



Mathematics is a highly interwoven subject, this curriculum maps attempts to highlight only some of the key links.

Topic name	Term	Skills developed	Next link in curriculum
Algebraic Expressions	Autumn	<ul style="list-style-type: none"><li>• Multiply and divide integer powers</li><li>• Expand a single term over brackets and collect like terms</li><li>• Expand the product of two or three expressions</li><li>• Factorise linear, quadratic and simple cubic expressions</li><li>• Know and use the laws of indices</li><li>• Simplify and use the rules of surds</li><li>• Rationalise denominators</li></ul>	<ul style="list-style-type: none"><li>• Quadratics Y12</li></ul>
Quadratics	Autumn	<ul style="list-style-type: none"><li>• Solve quadratic equations using factorisation, the quadratic formula and completing the square</li><li>• Read and use <math>f(x)</math> notation when working with functions</li><li>• Sketch the graph and find the turning point of a quadratic function</li><li>• Find and interpret the discriminant of a quadratic expression</li><li>• Use and apply models that involve quadratic functions</li></ul>	<ul style="list-style-type: none"><li>• Graphs and Transformations Y12</li></ul>
Equations and Inequalities	Autumn	<ul style="list-style-type: none"><li>• Solve linear simultaneous equations using elimination or substitution</li><li>• Solve simultaneous equations: one linear and one quadratic</li><li>• Interpret algebraic solutions of equations graphically</li><li>• Solve linear inequalities</li><li>• Solve quadratic inequalities</li><li>• Interpret inequalities graphically</li><li>• Represent linear and quadratic inequalities graphically</li></ul>	<ul style="list-style-type: none"><li>• Straight Line Graphs Y12</li></ul>
Graphs and Transformations	Autumn	<ul style="list-style-type: none"><li>• Sketch cubic graphs</li><li>• Sketch quartic graphs</li><li>• Sketch reciprocal graphs of the form <math>y = \frac{a}{x}</math> and <math>y = \frac{a}{x^2}</math></li><li>• Use intersection points of graphs to solve equations</li><li>• Translate graphs</li><li>• Stretch graphs</li><li>• Transform graphs of unfamiliar functions</li></ul>	<ul style="list-style-type: none"><li>• Straight Line Graphs Y12</li><li>• Circles Y12</li></ul>



Straight Line Graphs	Autumn	<ul style="list-style-type: none"><li>• Calculate the gradient of a line joining a pair of points</li><li>• Understand the link between the equation of a line, and its gradient and intercept</li><li>• Find the equation of a line given (i) the gradient and one point on the line or (ii) two points on the line</li><li>• Find the point of intersection for any pair of straight lines</li><li>• Know and use the rules for parallel and perpendicular gradients</li><li>• Solve length and area problems on coordinate grids</li><li>• Use straight line graphs to construct mathematical models</li></ul>	<ul style="list-style-type: none"><li>• Circles Y12</li></ul>
Circles	Autumn	<ul style="list-style-type: none"><li>• Find the midpoint of a line segment</li><li>• Find the equation of the perpendicular bisector to a line segment</li><li>• Know how to find the equation of a circle</li><li>• Solve geometrical problems involving straight lines and circles</li><li>• Use circle properties to solve problems on coordinate grids</li><li>• Find the angle in a semicircle and solve other problems involving circles and triangles</li></ul>	<ul style="list-style-type: none"><li>• Functions and Graphs Y13</li></ul>
Modelling in Mechanics	Autumn	<ul style="list-style-type: none"><li>• Understand how the concept of a mathematical model applies to mechanics</li><li>• Understand and be able to apply some of the common assumptions used in mechanical models</li><li>• Know SI units for quantities and derived quantities used in mechanics</li><li>• Know the difference between a scalar and vector quantities</li></ul>	<ul style="list-style-type: none"><li>• Constant Acceleration Y12</li><li>• Underpins all KS5 Mechanics</li></ul>
Data Collection	Autumn	<ul style="list-style-type: none"><li>• Understand 'population', 'sample' and 'census', and comment on the advantages and disadvantages of each</li><li>• Understand the advantages and disadvantages of simple random sampling, systematic sampling, stratified sampling, quota sampling and opportunity sampling</li><li>• Define qualitative, quantitative discrete and continuous data, and understand grouped data</li><li>• Understand the large data set</li></ul>	<ul style="list-style-type: none"><li>• Measures of Location and Spread Y12</li></ul>



Measures of Location and Spread	Autumn	<ul style="list-style-type: none"><li>• Calculate measures of central tendency such as the mean, median and mode</li><li>• Calculate measures of location such as percentiles and deciles</li><li>• Calculate measures of spread such as range, interquartile range and interpercentile range</li><li>• Calculate variance and standard deviation</li><li>• Understand and use coding</li></ul>	<ul style="list-style-type: none"><li>• Probability Y12</li><li>• Representations of Data Y12</li></ul>
Algebraic Methods	Autumn	<ul style="list-style-type: none"><li>• Cancel factors in algebraic fractions</li><li>• Divide a polynomial by a linear expression</li><li>• Use the factor theorem to factorise a cubic expression</li></ul>	<ul style="list-style-type: none"><li>• Algebraic Methods Y13</li></ul>
The Binomial Expansion	Autumn	<ul style="list-style-type: none"><li>• Use Pascal's triangle to identify binomial coefficients and use them to expand simple binomial expressions</li><li>• Use combinations and factorial notation</li><li>• Use the binomial expansion to expand brackets</li><li>• Find individual coefficients in a binomial expansion</li><li>• Make approximations using the binomial expansions</li></ul>	<ul style="list-style-type: none"><li>• Binomial Expansion (Year 13) – This is a different type of expansion that is explored</li></ul>
Differentiation	Autumn	<ul style="list-style-type: none"><li>• Find the derivative, <math>f'(x)</math> or <math>\frac{dy}{dx}</math>, of a simple function</li><li>• Use the derivative to solve problems involving gradients, tangents and normal</li><li>• Identify increasing and decreasing functions</li><li>• Find the second order derivative, <math>f''(x)</math> or <math>\frac{d^2y}{dx^2}</math> of a simple function</li><li>• Find stationary points of functions and determine their nature</li><li>• Sketch the gradient function of a given function</li><li>• Model real-life situations with differentiation</li></ul>	<ul style="list-style-type: none"><li>• Differentiation (Year 13)</li><li>• Integration Y12 and 13</li><li>• Variable Acceleration Y12</li></ul>
Proof	Autumn	<ul style="list-style-type: none"><li>• Construct mathematical proofs using algebra</li><li>• Use proof by exhaustion and disproof by counter-example</li><li>• Use proof by contradiction to prove true statements</li></ul>	<ul style="list-style-type: none"><li>• Various topics such as Trigonometry require well-presented and logical arguments in "Show that" questions Y12</li></ul>



Constant Acceleration	Autumn	<ul style="list-style-type: none"> <li>Understand and interpret displacement-time graphs</li> <li>Understand and interpret velocity-time graphs</li> <li>Derive the constant acceleration formulae and use them to solve problems</li> <li>Use the constant acceleration formulae to solve problems involving vertical motion under gravity</li> </ul>	<ul style="list-style-type: none"> <li>Variable Acceleration Y12</li> <li>Projectiles Y13 (working in 2 Dimensions)</li> </ul>
Representations of Data	Autumn	<ul style="list-style-type: none"> <li>Identify outliers in data sets</li> <li>Draw and interpret boxplots</li> <li>Draw and interpret cumulative frequency diagrams</li> <li>Draw and interpret histograms</li> <li>Compare two data sets</li> </ul>	<ul style="list-style-type: none"> <li>Correlation Y12</li> </ul>
Trigonometric Ratios	Spring	<ul style="list-style-type: none"> <li>Use the cosine rule to find a missing side or angle</li> <li>Use the sine rule to find a missing side or angle</li> <li>Find the area of a triangle using an appropriate formula</li> <li>Solve problems involving triangles</li> <li>Sketch the graphs of the sine, cosine and tangent functions</li> <li>Sketch simple transformations of these graphs</li> </ul>	<ul style="list-style-type: none"> <li>Trigonometric Identities and Equations Y12</li> <li>Radians Y13</li> </ul>
Trigonometric Identities and Equations	Spring	<ul style="list-style-type: none"> <li>Calculate the sine, cosine and tangent of any angle</li> <li>Know the exact trigonometric ratios for <math>30^\circ</math>, <math>45^\circ</math> and <math>60^\circ</math></li> <li>Know and use the relationships <math>\tan \theta \equiv \frac{\sin \theta}{\cos \theta}</math> and <math>\sin^2 \theta + \cos^2 \theta \equiv 1</math></li> <li>Solve simple trigonometric equations of the forms <math>\sin \theta = k</math>, <math>\cos \theta = k</math> and <math>\tan \theta = k</math></li> <li>Solve more complicated trigonometric equations of the forms <math>\sin n\theta = k</math> and <math>\sin(\theta \pm \alpha) = k</math> and equivalent equation involving cos and tan</li> <li>Solve trigonometric equations that produce quadratics</li> </ul>	<ul style="list-style-type: none"> <li>Trigonometric Functions Y13</li> </ul>
Integration	Spring	<ul style="list-style-type: none"> <li>Find <math>y</math> given <math>\frac{dy}{dx}</math> for <math>x^n</math></li> <li>Integrate polynomials</li> <li>Find <math>f(x)</math>, given <math>f'(x)</math> and a point on the curve</li> <li>Evaluate a definite integral</li> <li>Find the area bounded by a curve and the <math>x</math>-axis</li> <li>Find areas bounded by curves and straight lines</li> </ul>	<ul style="list-style-type: none"> <li>Integration Y13</li> </ul>



Exponentials and Logarithms	Spring	<ul style="list-style-type: none"> <li>• Sketch graphs of the form <math>y = a^x</math>, <math>y = e^x</math>, and transformations of these</li> <li>• Differentiate <math>e^{kx}</math> and understand why this result is important</li> <li>• Use and interpret models that use exponential functions</li> <li>• Recognise the relationship between exponents and logarithms</li> <li>• Recall and apply the laws of logarithms</li> <li>• Solve equations of the form <math>a^x = b</math></li> <li>• Describe and use the natural logarithm function</li> <li>• Use logarithms to estimate the values of constants in non-linear models</li> </ul>	<ul style="list-style-type: none"> <li>• Regression, Correlation and Hypothesis Testing Y13</li> <li>• Various other topics Y13</li> </ul>
Correlation	Spring	<ul style="list-style-type: none"> <li>• Draw and interpret scatter diagrams for bivariate data</li> <li>• Interpret correlation and understand that it does not imply causation</li> <li>• Interpret the coefficients of a regression line equation for bivariate data</li> <li>• Understand when you can use a regression line to make predictions</li> </ul>	<ul style="list-style-type: none"> <li>• Regression, Correlation and Hypothesis Testing Y13</li> </ul>
Probability	Spring	<ul style="list-style-type: none"> <li>• Calculate probabilities for single events</li> <li>• Draw and interpret Venn Diagrams</li> <li>• Understand mutually exclusive and independent events, and determine whether two events are independent</li> <li>• Use and understand tree diagrams</li> <li>• Understand set notation in probability</li> <li>• Understand conditional probability</li> <li>• Solve conditional probability problems using two-way tables and Venn diagrams</li> </ul>	<ul style="list-style-type: none"> <li>• Statistical Distributions Y12</li> </ul>
Forces and Motion	Spring	<ul style="list-style-type: none"> <li>• Draw force diagrams and calculate resultant forces</li> <li>• Understand and use Newton's first law</li> <li>• Calculate resultant forces by adding vectors</li> <li>• Understand and use Newton's second law, <math>F = ma</math></li> <li>• Apply Newton's second law to vector forces and acceleration</li> <li>• Understand and use Newton's third law</li> <li>• Solve problems involving connected particles</li> </ul>	<ul style="list-style-type: none"> <li>• Moments Y13</li> <li>• Forces and Friction Y13</li> </ul>
Vectors	Summer	<ul style="list-style-type: none"> <li>• Use vectors in two dimensions</li> <li>• Use column vectors and carry out arithmetic operations on vectors</li> <li>• Calculate the magnitude and direction of a vector</li> <li>• Understand and use position vectors</li> <li>• Use vectors to solve geometric problems</li> </ul>	<ul style="list-style-type: none"> <li>• Mechanics Y13</li> <li>• Vectors Y13</li> </ul>



		<ul style="list-style-type: none"><li>• Understand vector magnitude and use vectors in speed and distance calculations</li><li>• Use vectors to solve problems in context</li></ul>	
Variable Acceleration	Summer	<ul style="list-style-type: none"><li>• Understand that displacement, velocity and acceleration may be given as functions of time</li><li>• Use differentiation to solve kinematics problems</li><li>• Use calculus to solve problems involving maxima and minima</li><li>• Use integration to solve kinematics problems</li><li>• Use calculus to derive constant acceleration formulae</li></ul>	<ul style="list-style-type: none"><li>• Further Kinematics Y13</li></ul>
Statistical Distributions	Summer	<ul style="list-style-type: none"><li>• Understand and use simple discrete probability distributions including the discrete uniform distribution</li><li>• Understand the binomial distribution as a model and comment on appropriateness</li><li>• Calculate individual probabilities for the binomial distribution</li><li>• Calculate cumulative probabilities for the binomial distribution</li></ul>	<ul style="list-style-type: none"><li>• Hypothesis Testing Y12</li></ul>
Hypothesis Testing	Summer	<ul style="list-style-type: none"><li>• Understand the language and concept of hypothesis testing</li><li>• Understand that a sample is used to make an inference about a population</li><li>• Find critical values of a binomial distribution using tables</li><li>• Carry out a one-tailed test for the proportion of the binomial distribution and interpret the results</li><li>• Carry out a two-tailed test for the proportion of the binomial distribution and interpret the results</li></ul>	<ul style="list-style-type: none"><li>• Further Hypothesis Testing in Y13 Statistics (e.g. Normal Distribution)</li></ul>