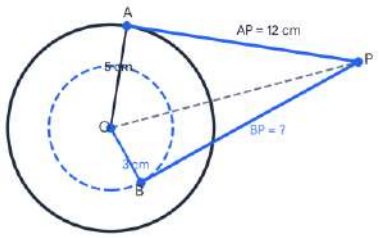
MATHS BASEMAKER

Class 10 CBSE — Chapter 10: Circles

Chapter Test Paper

SECTION A: MULTIPLE CHOICE QUESTIONS (4 Questions)

Q1. [CBSE Official Sample Paper MCQ] In the given figure, two concentric circles with centre O have radii 5 cm and 3 cm. From an external point P, tangents PA and PB are drawn to these circles respectively. If the length of tangent AP is 12 cm, find the length of tangent BP:



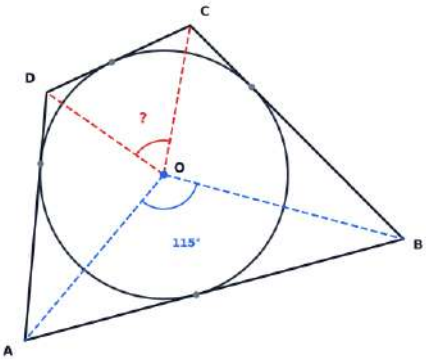
(a) 4√10 cm
(b) 2√38 cm
(c) 3√15 cm
(d) 10 cm

Q2. [CBSE Exemplar MCQ] At one end A of a diameter AB of a circle of radius 5 cm, tangent XAY is drawn to the circle. The length of the longest chord CD parallel to XY and at a distance of 8 cm from A is:

(a) 4 cm
(b) 5 cm
(c) 6 cm
(d) 8 cm

Q3. [CBSE Board Trap MCQ] In the given figure, quadrilateral ABCD is circumscribed about a circle with centre O such that its sides touch the circle at points P, Q, R, and S. If angle AOB = 115°, then the measure of angle COD is equal to:

(a) 65°
(b) 75°
(c) 115°
(d) 55°

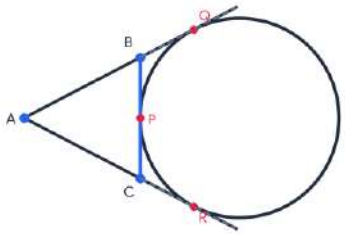


Q4. [CBSE Standard Sample Paper MCQ] PQ is a tangent at point C to a circle with centre O. If AB is a diameter of the circle and angle CAB = 30°, then the measure of angle PCA is:

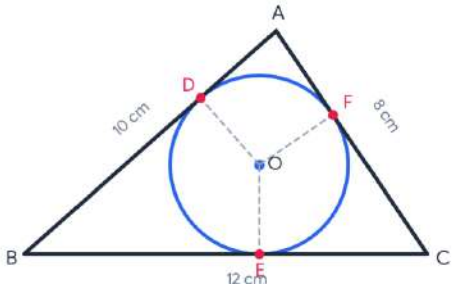
(a) 30°
(b) 60°
(c) 45°
(d) 90°

SECTION B: DESCRIPTIVE QUESTIONS (4 Questions)

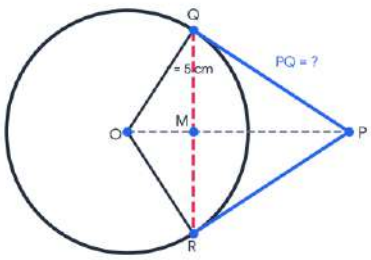
Q5. [CBSE Board 3-Marker — Tangent Intercept Logic] In the given figure, a circle touches the side BC of triangle ABC at point P and touches sides AB and AC produced at points Q and R respectively. Prove that:
AQ = (1/2) × (Perimeter of triangle ABC)



Q6. In the given figure, a circle with centre O is inscribed in triangle ABC touching the sides AB, BC, and CA at points D, E, and F respectively. If AB = 10 cm, BC = 12 cm, and CA = 8 cm, find the lengths of the tangent segments AD, BE, and CF.



Q7. [CBSE Board 4-Marker — Chord Length via External Tangents] In the given figure, tangents PQ and PR are drawn from an external point P to a circle of radius 5 cm with centre O. If the chord QR has length 8 cm, calculate the exact length of the tangent PQ.



Q8. [CBSE Board 5-Marker HOTS — Right Triangle Inradius] In a right-angled triangle ABC, right-angled at B, BC = 12 cm and AB = 5 cm. A circle is inscribed inside triangle ABC touching all three sides.
(i) Find the radius r of the inscribed circle.
(ii) Hence, find the lengths of the tangent segments from vertices A, B, and C to the points of contact.

Video solution link on YouTube : https://youtu.be/E_DwLgLPQMM

HINTS & STEPS

Q1. Solution & Steps [CBSE Official Sample Paper]

Hint: Connect external point P to centre O. Apply Pythagoras theorem in the two right triangles formed by the radii and tangents.

1. In right triangle OAP, OA = 5 cm (radius of outer circle), AP = 12 cm.

   $OP^2 = OA^2 + AP^2 = 5^2 + 12^2 = 25 + 144 = 169 \Rightarrow OP = 13$ cm.

2. In right triangle OBP, OB = 3 cm (radius of inner circle), OP = 13 cm.

   $OP^2 = OB^2 + BP^2 \Rightarrow 13^2 = 3^2 + BP^2 \Rightarrow 169 = 9 + BP^2$

   $BP^2 = 160 \Rightarrow BP = \sqrt{160} = \sqrt{(16 \times 10)} = 4\sqrt{10}$ cm.

Answer: (a) $4\sqrt{10}$ cm

Q2. Solution & Steps [CBSE Exemplar]

Hint: The diameter is perpendicular to the tangent at A. A parallel chord at distance 8 cm from A will be at distance $|8 - 5| = 3$ cm from the centre.

1. Radius of circle R = 5 cm, so diameter AB = 10 cm.
2. Tangent XY is perpendicular to diameter AB at A, so parallel chord CD is perpendicular to AB.
3. Distance of chord CD from centre O: OM = 8 - 5 = 3 cm.
4. Let M be the midpoint of chord CD. In right triangle OMC:

   $OC^2 = OM^2 + CM^2 \Rightarrow 5^2 = 3^2 + CM^2 \Rightarrow 25 = 9 + CM^2 \Rightarrow CM^2 = 16 \Rightarrow CM = 4$ cm.

5. Length of chord CD = $2 \times CM = 2 \times 4 = 8$ cm.

Answer: (d) 8 cm

Q3. Solution & Steps [CBSE Board Trap MCQ]

Hint: Opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre.

1. For any quadrilateral circumscribing a circle, opposite sides subtend supplementary angles at the centre OR Opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle."
: angle AOB + angle COD = 180°
2. Given angle AOB = 115°:

   115° + angle COD = 180° => angle COD = 180° - 115° = 65°.

Answer: (a) 65°

Q4. Solution & Steps [CBSE Standard Sample Paper]

Hint: Angle in a semicircle is 90°, and radius to point of contact is perpendicular to the tangent.

1. AB is diameter, so angle ACB = 90° (angle in a semicircle).
2. In right triangle ACB: angle ABC = 180° - (90° + 30°) = 60°.
3. In triangle OCA, OA = OC (radii) => angle OCA = angle CAB = 30°.
4. Radius OC is perpendicular to tangent PQ at C => angle OCP = 90°.
5. angle PCA = angle OCP - angle OCA = 90° - 30° = 60°.

Answer: (b) 60°

Q5. Solution & Steps [CBSE Board 3-Marker]

Hint: Tangents drawn from an external point to a circle are equal in length.

1. From external point A: AQ = AR.
2. From external point B: BQ = BP.
3. From external point C: CR = CP.
4. Perimeter of triangle ABC = AB + BC + CA = AB + (BP + CP) + CA
   Substitute BP = BQ and CP = CR:
   Perimeter = (AB + BQ) + (CA + CR) = AQ + AR
5. Since AR = AQ:
   Perimeter of triangle ABC = AQ + AQ = 2 × AQ
   AQ = (1/2) × (Perimeter of triangle ABC). (Hence Proved)

Answer: AQ = (1/2) × (Perimeter of triangle ABC) (Proved)

Q6. Solution & Steps [CBSE Exemplar / Sample Paper]

Hint: The perimeter of the triangle formed by a tangent cutting two tangents equals twice the tangent length.

1. Tangents from external point X are equal: XP = XQ = 16 cm.
2. Tangents from external point A: AP = AR.
3. Tangents from external point B: BQ = BR.
4. Perimeter of triangle XAB = XA + XB + AB = XA + XB + (AR + BR)
   Substitute AR = AP and BR = BQ:
   Perimeter = (XA + AP) + (XB + BQ) = XP + XQ = 16 + 16 = 32 cm.

Answer: 32 cm

Q7. Solution & Steps [CBSE Board 4-Marker]

Hint: The line joining the centre to an external point is the perpendicular bisector of the chord of contact. Use similar right triangles.

1. OP is the perpendicular bisector of chord QR at M.
   QM = QR / 2 = 8 / 2 = 4 cm.
2. In right triangle OMQ: OQ = 5 cm (radius), QM = 4 cm.
   OM = $\sqrt{(OQ^2 - QM^2)} = \sqrt{(5^2 - 4^2)} = \sqrt{(25 - 16)} = \sqrt{9} = 3$ cm.
3. In right triangle OQP (right-angled at Q, since radius OQ is perpendicular to tangent PQ):
   triangle OMQ ~ triangle OQP (by AA similarity)
   PQ / QM = OQ / OM => PQ / 4 = 5 / 3 => PQ = 20/3 cm (approx 6.67 cm).

Answer: 20/3 cm (or 6.67 cm)

Q8. Solution & Steps [CBSE Board 5-Marker HOTS]

Hint: Find hypotenuse AC. Notice that quadrilateral BDOE formed by the inradius at the right-angle vertex B is a square.

1. In right triangle ABC: AC = $\sqrt{(AB^2 + BC^2)} = \sqrt{(5^2 + 12^2)} = \sqrt{169} = 13$ cm.
2. Let circle touch AB at D, BC at E, and AC at F.

At vertex B (angle B = 90°), radius OD is perpendicular to AB and OE is perpendicular to BC.

Quadrilateral BDOE has three right angles and adjacent sides OD = OE = r, so BDOE is a square.

Therefore, BD = BE = r.

3. Tangents from external points: AD = AF = 5 - r, CE = CF = 12 - r.

4. AC = AF + CF => 13 = (5 - r) + (12 - r) => 13 = 17 - 2r => 2r = 4 => r = 2 cm.

5. Lengths of tangent segments from vertices:

From A: AD = AF = 5 - 2 = 3 cm.

From B: BD = BE = 2 cm.

From C: CE = CF = 12 - 2 = 10 cm.

Answer: (i) r = 2 cm, (ii) From A: 3 cm, From B: 2 cm, From C: 10 cm

Video solution link on YouTube : https://youtu.be/E_DwLgLPQMM