Mathematics

Curriculum Area: Mathematics

An intelligent mind acquires knowledge, and the ear of the wise seeks knowledge.
Proverbs 18:15

Curriculum Intent

All students in the Mathematics department should have a right to follow a curriculum and receive teaching that is appropriate to their mathematical ability and their needs. As a Department our aim is to ensure that learners acquire, develop and gain the following:

- Become critical thinkers and understand key concepts to help solve problems in unfamiliar situations.
- Are suitably challenged to achieve the best grade possible.
- Feel inspired by teachers who cultivate a passion for Maths in lessons.
- Have opportunities to develop their skills.
- Have high self-esteem, aspirations and develop a love of Mathematics.
- Are motivated to achieve their best in every Maths lesson.
- Understand that learning in Mathematics contributes to personal development.
- Use methods of investigation to solve problems in a disciplined way.
- Appreciate the contribution Maths makes to society and realise that applying Mathematics can lead to moral and ethical issues having to be addressed.
- Appreciate the powerful, but provisional nature of Mathematics knowledge and explanation.
- Are being catered for in a range of different ways according to their age, ability and social needs.

Curriculum Overview: Mathematics

	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
HT1	Place Value, the four operations	Indices, Multiples, Factors, primes, negative numbers, rounding.	Arithmetic, Powers, Fractions, decimals and percentages.	F: Rounding and error intervals, percentages and ratio. H: Surds and indices, quadratics and graphs.	F: Multiples and factors, algebra, solving equations.	Pure: Algebraic Expressions, Quadratics, Equations and Inequalities Applied: Data Collection, Measures of Location and Spread, Representation of data,	Pure: Algebraic fractions, algebraic division, Functions and graphs. Applied: Regression, correlation and hypothesis testing
HT2	Perimeter, Area and units, Angles and 2D shapes	Length and area, 3D shapes, Compound measures	Algebraic Manipulation, Co-ordinates and graphs.	F: Perimeter, Area and Volume H: Arcs and sectors, circle theorems	F: Indices and standard form, right angled triangles.	Pure: Quadratics, Straight Line graphs, Circles Applied: Correlation, Probability	Pure: Sequences and series, binomial expansion, Radians Applied: Conditional probability and the Normal distribution
HT3	Fractions, Decimals and Percentages	Fractions and Probability	2D and 3D Shapes	F: Angles, bearings and transformations. H: Similarity and congruence, transformations, probability.	Revision	Pure: Algebraic Methods, Differentiation Applied: Binomial distribution, probability distributions, hypothesis testing.	Pure, Trignometric functions, Trigonometry and modelling Applied: Moments, Forces and Friction
HT4	Algebra, Co-ordinates and graphs	Algebraic manipulation and solving equations.	Solving equations and sequences.	F: Drawing graphs H: Volume, Bounds	Revision	Pure: Integration, The Binomial Expansion Applied: Modelling in mechanics, constant acceleration	Pure: Parametric equations, Differentiation Applied: Projectiles, application of forces
HT5	Order of operations, ratio and proportion.	Angles and Transformations	Percentages and Proportion	F: Compound measures, probability.	Revision	Pure: Trigonometric Ratios, Exponentials and Logs	Pure: Numererical methods, Integration. Vectors

				H: Graphs of circles, linear and quadratic equations.		Applied: Forces and motion	Applied: Further Kinematics.
HT6	Working with data	Statistics	Constructions, Loci and bearings.	F: Averages and range H: Histograms, Cumulative frequency and box plots.		Pure: Vectors Applied: Variable Acceleration	

Curriculum Overview: Further Mathematics

	Year 12	Year 13
HT1	**Complex number (4) introduction and basic manipulations** **The Argand diagram, Modulus and argument (8)** **Mod-Arg form of complex numbers** **Loci and Regions in the argand diagram** **Graphs and networks (4)** **Planarity algorithm** **Algorithms on graphs (5)**	**COMPLEX NUMBERS (6)** **De Moivre's theorem and nth roots** **Solving geometric problems** **HYPERBOLIC FUNCTIONS (6)** **Definitions, inverse hyperbolic** **Differentiating hyperbolic functions** **Integrating hyperbolic functions** **Introduction to momentum and impulse (3)** **Introduction to work, energy, power (6)**
HT2	**Roots of polynomials (8)** **Roots of a quadratic equation** **Roots of a cubic equation** **Roots of a quartic equation** **Series (6)** **Sums of natural numbers** **Sums of squares and cubes** **Floyd's algorithm (2)** **Route inspection algorithm (6)** **Travelling salesman problem (4)**	**POLAR COORDINATES (6)** **Sketching curves, areas enclosed** **Tangents to polar curves** **SERIES (6)** **The method of differences** **Maclaurin series and expansions** **Power (1)** **Hooke's law and equilibrium problems (6)**
HT3	**Introduction to matrices (5), multiplication** **Determinant, Inverting a 2x2 matrix, 3x3 matrix** **Solving systems of equations using matrices**	**METHODS IN CALCULUS (12)** **Improper integrals** **The mean value of a function**

	Linear transformations in 2D (9): **Reflections and Rotations** **Enlargements and stretches** **Critical path analysis (3)** **Activity networks/precedence tables (2)** **Earliest and latest times (2)** **Gantt charts (3)**	**Differentiating inverse trig functions** **Integrating with inverse trig Integrating using partial fractions** **Problem solving involving elastic energy (3)** **Collisions and Newton's law of restitution (6)**
HT4	**Proof by induction (8) for summation** **Proof by induction for divisibility** **Proof by induction for matrices** **Volumes of revolution (7) Modelling with volumes of revolution** **Scheduling diagrams (4)** **Resource histograms** **Linear programming** **Formulating the problem** **Graphical methods** **Locating the optimal point (5)**	**VOLUMES OF REVOLUTION (12)** **Vol of revolution around the x-axis** **Vol of revolution around the y-axis** **Volumes of revolution of parametric** **Modelling with volumes of revolution** **Oblique impact of a sphere with a plane surface (3)** **Successive oblique impacts of a sphere with plane surfaces (3)**
HT5	**Vectors (8), Equation of a line in 3D** **Equation of a plane in 3D** **Scalar product** **Angles between lines and planes** **Finding perpendiculars** **Integer only solutions (2)** **Algorithms and flow charts** **Sorting algorithms** **Bin packing algorithms** **Order of an algorithm (5)**	**METHODS IN DIFF EQUATIONS (10)** **First-order differential equations** **Second-order homogeneous diff equations** **2nd-order non-homogeneous diff equations** **Using boundary conditions** **MODELLING WITH DIFFERENTIAL EQUATIONS (8)** **Modelling with 1st order diff equations** **Simple harmonic motion** **Damped and forced harmonic motion** **Coupled 1st order simult. diff equations** **Oblique impact of smooth spheres (3)**
HT6	**Simplex algorithm - introduction** **Simplex algorithm - one stage** **Simplex algorithm - two stage** **Big-M method (6)**	

Curriculum Overview: Core Mathematics

	Year 12
HT1	Analysis of Data: Sampling, Measures of Spread, Box and Whisker Diagrams, Cumulative Frequency Graphs, histograms.
HT2	Fermi Estimation, Personal finance; Tax, national insurance, mortgages, APR, AER.
HT3	Critical Analysis of graphs within the media. Critical Path analysis and project planning.
HT4	Probability, expectation and cost-benefit analysis.
HT5	Working with the Preliminary material.
HT6	Exam

Subject Specific Information

Mathematics contributes to the school curriculum by developing students' abilities to solve problems, to calculate, to reason logically, algebraically, and geometrically and to make sense of data. Mathematics is important for students in many other areas of study, particularly Science and Technology. It is also important in everyday life, in many forms of employment and in decision-making.

As a subject in its own right, Mathematics presents frequent opportunities for creativity. It can stimulate moments of pleasure and wonder; especially when problems are solved or when more elegant solutions to problems are discovered. Mathematics is one means of making knowledge useful.

We want all our students to become fluent in the fundamentals of mathematics, to be able to reason mathematically and to solve problems by applying their mathematical understanding to a variety of problems.

Within the Mathematics department, we aim to set challenging targets with high expectations for all students. We strongly believe in the importance of offering a variety of different approaches to teaching and learning to help motivate students. We will always look to ensure that the students are actively participating and enjoying mathematics.

Mathematics is usually taught in ability sets: this means the more able children will be stretched, while children who struggle with Mathematics will take things more slowly, and be given more support. In KS3 your child will find some of the work similar to primary school, but it will be more challenging and the children are expected to be working more independently. With all the topics the children will be studying, they'll be developing 'mathematical process' skills, which include reasoning, analysis and evaluation.