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| **UNIT 16: Circle theorems and circle geometry** |

[Return to Overview](#HOverview)

**SPECIFICATION REFERENCES**

A16 **recognise and use the equation of a circle with centre at the origin; find the equation of a tangent to a circle at a given point**

G9 identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment

G10 **apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results**

**PRIOR KNOWLEDGE**

Students should have practical experience of drawing circles with compasses.

Students should recall the words, centre, radius, diameter and circumference.

Students should recall the relationship of the gradient between two perpendicular lines.

Students should be able to find the equation of the straight line, given a gradient and a coordinate.

**KEYWORDS**

Radius, centre, tangent, circumference, diameter, gradient, perpendicular, reciprocal, coordinate, equation, substitution, chord, triangle, isosceles, angles, degrees, cyclic quadrilateral, alternate, segment, semicircle, arc, theorem

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| **16b. Circle geometry**  (A16) | **Teaching time**  4-6 hours |

**OBJECTIVES**

By the end of the sub-unit, students should be able to:

* Select and apply construction techniques and understanding of loci to draw graphs based on circles and perpendiculars of lines;
* Find the equation of a tangent to a circle at a given point, by:
* finding the gradient of the radius that meets the circle at that point (circles all centre the origin);
* finding the gradient of the tangent perpendicular to it;
* using the given point;
* Recognise and construct the graph of a circle using *x*2 + *y*2 = *r*2 for radius *r* centred at the origin of coordinates.

**POSSIBLE SUCCESS CRITERIA**

Find the gradient of a radius of a circle drawn on a coordinate grid and relate this to the gradient of the tangent.

Justify the relationship between the gradient of a tangent and the radius.

Produce an equation of a line given a gradient and a coordinate.

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Justify if a straight-line graph would pass through a circle drawn on a coordinate grid.

**COMMON MISCONCEPTIONS**

Students find it difficult working with negative reciprocals of fractions and negative fractions.

**NOTES**

Work with positive gradients of radii initially and review reciprocals prior to starting this topic.

It is useful to start this topic through visual proofs, working out the gradient of the radius and the tangent, before discussing the relationship.