

Maths Faculty Rationale

To make mathematics enjoyable, exciting and interesting for all pupils, regardless of their ability, gender or ethnicity.

To create a balanced and supportive culture in which pupils are confident to work collaboratively, to apply logic and reasoning to mathematical problems and to apply methods that are efficient and reliable without engendering a fear of failure or derision.

To enable pupils to appreciate that mathematics is more than 'sums' so that they consider that it appears all around us and how it can be used in everyday life.

To equip all pupils with functional mathematical tools that can be used throughout their lives, particularly to promote interest in science, engineering and other associated disciplines.

A-Level Further Mathematics Aims at KS5

OCR A Level in Further Mathematics B (MEI) is designed for students with an enthusiasm for mathematics, many of whom will go on to degrees in mathematics, engineering, the sciences and economics. or any subject where mathematics is developed further than in A level Mathematics. OCR A Level in Further Mathematics B (MEI) is both deeper and broader than A level mathematics. AS and A Level Further Mathematics build from GCSE Level and AS and A Level Mathematics. As well as building on algebra and calculus introduced in A Level Mathematics, the A Level Further Mathematics core content introduces complex numbers and matrices, fundamental mathematical ideas with wide applications in mathematics, engineering, physical sciences and computing. The non-core content includes different options that can enable students to specialise in areas of mathematics that are particularly relevant to their interests and future aspirations. A Level Further Mathematics prepares students for further study and employment in highly mathematical disciplines that require knowledge and understanding of sophisticated mathematical ideas and techniques.

Core Year 2

	Content	Skills	Rationale / Link to NC
Unit 1 Vectors Y12 END OF YEAR	The Vector equation of a line. Lines and planes.	See SOW objectives column	Building on work done in Year 12, this topic extends to find the intersection of a line and a plane. This is a prerequisite for Unit 11.
Unit 2 Matrices Y12 END OF YEAR Recap end of Y13	Finding the inverse of a 3x3 matrix. Intersection of three planes.		This topic introduces students to the idea of how to find the intersection of three planes in three dimensional space. Where there is no unique point, the arrangement of these planes is found, either as a sheaf of planes, or a triangular prism.
Unit 3 Series and induction. Throughout	Summation of series. Proof by induction.		This unit is a recap of work covered in Year 12 on proof by inductions; it serves as a revision topic and is covered at various points throughout the course.

Unit 4 Further calculus. HT 3 Week 14-16	Improper integrals, calculus with inverse trig functions. Partial fractions, further integration.		We look at values of integrals where the graph approaches an asymptote and the calculation of the area under that curve. The use of partial fractions is extended from maths to include non-factorisable denominators. Integration with trig substitutions is also considered.
Unit 5 Polar Co-ordinates HT 2 Week 9-10	Sketching curves with polar coordinates, finding the area enclosed by a polar curve.		Having being taught after complex numbers, the links between polar co-ordinates and modulus argument form is considered. Students also consider the area enclosed with a loop using integration with trig identities.
Unit 6 Maclaurin Series HT 2 Week 7-8	Polynomial approximation for standard functions.		This unit teaches students how to find a polynomial approximation to standard functions. It is particularly important that students have completed some trig differentiation from maths.
Unit 7 Hyperbolic Functions HT 1 Week 5-6	Hyperbolic functions, inverse hyperbolic functions, integration using hyperbolic functions.		Students are introduced to the idea of hyperbolic functions as a natural extension to trig functions. They are taught how to differentiate, integrate and solve hyperbolic equations, using both the exponential and natural logarithm functions.
Unit 8 Applications of Integration HT 2 Week 11-13	Volume of revolution. Mean value of a function. General Integration.		One real life application of integration is to find the volume of revolution of a curve about either axis. Students also look at how to calculate the mean of a function. More general integration recovers the work done on circular and hyperbolic substitutions.
Unit 9 First order differential equations HT 3 Week 17-19	Separation of variables. Integrating factors		Students first encounter differential equations in maths, for this reason 1 st and 2 nd order DEs are left to the end of Year 13. This unit which is a prerequisite for Unit 12 looks at various techniques that can be used to solve 1 st order ODEs.
Unit 10 Complex Numbers HT 1 Week 1-4	De Moivre's Theorem, nth roots of a complex number, multiple angle identities.		This unit builds on all the previous work of complex numbers. Students learn and use De Moivre's to calculate roots of complex numbers. De Moivre's is also used to allow students to prove multiple angle identities in trigonometry.
Unit 11 Vectors 2 End of Y12 Recap end of Y13	Vector product, finding distances.		Having completed unit 1, students now extend their knowledge to calculate the vector product and find the distance of a point from a plane.

Unit 12 Second order differential equations HT 4 Week 20-22	Auxiliary equations with complex roots, non-homogeneous differential equations, systems of differential equations.		Having already completed Unit 9, this builds and extends to 2 nd order ODEs looking at the various methods which can be used to solve them. Finally, systems of differential equations are considered including predator-prey models.
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Statistics

Unit 1 Statistical Problem Solving. HT 1 Weeks 1-2	The problem-solving cycle		This unit introduces the idea of problem specification and analysis and interpretation. The idea of sampling and the various types is considered.
Unit 2 Discrete Random Variables HT 1 Weeks 3-6	Conditions for a discrete random variable. Expectation and variance.		Calculations involving discrete random variables for finite distributions are studied and the expectation and variance of a distributions. Students also look at the idea of coding in terms of a linear variable.
Unit 3 Discrete probability distributions HT 2 Weeks 7-10	The binomial distribution, poisson distribution, link between binomial and Poisson distributions.		Real life situations involving the binomial distribution are studied: questions such as premium bonds and manufacturing situations. This is extended by following Poisson distributions and looking at situations where they arise.
Unit 4 Bivariate data HT 2 Weeks 11-13	Interpreting scatter diagrams, product moment correlation, rank correlation.		Bivariate data is considered an important tool in the analysis of two different data sets. Various tools should as Product moment correlation are calculated. The pupils are required to look at interpreting correlation.
Unit 5 Regression lines HT 3 Weeks 14-18	The least squares regression line (random on non-random) and (random on random).		This unit builds on students' understanding of scatter graphs and allows them to calculate the least squares regression line and use this to interpolate and extrapolate information.
Unit 6 Chi-squared tests HT 4 Weeks 19-22	The Chi-squared test for a contingency table. Goodness of fit tests.		Whilst looking at contingency tables students are asked to discover the extent to which two variables are related. Goodness of fit is looked at to see if proposed model fits observed data.

