



Mathematics

Curriculum Overview



MATHEMATICS

Our Vision

The Mathematics department aims to ensure all students develop excellent mathematical skills that will help them in the real-world and which are suitable to support them beyond school life. We want students to be confident with mental mathematics and be freely able to do calculations in their heads quickly. We want students to understand the financial world and leave school with knowledge such as: understanding what a mortgage is; what different types of bank account there are; what APR means and what represents a good rate; what tax and National Insurance are; what a pay-slip looks like; how to take out a loan. We want students to become excellent problem solvers and develop skills which are useful outside of school for future careers. We want students to have mastery of all topics and to retain their knowledge and be able to apply what they have learnt to different situations and scenarios. All this whilst also learning prescribed curriculum content.

Our Curriculum

Mathematics is no longer about learning how to do something and then repeating it for an examination. Students are expected to learn content and then be able to apply what they have learnt to different, previously unseen situations. Problem solving is a big part of the learning of mathematics. We are driven by the National Curriculum for Key Stage 3 and Key Stage 4. The course program that we have designed is a five-year course that combines both these curricula, but in an order that it is taught in a way that is logical and progressively more difficult. Content will be taught by a specialist mathematics teacher and time will be given to master each topic, going in to as much depth as possible. At the earliest opportunity, topics will be inter-linked and problem-solving skills will develop from this. One exam question could test four different topics, and unless you know them all you cannot answer the question fully. Therefore, practising this as early as possible will help to enhance those skills. To support knowledge retention, we will give frequent, short 'flash tests' that focus on previous topics and using psychological evidence that revisiting topics regularly is the way to help students remember them.

In addition to the prescribed curriculum content, students will spend a whole term in Year 9 looking at the financial world and really getting a good understanding of knowledge they will need in their lives outside of school, such as banking, credit cards, loans, mortgages, taxes, pensions and budgeting.

Enrichment

With a lack of female engineers in the UK (a mere 12% of all engineers in the UK are female), we are supporting and developing STEM activities to showcase some of the possible careers related to STEM subjects in the hope of encouraging more females in to the world of engineering. Students at our school have brilliant mathematical skills and a creative flair and we will try to develop this further with STEM activities and external visits.

YEAR 7 CURRICULUM

Topics will be frequently revisited and tested and put into different contexts.

Term 1

Mental maths techniques, such as multiplying by 3.5 in your head.

Calculating with negative numbers

BIDMAS

Rounding and estimating

Calculating with decimals

Term 2

Index notation and laws of indices

Identify factors, multiples and prime numbers

Highest Common Factor and Lowest Common Multiple

Algebraic notation

The difference between expressions, identities, equations and formulae

Simplifying algebraic expressions

Term 3

Expand brackets and factorise expressions

Substitute into expressions and formulae

Set up and solve linear equations and linear inequalities

Use inequalities with number lines

Term 4

Compare and simplify fractions

Mixed numbers and improper fractions

Add, subtract, multiply and divide fractions

Convert between fractions, decimals and percentages

Recurring decimals

Calculate a percentage, percentage profit/loss, VAT and interest

Term 5

Properties of triangles and quadrilaterals

Parallel lines (corresponding and alternate angles)

Recognise sequences such as Fibonacci, arithmetic and geometric

Finding the nth term of a sequence

Term 6

Frequency tables

Averages

Different types of charts and graphs

YEAR 8 CURRICULUM

Topics from Year 7 will also be revised and tested and combined with Year 8 topics wherever possible.

Term 1

Convert between units of measure
Area of triangles, trapezia and parallelograms
Area and perimeter of compound shapes
Volume and Surface Area of prisms
Nets of 3D shapes
Primary and Secondary data
Sampling and populations
Averages from frequency tables and compare measures of average

Term 2

Carry out a large data handling project to practise all data skills
Rotations, reflections, translations and enlargements
Congruence

Term 3

Simplify ratio and share a quantity in a given ratio
Currency conversion
Direct and inverse proportion
Best buy problems
Pythagoras in 2-D
Length of a line segment using Pythagoras
Trigonometric ratios - sine, cosine and tangent

Term 4

Sum of exterior angles of all polygons
Sum of interior angles of any polygon
Measure and draw lines and angles accurately
Sketch 3-D solids
Draw front, side and plan elevations

Term 5

Probability scales
Theoretical and experimental probability
Mutually exclusive and independent outcomes
Relative frequency
Sample space diagrams
Venn diagrams

Term 6

Perpendicular bisectors and angle bisectors
Construct angles of 30, 45, 60 and 90 degrees
Find regions satisfying a combination of loci
Use 3-figure bearings to solve problems

YEAR 9 CURRICULUM

Content from both Year 7 and Year 8 will be revisited and tested throughout the year and will be combined with Year 9 topics wherever possible.

Term 1

Financial mathematics – looking at savings, budgeting, borrowing and repayments, earnings, payslips, tax, national insurance, pensions, investment and insurance.

Term 2

Draw and interpret real-life graphs
Distance-time and velocity-time graphs
Drawing straight line graphs in the form $y=mx+c$ by calculating coordinates
Interpreting gradients

Term 3

Density/mass/volume, speed/distance/time, pressure/force/area
Convert between metric speed measures such as m/s to km/h
Use kinematics formulae to calculate speed and acceleration
Reverse percentages
Multipliers for repeated percentage change
Compound interest and simple interest
Growth and decay problems
Direct and inverse proportion
Area and circumference of a circle
Surface area and Volume of 3D shapes

Term 4

Similar shapes, including area and volume scale factors
Quadratic equations – factorise and solve (including the quadratic formula)
Simultaneous equations, including where one is a quadratic

Term 5

Drawing quadratic graphs by calculating coordinates
Identify roots and turning points of a quadratic graph
Changing the subject of a formula
Harder laws of indices
Calculating in standard form

Term 6

Introduction to vector notation
Harder sequences and finding the n th term of a quadratic sequence

YEAR 10 CURRICULUM

Content from Years 7, 8 and 9 will be revised and tested throughout Year 10, and will be linked to Year 10 modules wherever possible.

Term 1

Set up and solve linear equations derived from a variety of topics and situations

Change the subject of a formula – harder type

Iterations

$y=mx+c$, finding the equation of a line, the gradient, the mid-point

Parallel and perpendicular lines

Term 2

Solving ratio problems

Calculating with compound measures

Direct and inverse proportion, including recognising graphs of proportionality

Recognise and draw graphs of cubic, reciprocal and exponential functions

Recognise the equation of a circle and sketch a circle from its equation.

Term 3

Bounds and measure of accuracy

Arc length and area of sectors

Volume and surface area of compound shapes

Problems with complex 3D shapes such as frustums and similarity

Solving quadratic inequalities

Probability tree diagrams and Venn diagrams

Algebraic problems with probability topics

Term 4

Recognise and draw graphs of trigonometric functions

Solve trigonometric equations

Know and use the exact trigonometric values of 0, 30, 45, 60 and 90 degrees

Apply and identify transformations of graphs

Area of non-right-angled triangles using $\frac{1}{2} ab \sin C$

The Sine Rule and the Cosine Rule

3D trigonometry and Pythagoras problems

Term 5

Random stratified sampling

Draw and interpret cumulative frequency graphs and box-plots

Draw and interpret frequency polygons

Draw and interpret histograms

Recognise and use circle theorem to solve problems

Term 6

Work out the equation of a tangent to a circle

Surds

Algebraic Fractions

Functions, including composite and inverse

Vector problems and proof.

YEAR 11 CURRICULUM

The curriculum content was covered in Years 7 to 10, and so Year 11 is a year to identify and focus on weaker areas and to hone examination technique. There are no easy questions on the Mathematics examination papers – many questions are problem solving and can involve numerous topics. For that reason, we will continue to build and enhance the skills to tackle the examination by learning how to start a question that has no obvious entry point, and practising questions with combined topics in.

You will work through numerous past papers and practice papers throughout the year, using them to identify knowledge gaps and to then fill those gaps during lesson time.

YEAR 12 CURRICULUM

The A-level Mathematics curriculum follows the Edexcel specification and consists of modules in Core Mathematics, Statistics, and Mechanics. The Year 12 content is:

Core Mathematics modules

Manipulation of algebraic polynomials
The binomial expansion
Algebraic division and the factor theorem
Laws of indices
Surds and rationalising the denominator
Quadratic functions and the discriminant
Solving quadratic equations by factorising, formula and completing the square
Solving linear and quadratic simultaneous equations and inequalities
Sketching quadratic, cubic and reciprocal graphs
Transformation of graphs
Straight-line coordinate geometry
Equations of circles
The Sine Rule and the Cosine Rule
Trigonometric graphs and solving trigonometric equations
Trigonometric identities
Exponential functions
Logarithms
The number e
Calculus – differentiation and integration
Vectors

Statistics Modules

Measures of central tendency
Standard deviation and variance
Linear coding
Cumulative frequency graphs and histograms
Scatter graphs and regression lines
Discrete and continuous probability distributions
Binomial distribution
Hypothesis testing and significance levels

Mechanics Modules

Kinematics
The equation of constant acceleration
Vertical motion
Displacement-time and velocity-time graphs
Variable acceleration
Forces
Newton's law of motion
Connected particles
Pulley

YEAR 13 CURRICULUM

In Year 13 you will continue from where you left off in Year 12 and build on the previous years learning. The Year 13 content is:

Core Mathematics Modules

Functions – composite and inverse
Modulus
Partial fractions and use in differentiation and integration
Parametric equations
Sequences and series – arithmetic and geometric
Trigonometry with radians
Addition and subtraction formulae
The chain rule
Differentiation of exponential functions
Differentiation of Sine and Cosine functions
The product rule
The quotient rule
Implicit equations and differential equations
Integrating trigonometric functions
Integration by parts
Iterative methods
Newton-Raphson formula

Statistics Modules

Conditional probability and set notation
The normal distribution
The correlation coefficient
Hypothesis tests for the mean of a normal distribution
Non-linear regression

Mechanics Modules

Vectors in three-dimensions
The equation of a constant of acceleration
Velocity vectors
Vectors with calculus
Projectiles
Forces
Coefficients of friction
Connected particles
Turning moments
Horizontal rods