15. In the given figure, If ∠AOB = 125° then find ∠COD.
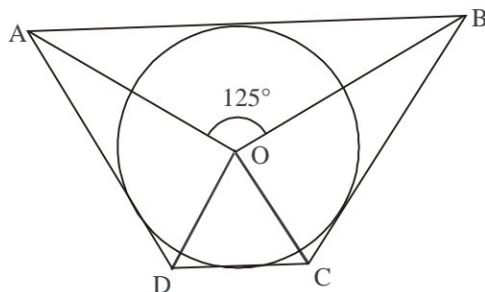
16. If two tangent TP and TQ are drawn from an external point T such that ∠TQP = 60°, then find ∠OPQ.

17. Find the distance between two points of contact of two parallel tangents to a given circle of radius 9 cm.

18. Find the radius of a circle, if distance between two parallel tangents be 10 cm.

19. How many common tangents can be drawn to two circles touching internally?

SHORT ANSWER TYPE QUESTIONS

20. If diameters of two concentric circles are d_1 and d_2 $(d_2 > d_1)$ and c is the length of chord of bigger circle which is tangent to the smaller circle. Show that $d_2^2 = c^2 + d_1^2$.

21. The length of tangent to a circle of radius 2.5 cm from an external point P is 6 cm. Find the distance of P from the nearest point of the circle.

22. TP and TQ are the tangents from the external point T of a circle with centre O. If $\angle OPQ = 30°$ then find the measure of $\angle TQP$.

23. In the given figure, AP = 4 cm, BQ = 6 cm and AC = 9 cm. Find the semi perimeter of $\triangle ABC$.
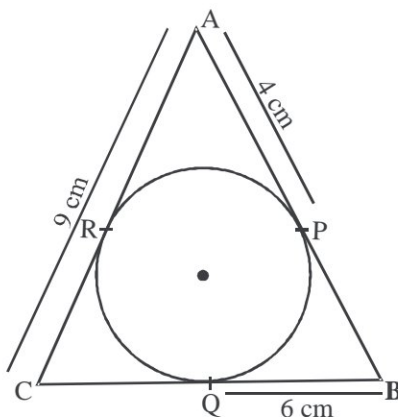
24. A circle is drawn inside a right angled triangle whose sides are a, b and c where c is the hypotenuse, which touches all the sides of the triangle. Prove that $r = \dfrac{a + b - c}{2}$ where r is the radius of the circle.

25. Prove that in two concentric circles the chord of the larger circle which is tangent to the smaller circle is bisected at the point of contact.
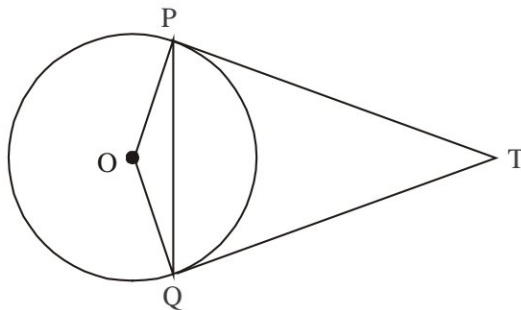
26. In the given figure, AC is diameter of the circle with centre O and A is the point of contact. Find x.
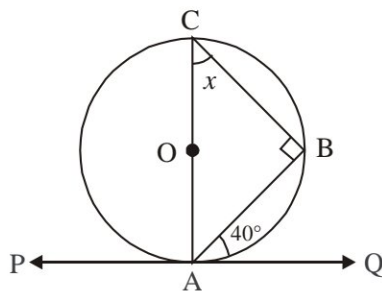

**27.** In the given figure, KN, PA and PB are tangents to the circle. Prove that KN = AK + BN.
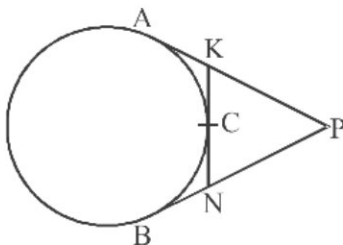
28. In the given figure, PQ is a chord of length 6 cm and the radius of the circle is 6 cm. TP and TQ are two tangents drawn from an external point T. Find $\angle$PTQ.


29. In the given figure, ABC is a triangle in which $\angle$B = 90°, BC = 48 cm and AB = 14 cm. A circle is inscribed in the triangle, whose centre is O. Find the radius (r) of the incircle.

Mathematics-X
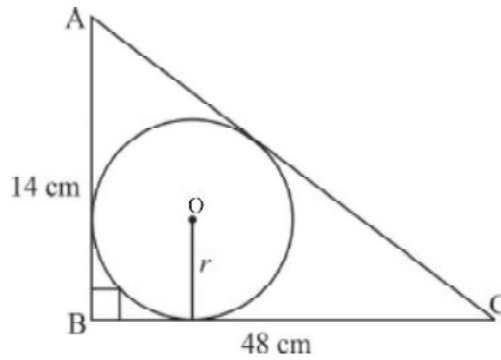
**30.** If the inscribed circle of the ΔABC touches BC at D. Prove that AB − BD = AC − CD.
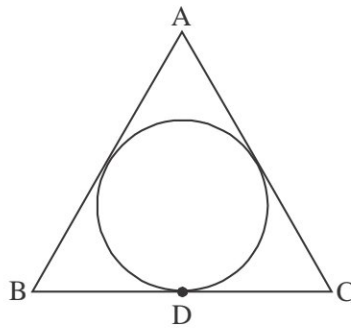
31. From a point P which is at distance of 13 cm from the centre O of a circle of radius 5 cm, the pair of tangents PQ and PR to the circle are drawn, then find the area of the quadrilateral PQOR.

32. In the given figure, tangents AC and AB are drawn to a circle from a point A such that $\angle BAC = 30°$ and a chord BD is drawn parallel to the tangent AC. Find $\angle DBC$.
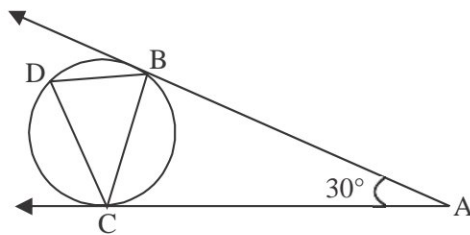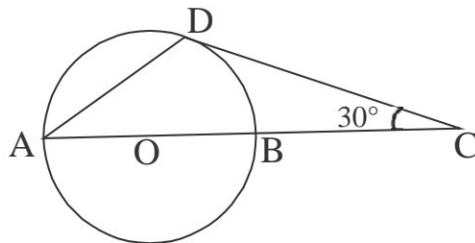
33. Find the value of x.
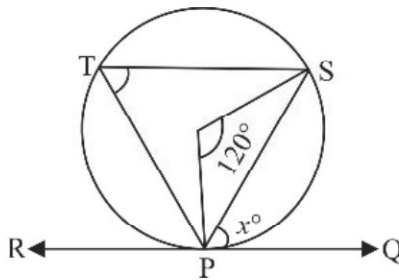
34. PA and PB are tangents to the circle with centre at O. If $\angle APB = 70°$, then find $\angle AQB$.
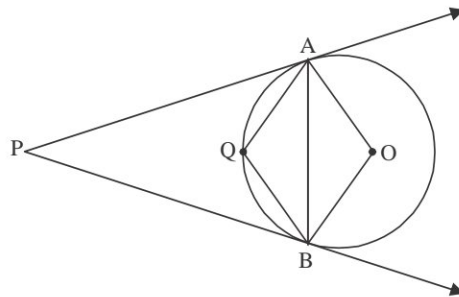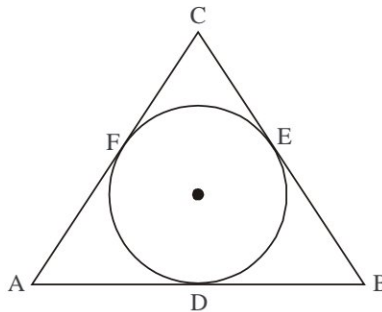

35. In the given figure, CD is a tangent and AB is a diameter of the circle. If $\angle DCB = 30°$, then find $\angle ADC$.
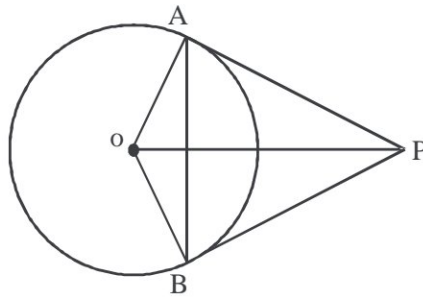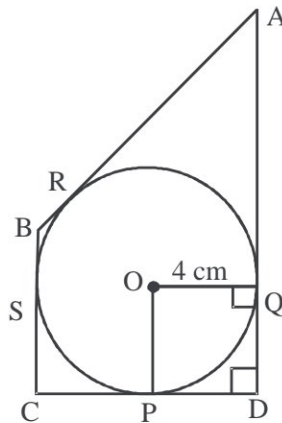

LONG ANSWER TYPE QUESTIONS

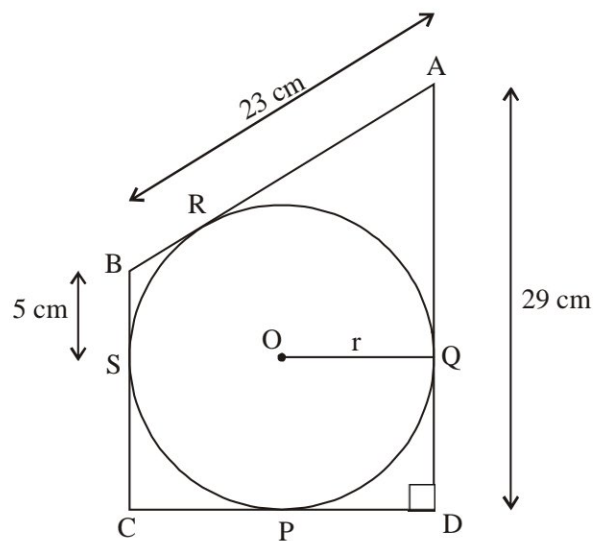**36.** In the given figure, find AD, BE, CF where AB = 12 cm, BC = 8 cm and AC = 10 cm.

Mathematics-X

37. In the given figure, OP is equal to the diameter of the circle with centre O. Prove that ΔABP is an equilateral triangle.

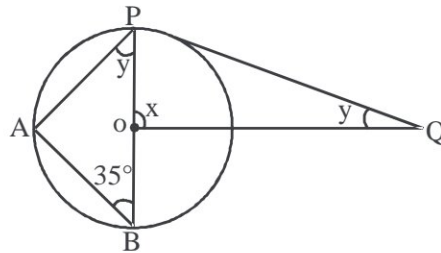**38.** In the given figure, find PC. If AB = 13 cm, BC = 7 cm and AD = 15 cm.

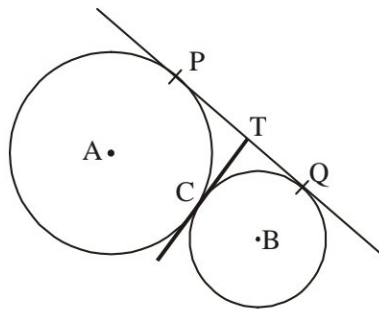**39.** In the given figure, find the radius of the circle.

Mathematics-X

**40.** In the given figure, PQ is tangent and PB is diameter. Find the values of angle *x* and *y*.

41. In the given figure, two circles touch each other at the point C. Prove that the common tangent to the circles at C, bisects the common tangent at P and Q.


42. In the given figure, a circle touches all the four sides of a quadrilateral ABCD. If AB = 6 cm, BC = 9 cm and CD = 8 cm, then find the length of AD.
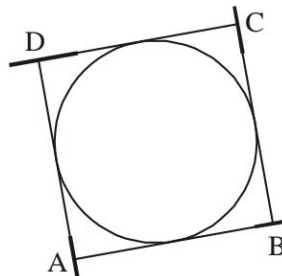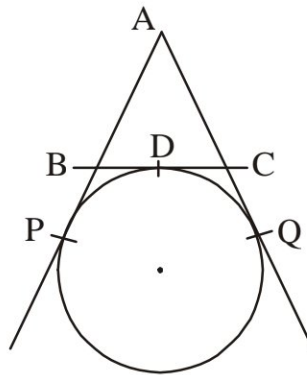

43. In the figure, PA is a tangent from an external point P to a circle with centre O. If ∠POB = 115°, then find ∠APO.
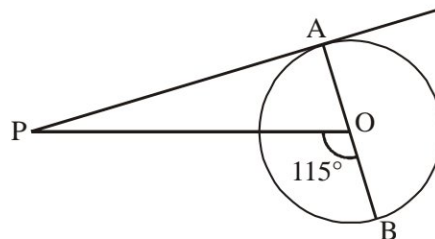
44. In the given figure, XP and XQ are tangents from X to the circle with centre O, R is a point on the circle and AB is tangent at R. Prove that :

XA + AR = XB + BR
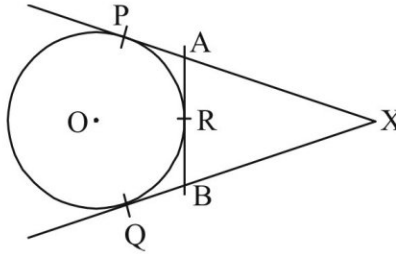
45. In the given figure, find the perimeter of ΔABC, if AP = 12 cm.

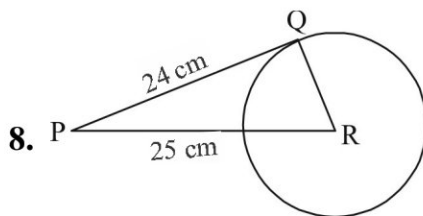## ANSWERS AND HINTS

1. (d) Infinitely many

2. (a) Only one point

3. (d) 180°

4. (d) $\sqrt{119}$ cm

5. (a) Two

6. (b) 47.5°

7. Since length of both the tangents from a point outside the circle is equal, So

$$BN = BL, \ CM = CL$$

$$BL + CL = BC = 10 \text{ cm}$$

8.

By Pythagoras Theorem, QR = 7 cm.