



Essential Knowledge

- Recall the definition of a circle and identify (name) and draw parts of a circle, including sector, tangent, chord, segment;
- Prove and use the facts that:
- the angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the circumference;
- the angle in a semicircle is a right angle;
- the perpendicular from the centre of a circle to a chord bisects the chord;
- angles in the same segment are equal;
- alternate segment theorem;
- opposite angles of a cyclic quadrilateral sum to 180° ;
- Understand and use the fact that the tangent at any point on a circle is perpendicular to the radius at that point;
- Find and give reasons for missing angles on diagrams using:
- circle theorems;
- isosceles triangles (radius properties) in circles;
- the fact that the angle between a tangent and radius is 90° ;
- the fact that tangents from an external point are equal in length.
- 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.

Teaching Points

- Reasoning needs to be carefully constructed and correct notation should be used throughout.
- Students should label any diagrams clearly, as this will assist them; particular emphasis should be made on labelling any radii in the first instance
- 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

Assumed Prior Knowledge/ Links / Interleaving

- 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.

Potential Barriers to Access / Misconceptions		Opportunities for Reasoning/Problem Solving/Proofs	
<ul style="list-style-type: none"> • Much of the confusion arises from mixing up the diameter and the radius. • Students find it difficult working with negative reciprocals of fractions and negative fractions 		<ul style="list-style-type: none"> • Problems that involve a clear chain of reasoning and provide counter-arguments to statements. • Can be linked to other areas of mathematics by incorporating trigonometry and Pythagoras' Theorem. • Justify if a straight-line graph would pass through a circle drawn on a coordinate grid. 	
Key Mathematical Vocabulary	Radius, centre, tangent, circumference, diameter, gradient, perpendicular, reciprocal, coordinate, equation, substitution, chord, triangle, isosceles, angles, degrees, cyclic quadrilateral, alternate, segment, semicircle, arc, theorem		