



Attempt questions first; check the separate key afterward. Show steps and draw labelled diagrams where asked.

A. Very short answers - 1 mark each

1. Define tangent to a circle.
2. How many tangents exist at a point on a circle?
3. State the angle between tangent and radius at contact.
4. How many tangents can be drawn from an exterior point?
5. Can a tangent pass through the centre of a non-zero-radius circle?
6. Define point of contact.
7. If PA and PB are tangents from P and $PA=7$ cm, find PB.
8. How many tangents can be drawn from an interior point?

B. Short answers / practice - 2 marks each

9. A circle has radius 5 cm; $OP=13$ cm. Find tangent length from P.
10. Tangent length is 8 cm and radius 6 cm. Find distance of exterior point from centre.
11. If angle $APB=60^\circ$ for tangents PA, PB, find angle AOB.
12. If central angle $AOB=140^\circ$, find angle between tangents at A, B.
13. Two tangents PA, PB have $PA=3x+1$ and $PB=5x-7$. Find x.
14. Explain why a secant is not a tangent.
15. A radius is 9 cm and $OP=15$ cm. Find tangent length.
16. If tangents from P make angle 90° , find angle AOB.
17. Prove that tangent segments from an exterior point are equal.
18. Prove that a tangent is perpendicular to the radius at contact.
19. Find perimeter of triangle PAB if $PA=PB=10$ and $AB=12$.
20. Can two tangents from one exterior point have different lengths?

C. Application / reasoning - 3 marks each

21. A circle touches sides of quadrilateral ABCD. Prove $AB+CD=BC+AD$.
22. A tangential quadrilateral has sides 5, 8, 9, x in order. Find x.
23. A circle touches AB, BC, CA of a triangle with sides 13, 14, 15. Find tangent lengths from vertices A, B, C.
24. Show that OP bisects the angle between tangents PA and PB.
25. A circle of radius 4 has exterior point at distance 8. Find tangent length.
26. Explain why a line at distance greater than radius from centre misses the circle.
27. A circle of radius 12 cm has an exterior point 13 cm from its centre. Find tangent length.
28. Tangents PA and PB have lengths $4x-1$ and $2x+9$. Find x and tangent length.
29. If angle between two tangents is 80° , find the corresponding smaller central angle.
30. A tangential quadrilateral has successive sides 7, 10, 13, x cm. Find x.
31. A circle touches all sides of a triangle. Prove that a vertex's tangent length equals semiperimeter minus the opposite side.

D. Extended practice - 5 marks each

32. A circle is inscribed in a right triangle with legs 6 and 8. Find radius using tangent lengths.
33. A rhombus circumscribes a circle. Explain why opposite contact segments lead to equal side sums.
34. Tangents PA, PB make 60° and circle radius is 6 cm. Find OP and tangent lengths.
35. Prove that the centre, exterior point and midpoint of the chord of contact are collinear.

ANSWER KEY - Numerical / closed questions

- 2) One. 3) 90° . 4) Two. 5) No. 7) 7 cm. 8) None. 9) 12 cm. 10) 10 cm. 11) 120° . 12) 40° . 13) 4. 15) 12 cm. 16) 90° . 19) 32 cm. 20) No. 22) 6. 23) 7, 6, 8 respectively for AB 13, BC 14, CA 15. 25) $4\sqrt{3}$. 27) 5 cm. 28) $x=5$; 19 units. 29) 100° . 30) 10 cm. 32) 2. 34) OP 12 cm; $PA=PB=6\sqrt{3}$ cm.