DANEMATHICS
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GRADE 11 · EUCLIDEAN GEOMETRY

Circle Geometry Riders: Proofs, Converses & Method (Grade 11)

MEMORANDUM

Name: ..... Class: .....

Date: .....

MARK ____ / 30

Answer all questions. Show all your working — marks are awarded for method as well as the final answer. **Teacher copy: accept any correct equivalent method.**

1 State the axiom about a tangent and a radius that all of circle geometry is built on. (2)

> A tangent to a circle is perpendicular to the radius drawn to the point of contact ✓✓ (2)

2 O is the centre and $A\hat{P}B = 28°$, with A, B and P on the circle. Determine $A\hat{O}B$, with a reason. (2)

> $A\hat{O}B = 2 \times 28° = 56°$ ✓ (∠ at centre $= 2 \times$ ∠ at circumference) ✓ (2)

3 In cyclic quadrilateral ABCD, $\hat{A} = 118°$. Determine $\hat{C}$, and state the theorem you used. (3)

> $\hat{C} = 180° - 118°$ ✓ $= 62°$ ✓ (opp ∠s of a cyclic quad are supplementary) ✓ (3)

4 In quadrilateral KLMN, $\hat{K} = 96°$ and $\hat{M} = 84°$. Prove that KLMN is cyclic. (3)

> $\hat{K} + \hat{M} = 96° + 84°$ ✓ $= 180°$ ✓; ∴ KLMN is cyclic (converse: opp ∠s supplementary) ✓ (3)

5 O is the centre of a circle of radius 17 cm. A chord PQ is 30 cm long and M is its midpoint. Determine OM. (4)

> OM ⊥ PQ ✓ (line from centre to midpt of chord); PM = 15 cm ✓; $OM^2 = 17^2 - 15^2 = 289 - 225 = 64$ ✓; OM = 8 cm ✓ (4)

6 TA is a tangent at A and AB is a chord. The tangent–chord angle $T\hat{A}B = 52°$. Write down the size of the angle in the alternate segment, with a reason, and then determine $O\hat{A}B$. (3)

> The angle in the alternate segment $= 52°$ ✓ (tan–chord ∠) ✓; $O\hat{A}B = 90° - 52° = 38°$ ✓ (tan ⊥ radius) (3)

7 Explain why you may NOT quote "opp ∠s of a cyclic quad" as a reason inside a proof that a quadrilateral IS cyclic. (3)

> That reason assumes the quadrilateral is already cyclic ✓, which is exactly what is being proved ✓. You must show the opposite angles add to 180° and then conclude using the CONVERSE ✓. (3)

8 In $\triangle OMA$, O is the centre, OA is a radius and $OM \perp AB$ where AB is a chord. Prove that AM = MB. (4)

> Join OB ✓ (construction); OA = OB (radii) ✓; OM = OM (common); $O\hat{M}A = O\hat{M}B = 90°$ (given) ✓; $\therefore \triangle OMA \equiv \triangle OMB$ (RHS); $\therefore$ AM = MB ($\equiv\triangle$s) ✓ (4)

9 State the converse of the tangent–chord theorem and say what it is used to prove. (3)

> If the angle between a line and a chord equals the angle in the alternate segment ✓, then that line is a tangent to the circle ✓. It is used to PROVE that a given line is a tangent ✓. (3)

10 O is the centre and $A\hat{O}B = 96°$. OA and OB are radii. Determine $O\hat{A}B$, with reasons. (3)

> OA = OB (radii) ✓, so $\triangle OAB$ is isosceles and $O\hat{A}B = O\hat{B}A$ ($\angle$s opp equal sides) ✓; $O\hat{A}B = (180° - 96°) \div 2 = 42°$ ✓ (3)

TOTAL: 30 marks

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