



1. PA and PB are tangents drawn from a point P to the circle with centre O. If $\angle APB = 60^\circ$, then what is $\angle AOB$?
2. From a point P, the length of the tangent to a circle is 15 cm and distance of P from the centre of the circle is 17 cm. What is the radius of the circle?
3. Prove that the tangent drawn at the mid-point of an arc of a circle is parallel to the chord joining the end points of the arc.
4. Prove that the rectangle which circumscribes a circle is a square.
5. Prove that the parallelogram circumscribing a circle is a rhombus.
6. A circle touches the side BC of a triangle ABC at a point P and touches AB and AC when produced at Q and R respectively. Show that AQ is equal to half of the perimeter of ABC.
7. XP and XQ are two tangents to a circle with centre O from a point X outside the circle. ARB is a tangent to circle at R intersect XP at A and XQ at B. Prove that $XA + AR = XB + BR$.
8. The incircle of $\triangle ABC$ touches the sides BC, CA and AB at D, E and F respectively.
If $AB = AC$, prove that $BD = CD$.
9. $\triangle PQR$ is right angled at Q. A circle with centre O has been inscribed in the triangle. If $PQ = 12$ cm and $QR = 5$ cm, find the radius of the circle.
10. If PA and PB are two tangents drawn from a point P to a circle with centre O touching it at A and B, prove that OP is the perpendicular bisector of AB.
11. If a, b, c are the sides of a right triangle where c is the hypotenuse, prove that the radius of the circle which touches the sides of the triangle is given by $r = \frac{a+b-c}{2}$.
12. The sides AB, BC and CA of triangle ABC touch a circle with centre O and radius r at P, Q and R respectively. Prove that:
 - i. $AB + CQ = AC + BQ$
 - ii. $\text{Area}(\triangle ABC) = \frac{1}{2} (\text{Perimeter of } \triangle ABC) \times r$
13. Two tangents are drawn to a circle with centre O, from a point P. If OP is equal to the diameter of the circle, show that $\triangle APB$ is equilateral .
14. A triangle ABC is drawn to circumscribe a circle of radius 2 cm such that the line segments BD and DC into which BC is divided by the point of contact D are of lengths 4 cm and 3 cm respectively. If area of $\triangle ABC = 21 \text{ cm}^2$, then find the lengths of sides AB and AC.

15. A circle is inscribed in a quadrilateral ABCD in which $\angle B = 90^\circ$. If $AD = 23$ cm, $AB = 29$ cm and $DS = 5$ cm, find the radius of the circle.
16. Two concentric circles are of radii 7 cm and r cm respectively, where $r > 7$. A chord of the larger circle, of length 48 cm, touches the smaller circle. Find the value of r .
17. There are two concentric circles with centre O and of radii 5 cm and 3 cm. From an external point P, tangents PA and PB are drawn to these circles. If $AP = 12$ cm, find the length of BP.
18. AB is a chord of length 9.6 cm, of a circle with centre O and radius 6 cm. The tangents at A and B intersect at P. Find the length of PA.
19. O is the centre of a circle with radius 5 cm, T is an external point such that $OT = 13$ cm and OT intersects the circle at E. If AB is the tangent to the circle at E, find the length of AB.
20. PQ is a chord of length 16 cm, of a circle of radius 10 cm. The tangents at P and Q intersect at a point T. Find the length of TP.

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