

## Further Maths Curriculum Overview - Year 13

	Unit	Details
Autumn One	<p><b>Pure:</b> Proof, Algebraic fractions and partial fractions, Functions and modelling, Transformation of graphs, Arithmetic series, Geometric series &amp; recurrence relationships, Binomial Expansion, Trigonometry: radians and approximations, Trigonometry: proving and solving</p> <p><b>Statistics:</b> Probability, Normal Distribution, Normal approximation, Regression, Hypothesis Testing</p>	<p>Year 13 starts by developing algebraic skills and graphs, including functions and their use in modelling, before using series to find sums and terms, expand binomials for fractional and negative indices and use radians in trigonometry and begin to use identities to solve equations and prove identities.</p> <p>In statistics concepts encountered in Year 12 are developed by learning the properties on the normal distribution, using the normal approximation to the binomial distribution, and conducting hypothesis tests involving correlation and the normal distribution.</p>
Autumn Two	<p><b>Pure:</b> Trigonometry in context, Parametric Equations, Differentiation: product, quotient and chain rule, Implicit and parametric differentiation, Numerical Methods, Integration, Differential Equations, Vectors</p> <p><b>Mechanics:</b> Vectors in constant and non-constant acceleration, Projectile motion, Forces, Connected particles, Perpendicular Moments, Non-perpendicular Moments</p>	<p>Pupils will then extend their understanding of trigonometry in context before expanding calculus. Differentiation will include chain, product, quotient, parametric and implicit, along with numerical methods of finding roots such as Newton-Raphson method. Integration will include by parts, substitution and the use of partial fractions before looking at differential equations in context and extending vectors to 3 dimensions.</p> <p>In mechanics constant acceleration formulae will be used in projectile motion, before working on moments for perpendicular and non-perpendicular forces.</p>
Spring One	<p><b>Further Core: Complex Numbers, Method of Differences, Maclaurin's Theorem, Improper integrals and the mean value of a function</b></p> <p><i>Students will continue the two options from last year</i></p> <p><b>Further Pure:</b> Further Vectors, Further Conics</p> <p><b>Further Statistics:</b> Distributions, Hypothesis testing</p> <p><b>Further Mechanics:</b> Impulse &amp; Momentum with vectors</p>	<p>We begin the further core course by finding complex roots, using the method of differences to prove identities and use Maclaurin's theorem and then finish extending the ideas of integrals that are improper and finding the mean value of a function.</p> <p>In further pure, students will extend their understanding of vectors by solving problems in context and conic sections by studying the ellipse and the hyperbola. In further statistics the negative binomial and geometric distributions are studied, including the use of hypothesis testing with the geometric distribution. In further mechanics impulse and momentum will be extended into using vectors.</p>
Spring Two	<p><b>Further Core:</b> Partial fractions and inverse trig integrals, Volumes of revolution, Polar coordinates</p> <p><b>Further Pure:</b> Inequalities, Taylor series</p> <p><b>Further Statistic:</b> Central limit theorem, probability generating functions</p> <p><b>Further Mechanics:</b> Elastic strings and springs</p>	<p>Students will start this half term by studying partial fractions and inverse trigonometric integrals, then apply this when finding volumes of revolution before integrating polar coordinates to find areas and differentiating to find tangents and normals. In further pure they will study inequalities involving the modulus function and the Taylor series. In further statistics we will look at the use of the CLT for the sample mean and the use of the PGF to find expectations and variances using calculus. In further mechanics we will use Hooke's law along with using elastic potential energy with the work energy power formulae.</p>
Summer One	<p><b>Further Core:</b> Hyperbolic functions, First order differential equations, second order differential equations</p> <p><b>Further Pure:</b> Methods in calculus, Simpson's rule, Differential equations</p> <p><b>Further Statistics:</b> Quality of tests</p> <p><b>Further Mechanics:</b> Elastic collisions in two dimensions</p>	<p>In this final term pupils will extend their knowledge of trigonometry to look at hyperbolic functions before learning how to solve differential equations in the context of simple harmonic motion and coupled equations. In further pure they will look at methods in calculus including Leibnitz, L'Hopital's rule and the use of t-substitution in integration before finding an approximation to the area under a graph using Simpson's rule and series solutions of differential equations. In further statistics the idea behind Type I and II errors along with the significance of power and size of tests will be explored. In further mechanics WEP, Hook's law, resolving, impulse, momentum, restitution will all be applied to oblique collisions.</p>