

**Long  
Term Plan**

In year 11, pupils deepen understanding working with Circles and Trigonometry in order to be able to solve more complex problems. Pupils consider different ways to solve quadratics both algebraically and graphically depending on whether they want to the roots or the vertex and intercept. Year 11 pupils will begin to explore the concepts behind formal proof and how to construct rigorous mathematical arguments across a range of topics.

**Year 11: Mathematics**

	<b>Learning Cycle</b>	<b>Key Concepts and Themes</b>	<b>Vocabulary</b>
<b>HT1</b>	<p>Circles</p> <p>Trigonometry</p> <p>Linear and Quadratic Equations</p>	<ul style="list-style-type: none"> <li>Understand and apply circle theorems in geometric reasoning. State the equation of a circle and find the equation of a tangent.</li> <li>Use trigonometric functions to solve problems in right-angled triangles. Use sine and cosine rules in non-right-angled triangles. Use trig to find the area of a triangle. Solve problems in similar shapes and use bearings.</li> <li>Solve quadratic equations by factorisation. Approximate solutions to quadratics by graphing. Solve quadratic equations using the quadratic formula or by completing the square. Identify the key points of quadratic graphs and use to sketch. Solve quadratic and linear simultaneous equations.</li> </ul>	<p>Chord, Tangent, Arc, Sector, Segment, Theorem, Angle, Normal, Sine, Cosine, Tangent, Pythagoras' theorem, Similar shapes, Bearings, Root (of function), Parabola, Vertex, turning point, Solve, Variable, Equation.</p>
<b>HT2</b>	<p>Rate of Change</p> <p>Further Sequences</p> <p>Data Representations</p>	<ul style="list-style-type: none"> <li>Draw a tangent to a curve. Estimate the gradient at a point on a curve. Find the area under a linear graph. Estimate the area under a non-linear graph. Solve worded problems involving gradients/areas. Repeated proportional (percentage) change. Compound interest and depreciation.</li> <li>Identify a quadratic sequence and find missing terms. Find terms in a quadratic, cubic or fractional sequence when given the nth term. Combine nth terms of linear sequences to make complex sequences in the form of fractions. Find the nth term of a quadratic sequence in the form <math>an^2 + bn + c</math>.</li> <li>Construct a cumulative frequency diagram. Find median and IQR</li> <li>Draw a box plot from a cumulative frequency diagram.</li> <li>Construct histograms with both equal and unequal class intervals. MMR from grouped frequency tables.</li> <li>Draw frequency trees.</li> </ul>	<p>Gradient, tangent, area, velocity, speed, time, distance, instantaneous, average, variable, curve, percentage, proportional, depreciation, compound, growth, decay, Sequence, Linear, Quadratic, Relationship, Arithmetic, Geometric, Progression, nth term, Difference, Coefficient.</p> <p>Representation, data, cumulative, frequency, mean, median, mode, range, interquartile range, quartile, compare, interpret.</p>
<b>HT3</b>	<p>Trends</p> <p>Vectors</p> <p>Inequalities</p>	<ul style="list-style-type: none"> <li>Plot and interpret data used in a scatter graph, describing the correlation and relationship between the two variables.</li> <li>Draw and use a line of best to make predictions on data.</li> <li>Describe trends in populations based on numerical results.</li> <li>Add and subtract vectors. Draw vectors. Multiply column vectors by a scalar and be able to represent this as a diagram. Combine sums and scalar multiplication of vectors. Solve geometrical problems involving vectors. Solve vector proof problems.</li> <li>Represent inequalities on a number line and using set notation. Express integer values of an inequality. Solve linear inequalities. Recognise and represent inequalities on a graph. Solve quadratic inequalities and be able to represent this graphically.</li> </ul>	<p>Variable, Data, Scatter Graph, Independent, Dependant, Correlation, Line of Best Fit, Trends, Outlier, Anomaly, Sample, Representative, Stratified, Random, Predict.</p> <p>Column, vector, distance, direction, resultant, scalar multiple, coefficient.</p> <p>Inequality, integer, set notation, solve, equation, coordinate, linear, graph, variable, quadratic.</p>
<b>HT4</b>	<p>Proof</p> <p>Advanced Area and Volume</p> <p>Combined Transformations</p>	<ul style="list-style-type: none"> <li>Use identities to equate coefficients. Understand and construct mathematical arguments. Use algebra to write generalised expressions to prove results. Construct geometric proofs. Convert recurring decimals to fractions using mathematical proof.</li> <li>Calculate the arc length given the angle subtended at the centre and vice versa. Find the area of a sector given the radius and angle. Find the volume of composite shapes made from pyramids, cones, spheres and frustums. Find the surface area of complex composite solids.</li> <li>Enlarge a shape on a coordinate grid using a centre of enlargement. Enlarge and describe a shape using fractional and negative scale factors.</li> <li>Draw and accurately describe translations including the use of column vectors. Draw and accurately describe reflections and rotations. Be able to combine a variety of transformations to produce a final result on a grid.</li> </ul>	<p>Identity, equivalent, equation, coefficient, expression, algebra, reasoning, prove, geometrical, angle, infinity, recurring, decimal, fraction, irrational, terminating.</p> <p>Circle, arc, radius, circumference, angle, centre, sector, segment, area, pi, volume, sphere, pyramid, cone, tetrahedron, hemisphere, surface area, frustum.</p> <p>Enlargement, similarity, centre, coordinate, scale factor, fractional, negative, quadrant, invariance, reflection, rotation, translation, vector, cartesian, transformation.</p>

**Skill Development**

- Make and test conjectures about the generalisations that underlie patterns and relationships; look for proofs or counter-examples; develop further their use of algebra to support and construct arguments.
- Accurately interpret statistical and geometrical representations, and express arguments formally.
- Assess the validity of an argument and the accuracy of a given way of presenting information.
- Justify their reasoning in an articulate way using formal mathematical language.
- Develop mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems, financial contexts and worded scenarios.
- Make and use connections between different parts of mathematics to solve problems.
- Select appropriate concepts, methods and techniques to apply to unfamiliar and nonroutine problems; interpret solutions in the context of the given problem.