



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

Unit	Topic name	Term	Skills developed	Next link in curriculum
P1.1	Algebraic Expressions	Autumn	• Multiply and divide integer powers • Expand a single term over brackets and collect like terms • Expand the product of two or three expressions • Factorise linear, quadratic and simple cubic expressions • Know and use the laws of indices • Simplify and use the rules of surds • Rationalise denominators	• Quadratics Y12
P1.5	Straight Line Graphs	Autumn	• Calculate the gradient of a line joining a pair of points • Understand the link between the equation of a line, and its gradient and intercept • Find the equation of a line given (i) the gradient and one point on the line or (ii) two points on the line • Find the point of intersection for any pair of straight lines • Know and use the rules for parallel and perpendicular gradients • Solve length and area problems on coordinate grids • Use straight line graphs to construct mathematical models	• Circles Y12
P1.2	Quadratics	Autumn	• Solve quadratic equations using factorisation, the quadratic formula and completing the square • Read and use $f(x)$ notation when working with functions • Sketch the graph and find the turning point of a quadratic function • Find and interpret the discriminant of a quadratic expression • Use and apply models that involve quadratic functions	• Graphs and Transformations Y12
P1.8	The Binomial Expansion	Autumn	• Use Pascal's triangle to identify binomial coefficients and use them to expand simple binomial expressions • Use combinations and factorial notation • Use the binomial expansion to expand brackets • Find individual coefficients in a binomial expansion • Make approximations using the binomial expansions	• Binomial Expansion (Year 13) – This is a different type of expansion that is explored



P1.3	Equations and Inequalities	Autumn	- Solve linear simultaneous equations using elimination or substitution - Solve simultaneous equations: one linear and one quadratic - Interpret algebraic solutions of equations graphically - Solve linear inequalities - Solve quadratic inequalities - Interpret inequalities graphically - Represent linear and quadratic inequalities graphically	Graphs and transformations
P1.6	Circles	Autumn	- Find the midpoint of a line segment - Find the equation of the perpendicular bisector to a line segment - Know how to find the equation of a circle - Solve geometrical problems involving straight lines and circles - Use circle properties to solve problems on coordinate grids - Find the angle in a semicircle and solve other problems involving circles and triangles	Functions and Graphs Y13
P1.4	Graphs and Transformations	Autumn	- Sketch cubic graphs - Sketch quartic graphs - Sketch reciprocal graphs of the form $y = \frac{a}{x}$ and $y = \frac{a}{x^2}$ - Use intersection points of graphs to solve equations - Translate graphs - Stretch graphs - Transform graphs of unfamiliar functions	- Integration - Functions Y13
P1.7a	Algebraic Methods	Autumn	- Cancel factors in algebraic fractions - Divide a polynomial by a linear expression - Use the factor theorem to factorise a cubic expression	Algebraic Methods Y13
SM1.8	Modelling in Mechanics	Autumn	- Understand how the concept of a mathematical model applies to mechanics - Understand and be able to apply some of the common assumptions used in mechanical models - Know SI units for quantities and derived quantities used in mechanics - Know the difference between a scalar and vector quantities	- Constant Acceleration Y12 - Underpins all KS5 Mechanics



SM1.9	Constant Acceleration	Autumn	- Understand and interpret displacement-time graphs - Understand and interpret velocity-time graphs - Derive the constant acceleration formulae and use them to solve problems - Use the constant acceleration formulae to solve problems involving vertical motion under gravity	- Variable Acceleration Y12 - Projectiles Y13 (working in 2 Dimensions)
SM1.1	Data Collection	Autumn	- Understand 'population', 'sample' and 'census', and comment on the advantages and disadvantages of each - Understand the advantages and disadvantages of simple random sampling, systematic sampling, stratified sampling, quota sampling and opportunity sampling - Define qualitative, quantitative discrete and continuous data, and understand grouped data - Understand the large data set	Measures of Location and Spread Y12
SM1.2	Measures of Location and Spread	Autumn	- Calculate measures of central tendency such as the mean, median and mode - Calculate measures of location such as percentiles and deciles - Calculate measures of spread such as range, interquartile range and inter-percentile range - Calculate variance and standard deviation - Understand and use coding	- Probability Y12 - Representations of Data Y12
SM1.3	Representations of Data	Autumn	- Identify outliers in data sets - Draw and interpret boxplots - Draw and interpret cumulative frequency diagrams - Draw and interpret histograms - Compare two data sets	Correlation Y12
SM1.4	Correlation	Autumn	- Draw and interpret scatter diagrams for bivariate data - Interpret correlation and understand that it does not imply causation - Interpret the coefficients of a regression line equation for bivariate data - Understand when you can use a regression line to make predictions	Regression, Correlation and Hypothesis Testing Y13



SM1.5	Probability	Autumn	- Calculate probabilities for single events - Draw and interpret Venn Diagrams - Understand mutually exclusive and independent events, and determine whether two events are independent - Use and understand tree diagrams - Understand set notation in probability - Understand conditional probability - Solve conditional probability problems using two-way tables and Venn diagrams	Statistical Distributions Y12
P1.11	Vectors	Autumn	- Use vectors in two dimensions - Use column vectors and carry out arithmetic operations on vectors - Calculate the magnitude and direction of a vector - Understand and use position vectors - Use vectors to solve geometric problems - Understand vector magnitude and use vectors in speed and distance calculations - Use vectors to solve problems in context	- Mechanics Y13 - Vectors Y13
SM1.10	Forces and Motion	Autumn	- Draw force diagrams and calculate resultant forces - Understand and use Newton's first law - Calculate resultant forces by adding vectors - Understand and use Newton's second law, $F = ma$ - Apply Newton's second law to vector forces and acceleration - Understand and use Newton's third law - Solve problems involving connected particles	- Moments Y13 - Forces and Friction Y13
P1.12	Differentiation	Spring	- Find the derivative, $f'(x)$ or $\frac{dy}{dx}$, of a simple function - Use the derivative to solve problems involving gradients, tangents and normal - Identify increasing and decreasing functions - Find the second order derivative, $f''(x)$ or $\frac{d^2y}{dx^2}$ of a simple function - Find stationary points of functions and determine their nature - Sketch the gradient function of a given function - Model real-life situations with differentiation	- Differentiation (Year 13) - Integration Y12 and 13 - Variable Acceleration Y12



P1.7b	Proof	Spring	- Construct mathematical proofs using algebra - Use proof by exhaustion and disproof by counter-example - Use proof by contradiction to prove true statements	Various topics such as Trigonometry require well-presented and logical arguments in “Show that” questions Y12
P1.9	Trigonometric Ratios	Spring	- Use the cosine rule to find a missing side or angle - Use the sine rule to find a missing side or angle - Find the area of a triangle using an appropriate formula - Solve problems involving triangles - Sketch the graphs of the sine, cosine and tangent functions - Sketch simple transformations of these graphs	- Trigonometric Identities and Equations Y12 - Radians Y13
P1.10	Trigonometric Identities and Equations	Spring	- Calculate the sine, cosine and tangent of any angle - Know the exact trigonometric ratios for 30°, 45° and 60° - Know and use the relationships $\tan \theta \equiv \frac{\sin \theta}{\cos \theta}$ and $\sin^2 \theta + \cos^2 \theta \equiv 1$ - Solve simple trigonometric equations of the forms $\sin \theta = k$, $\cos \theta = k$ and $\tan \theta = k$ - Solve more complicated trigonometric equations of the forms $\sin n\theta = k$ and $\sin(\theta \pm \alpha) = k$ and equivalent equation involving cos and tan - Solve trigonometric equations that produce quadratics	Trigonometric Functions Y13
P1.13	Integration	Spring	- Find y given $\frac{dy}{dx}$ for x^n - Integrate polynomials - Find $f(x)$, given $f'(x)$ and a point on the curve - Evaluate a definite integral - Find the area bounded by a curve and the x-axis - Find areas bounded by curves and straight lines	Integration Y13
P1.14	Exponentials and Logarithms	Spring	- Sketch graphs of the form $y = a^x$, $y = e^x$, and transformations of these - Differentiate e^{kx} and understand why this result is important - Use and interpret models that use exponential functions - Recognise the relationship between exponents and logarithms - Recall and apply the laws of logarithms - Solve equations of the form $a^x = b$ - Describe and use the natural logarithm function	- Regression, Correlation and Hypothesis Testing Y13 - Various other topics Y13



			Use logarithms to estimate the values of constants in non-linear models	
SM1.6	Statistical Distributions	Spring	- Understand and use simple discrete probability distributions including the discrete uniform distribution - Understand the binomial distribution as a model and comment on appropriateness - Calculate individual probabilities for the binomial distribution - Calculate cumulative probabilities for the binomial distribution	Hypothesis Testing Y12
SM1.7	Hypothesis Testing	Summer	- Understand the language and concept of hypothesis testing - Understand that a sample is used to make an inference about a population - Find critical values of a binomial distribution using tables - Carry out a one-tailed test for the proportion of the binomial distribution and interpret the results - Carry out a two-tailed test for the proportion of the binomial distribution and interpret the results	Further Hypothesis Testing in Y13 Statistics (e.g. Normal Distribution)
SM1.11	Variable Acceleration	Summer	- Understand that displacement, velocity and acceleration may be given as functions of time - Use differentiation to solve kinematics problems - Use calculus to solve problems involving maxima and minima - Use integration to solve kinematics problems - Use calculus to derive constant acceleration formulae	Further Kinematics Y13
P2.1	Algebraic Methods	Summer	- Use proof by contradiction to prove true statements - Multiply and divide two or more algebraic fractions - Add or subtract two or more algebraic fractions - Convert an expression with linear factors in the denominator into partial fractions - Divide algebraic expressions - Convert an improper fraction into partial fraction form	Sequences and Series



P2.3	Sequences and Series	Summer	- Find the nth term of an arithmetic sequence - Prove and use the formula for the sum of the first n terms of an arithmetic series - Find the nth term of a geometric sequence - Prove and use the formula for the sum to infinity of a convergent geometric sequence - Use sigma notation to describe series - Generate sequences from recurrence relations - Model real-life situations with sequences and series	Numerical Methods in Further Education
P2.2	Functions and Graphs	Summer	- Understand and use the modulus function - Understand mappings and functions, and use domain and range - Combine two or more functions to make a composite function - Know how to find the inverse of a function graphically and algebraically - Sketch the graphs of the modulus functions $y = f(x)$ and $y = f(x)$ - Apply a combination of two (or more) transformations to the same curve - Transform the modulus function	Parametric Equations Y13
P2.4	Binomial Expansion	Summer	- Expand $(1 + x)^n$ for any rational constant n and determine the range of values of x for which the expansion is valid - Expand $(a + bx)^n$ for any rational constant n and determine the range of values of x for which the expansion is valid - Use partial fractions to expand fractional expressions	Integration Y13