Grade 12 Mathematics: Euclidean Geometry Study Guide

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1. Circle Theorems (Grade 11 Revision)

- Angle at centre = twice angle at circumference (same arc)
- Angles in the same segment are equal
- Angle in a semi-circle = 90 deg
- Opposite angles of cyclic quadrilateral are supplementary (add to 180 deg)
- Exterior angle of cyclic quad = interior opposite angle
- Tangent _|_ radius at point of contact
- Two tangents from external point are equal in length

2. Grade 12 Geometry Theorems

Proportion Theorem (Basic Proportionality)

A line drawn parallel to one side of a triangle divides the other two sides proportionally.

If DE || BC in TriABC, then AD/DB = AE/EC.

Midpoint Theorem

The line segment joining the midpoints of two sides of a triangle is parallel to the third side and equal to half its length.

Similar Triangles (AAA / SSS / SAS)

Triangles are similar if:
- All corresponding angles are equal (AAA)
- All corresponding sides are proportional (SSS)
- Two pairs of sides proportional with equal included angle (SAS)

If TriABC |||| TriDEF: AB/DE = BC/EF = AC/DF

And: Area(ABC)/Area(DEF) = (AB/DE)2

3. Pythagoras & Similar Triangles

In a right-angled triangle, the square on the hypotenuse equals the sum of the squares on the other two sides.

Using similar triangles in a right-angled Tri (altitude drawn to hypotenuse h from right angle to hypotenuse):

h2 = p.q (where p, q are parts of hypotenuse)

a2 = p.c

b2 = q.c

4. Exam Proof Strategy

1. Draw and label a clear diagram
2. State what needs to be proven
3. Give reasons in brackets [ ] or () after each statement
4. Use correct notation: || for parallel, _|_ for perpendicular, Tri for triangle
5. Quote theorems by their full name

TIP Common reasons to quote: "angles in same segment", "opp angles of cyclic quad", "tan-chord angle = angle in alt seg", "prop theorem, DE||BC"