

## 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 Mathematics Aims at KS5

A Level Mathematics provides a framework within which students continue the subject beyond GCSE (9–1). It supports their mathematical needs across a broad range of subjects at this level and provides a basis for subsequent quantitative work in a very wide range of higher education courses and in employment. A Level Mathematics builds from GCSE (9–1) level mathematics and introduces calculus and its applications. It emphasises how mathematical ideas are interconnected and how mathematics can be applied to model situations using algebra and other representations, to help make sense of data, to understand the physical world and to solve problems in a variety of contexts, including social sciences and business. It prepares students for further study and employment in a wide range of disciplines involving the use of mathematics.

## Teacher A (Mechanics)

	Content	Skills	Rationale / Link to NC
Unit 5 Differentiation HT1 Weeks 1-2	Shape of curves, chain, product and quotient rule. Rates of change problems.	See SOW objectives column	This topic is the first introduction to Y13 Calculus and introduces the students to a much wider range of techniques for differentiation.
Unit 12 Vectors HT1 Weeks 3	3D vectors, problem solving.		This topic extends the work covered in Y12 and looks at how vectors can be used in three dimensions. It is especially important for topics such as statics and projectiles.
Unit 18 Kinematics HT1 Weeks 4-5	Motion in 2 and 3 dimensions.		Students have previously studied the use of kinematics in Year 12. This topic builds on this and looks at motion in 3 dimensions.
Unit 21 Projectiles HT2 Weeks 6-7	Equations for projectile motion, further problems, path of a projectile, general equations.		This builds on the use of both vectors and kinematics in Year 12 and is a useful application of real life maths to solve problems involving projectile motion.

Unit 3 Sequences and series. HT2 Weeks 8-9	Arithmetic and Geometric sequences and series.		A stand-alone topic for Year 13, it is however needed in further maths for the summation of complex series.
Unit 9 Further differentiation HT2 Weeks 10-11	Differentiation of $\ln(x)$ and $e^x$ . Differentiation of trig functions. Implicit differentiation.		Again, differentiation is revisited and builds on the use of chain, product and quotient rule by introducing more functions such as the natural logarithm, exponential and trig functions.
Unit 10 Integration HT2 Weeks 12-13	Finding areas, substitution, integrating $\ln(x)$ , integration by parts.		Develops the use and understanding of integration as the reverse of differentiation. This unit also introduces students to a much wider range of techniques required such as substitution and by parts. It is a fundamental unit for further maths.
Unit 13 Differential equations HT3 Weeks 14-16	First order differential equations, method of separation of variables.		This topic gives pupils their first taste of 1 <sup>st</sup> order ODEs. It ties together all previous integration as well as the use of partial fraction in integration. Whilst Year 13 maths stays at this level it is an important prerequisite for 2 <sup>nd</sup> order differential equations in further maths.
Unit 19 Force and motion HT3 Weeks 17-18	Forces in equilibrium, resultant forces. N2L in two dimensions.		A topic which gives a real life application of mathematics in mechanics. Students study the effect of forces on motion in 2D and the resulting acceleration. It is further built upon in units 22 and 20.
Unit 22 Friction HT4 Weeks 19-20	A model for friction.		Again, building on Newton's Second Law and introduces the real life effects of friction on a particular model.
Unit 20 Moments HT4 Weeks 21-22	Turning effect in rigid bodies.		Introduction to moments. Some students will have previously met this in Physics. It does not include forces at an angle.

## Teacher B (Statistics)

Unit 4 Functions HT1 Weeks 1-2	Composite functions, modulus functions.		The composition of function is considered in greater detail than at GCSE. The sketching of modulus functions and solving equations with modulus functions is studied.
Unit 2 Trigonometry HT1 Weeks 3-4	Radians, circular measure, small angle approximations.		This unit of work introduces pupils to radians and is their first encounter with trigonometry in Year 13. It is a prerequisite for units 6 and 8.
Unit 6 Trig functions HT1 Weeks 5-6	Reciprocal functions, solving equations using radians.		Pupils learn about sec, cosec and cotangent functions. They use identities to solve trigonometrical equations, both in degrees and radians.
Unit 8 Trig identities HT2 Weeks 7-8	Compound angle formulae, double angle formulae, the for $r\cos(x+a)$		Building on the previous two units, students are introduced to the compound and double angle formulae as a means of widening students' use of trig identities. The form $r\cos(x+a)$ is used as a means of solving an equation but also has implication in physics when looking at wave interference.
Unit 7 Further algebra HT2 Weeks 9-11	General binomial expansions, partial fractions.		The use of binomial expansions is further developed using negative and fractional powers. This is a useful technique which can be used when approximating functions. Partial fractions serves as a method needed in the use of binomial and will be used in Unit 10 (integration).
Unit 1 Proof HT2 Weeks 12-13	Methods of proof.		Proof is the foundation of all mathematics and students are introduced to some of the formal methods of proof that is required in A Level maths. The ability to structure a proof is important in further study of the subject.
Unit 15 Probability HT3 Weeks 15-16	Probability of 2 events, conditional probability.		Real life examples of two or more events are considered and the probability of events given something has already happened. This will have lots of applications in risk analysis and finance.
Unit 16 Statistical distributions HT3 Weeks 17-19	Discrete random variables, the normal distribution.		The normal distribution can be used as a model to approximate whole population structures. This serves as an introduction to the use of hypothesis testing in Unit 17.

Unit 17 Statistical Hypothesis Testing HT4 Weeks 20-22	Using the normal distribution. Bivariate data, correlation and association.		Many real life situations can be modelled using the Normal Distribution and in this unit Hypothesis testing is further developed. Product moment correlation is considered as a means to look at causation and effect.
Unit 14 Numerical methods HT4 Weeks 23-24	Decimal search, Newton-Raphson method and fixed point iteration.		Numerical method as introduced as a way of obtaining an approximation to solving equations. Whilst DS and NR are completely new, students should be familiar with fixed point iteration, however, this is look at in more detail including the gradient of $g(x)$ .