



Maths

Curriculum Intent

The Mathematics department aims to challenge each student and has high expectations of all its students. We make full use of bespoke Google Sites to deliver the curriculum through students' use of 1:1 devices.

Key Stage 3

In Year 7, we ensure that all students have covered and are competent in topics that are described in the Key Stage 2 curriculum by assessing their prior knowledge. This allows for a smooth transition between further Key Stages and ensures progression in teaching and learning throughout their time at AHS.

In Year 8 and 9, we build on the knowledge from Year 7 and take the concepts further in preparation for the Higher GCSE course.

We offer a variety of teaching and learning activities such as independent tasks, online activities including Mymaths and Desmos, as well as practical group tasks. This aims to seamlessly bridge the gap from Primary to Secondary level Mathematics and develop the students' fluency in performing and applying key mathematics skills. This helps to engage and motivate our students through full participation in lessons. We typically build in extension material where students can explore enrichment opportunities both within and outside of the curriculum to enhance students' enjoyment of Mathematics, such as UKMT Mathematics challenge problems.

We aim to nurture students' ability to reason and problem-solve through exposure to a variety of strategies by making this a regular feature in lessons and assessments. Challenge is provided through depth rather than acceleration.

Students are assessed regularly through tests and homework where feedback is given either in lessons, orally or written onto their work. Students are organised by ability from the start of Year 8 by splitting the Year group in two to make three Set 1 groups and three Set 2 groups and this continues into Year 9. There can still be a wide range of ability within a class so we aim to establish a classroom climate where all students feel that they can contribute and which secures their motivation and concentration. We adapt teaching strategies to keep all students suitably challenged. If intervention is required, we will provide appropriate support within lessons or suggest making use of the maths clinic to ensure students do not fall behind the rest of their peers. All students will be given the opportunity to partake in the UKMT maths challenge events (All Year

7 and some of Year 8 do the junior maths challenge and some Year 9 students are invited to sit the intermediate maths challenge) with support given at a lunchtime club. There is also the House Mathematics competition for Year 7 which is a relay race using problems similar to that seen in the UKMT Maths Challenges.

Key Stage 4

The Mathematics department organises the students by ability at the start of Year 10. We stream the students into two set 1 groups, two set 2 groups and three set 3 groups. All students will study for the AQA Higher GCSE Mathematics with the students in sets 1 and 2 having the opportunity to study the Further Maths Level 2 qualification. The aims of this are to give students the time to become fluent in the skills at GCSE and to stretch and challenge the more able students. We have adapted our schemes of work to reflect the changing nature of Mathematics assessments by including more problem-solving activities. We regularly assess prior knowledge allowing us to focus our teaching on areas that require the time.

We run revision sessions for selected students in Year 11 prior to their summer exams.

Students will be given the opportunity to partake in the UKMT maths challenge events with support given at a lunchtime club.

The students revise throughout Year 11 by working through past papers for homework and in class. They can seek help from the Maths Clinic at lunchtimes.

Key Stage 5

At Key Stage 5 we offer two A Levels and one AS Level: AS and A Level Mathematics and A Level Further Mathematics, following the Edexcel Specifications 8MA0, 9MA0 and 9FM0. Students are taught in small groups by two teachers where they are taught a linear programme with a deeper emphasis on developing and assessing reasoning, problem-solving skills and modelling. There is also a focus on the use of technology in teaching and learning and students will have to familiarise themselves with the more advanced statistical uses of their calculators. The large data set is referred to from early on in Y12 so that our students become familiar with it and are able to use it throughout the course. This allows a thorough understanding by the end of the two years.

Throughout the course we aim to cover topics in Pure Maths and Applied Maths simultaneously so that our students remain confident in all core skills and are better prepared for their final exams.

We offer Further Mathematics in order to challenge our more capable mathematicians and enable them to move on to Maths and Engineering based courses at university or to higher level apprenticeships with a strong mathematical understanding. In this A Level, students are taught a linear programme with the same emphasis as in Mathematics A Level. They will advance their knowledge of the number system to include complex numbers and explore how these can be used to solve many otherwise impossible problems. We will also extend their learning with modules in Decision Maths and Further Pure.

All A Level Mathematicians are encouraged to participate in both the individual and group Maths Challenges. We also offer two enrichment courses:

1. Statistics in context is designed to aid students who are not studying A Level Maths but are studying A Levels with a high statistical content such as Biology, Geography, Psychology
2. Personal Finance is designed to help students understand money matters in the real world

Curriculum Implementation

Key Stage 3

Calculators are not to be used in year 7. We want to make sure all girls can competently perform calculations. All tests and the end of year exam will be non-calculator.

Year 7	Year 8	Year 9
Sequences The coordinate grid Area and perimeter Negative numbers BIDMAS Introduction to algebra Factors and multiples Fractions, decimals and percentages Solving linear equations Ratio Averages and displaying data Angles and polygons Construction 3D shapes Circumference and area of circles Volume and surface area of prisms Measures Indices and Standard form Expression and formulae	Negative numbers Algebraic fractions Expanding and factorising with single brackets Rearranging formulae Sample Spaces/Tree Diagrams Functions and Graphs Transformations and Congruence Reverse percentages and percentage change Ratio Stem & Leaf and Scatter Diagrams Inequalities Dimensions and Scales Geometrical reasoning Simultaneous equations	Linear and Simultaneous Equations and Trial and Improvement Bias, Cumulative Frequency and Comparing Distributions Proportional Reasoning Algebraic Manipulation Perimeter, Area and Volume Calculations with Compound Measures, Surds and Recurring Decimals Transformations and Congruence Further Graphs Inequalities Tree Diagrams and Relative Frequency Trigonometry Factorising Angles in circles Ratio Formulae and Expressions

Key Stage 4: GCSE (AQA)

Year 10	Year 11
Factorising Quadratics Percentages Equations and Formulae Statistics Straight line graphs Indices and Standard Form Surds Solving Quadratics Different types of curved graphs	Sine and Cosine rules Iteration Probability Congruency and Similar Shapes Sequences Shape Upper/lower bounds Compound measures Construction Recurring decimals Transforming graphs Vectors

<p>Trigonometry and trig graphs</p> <p>Angles in circles</p> <p>Equation of a circle</p> <p>Algebraic Fractions</p> <p>Functions</p> <p>Factor Theorem (sets 1 and 2 only)</p> <p>Calculus (sets 1 and 2 only)</p> <p>Bearings and Trigonometry</p> <p>Shape</p> <p>Pythagoras and Trigonometry in 3D</p> <p>Volume and Surface Area of Pyramids and Spheres</p> <p>Proportion</p>	<p>Graphs</p> <p>Loci</p> <p>Converting units</p>
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Key Stage 5: A Level (Edexcel)

In Year 12 and 13, we are studying the new Edexcel 8MA0, 9MA0 AS and A Level Mathematics, and 9FM0 A Level Further Mathematics courses.

Year 12	Year 13
<p>Pure Maths:</p> <ul style="list-style-type: none"> ● Indices ● Surds ● Proof ● Quadratic functions ● Lines and circles ● Simultaneous equations ● Inequalities ● Polynomials ● Binomial theorem ● Sketching curves ● Trigonometry ● Differentiation ● Integration ● Logarithms ● Vectors <p>Mechanics:</p> <ul style="list-style-type: none"> ● Kinematics ● Motion under constant acceleration ● Variable acceleration ● Forces and motion ● Resolving and resultants ● Motion under gravity 	<p>Pure Maths:</p> <ul style="list-style-type: none"> ● Proof ● Algebraic methods ● Functions ● Sequences and series ● Binomial expansion ● Radians ● Trigonometry ● Parametric equations ● Integration ● Vectors ● Differential equations <p>Statistics:</p> <ul style="list-style-type: none"> ● Bivariate data ● Scatter graphs ● Correlation ● Regression line ● Interpolation and extrapolation ● Conditional Probability ● The Normal distribution ● Hypothesis testing

- Systems of forces

Statistics:

- Measures of central tendency
- Measures of spread
- Outliers
- Percentiles
- Box and whisker
- Frequency polygon
- Histogram
- Cumulative frequency graph
- Comparing data sets
- Sampling data
- Probability and Conditional Probability
- Binomial Distribution

If you are studying further maths in Year 12 then you will also study the rest of the A Level in Mathematics and some components of the A Level Further Mathematics.

Pure Maths:

- Further proof
- Functions
- Parametric equations
- Algebraic fractions
- Partial fractions
- Vectors in 3D
- Sequences
- Radians
- Trigonometric formulae
- Differentiation and Integration
- Numerical methods

Mechanics:

- Kinematics in two dimensions
- Motion in 2D with constant and variable acceleration
- Motion under forces

Statistics:

- The Normal distribution
- Hypothesis testing

Core Pure (further maths)

- Matrices
- Complex numbers

Mechanics:

- Moments
- Force and Friction
- Application of forces
- Further kinematics
- Projectiles

If you are studying further maths at A Level

Core Pure 1 and 2:

- Introduction to differential equations
- Numerical methods
- Linear equations
- Systems of differential equations
- Calculus
- Polar coordinates
- Complex numbers
- Power series
- Matrices
- Hyperbolic functions

Further Pure 1:

- Vectors
- Conics
- Inequalities
- t-formulae
- Taylor series
- Methods in calculus
- Numerical methods
- Reducible differential equations

Further Decision:

- Algorithm problems
- Graphs and networks
- Algorithms on graphs
- Route inspection
- The travelling salesperson problem
- Linear programming
- The simplex algorithm
- Critical path analysis

Impact

Key Stage 3 Our KS3 curriculum encourages problem solving which prepares students well for their GCSE course. Students are more fluent in maths. They can explain their answers more proficiently and in greater depth. They appreciate the links between topics and how they relate to the real world, which enhances their appreciation for the topic.

They are more adept at problem solving by being exposed to a wide variety of problems. They use their basic concepts to develop their skills in order to solve unfamiliar problems.

Students are becoming more confident in trying even if they may make mistakes. Class discussions allow them to share ideas and work together towards the solution.

They have worked collaboratively through discussion and tackling problems in pairs/teams. They have benefited from sharing ideas with others.

Throughout KS3, students have become used to using IT in their learning. Interactive websites such as Desmos and MyMaths allow them to visually see how the Maths works.

The scheme of work has been adapted to allow for better sequencing where the topics lead into one another more fluidly. Students regularly revisit previous topics as they extend their understanding by seeing how they can be used within other areas of mathematics. This allows students to revise topics without having to spend lessons going back over all of the concepts.

KS3 students use manipulatives in lessons to physically depict the problem and use objects such as tiles, discs and cubes to solve it.

KS3 students have had opportunities of mathematical enrichment through taking part in Maths Challenges or House Maths.

Key Stage 4

Students are confident and fluent in tackling GCSE Higher Maths questions. This also supports other GCSE courses like Science, Geography, Technology. The skills learnt help students move on to A level courses such as Science, Psychology and Geography. The Further Maths course helps prepare students for A level Maths and eases the transition.

Use of exam questions in homeworks and assessments help students achieve high grades at GCSE. Also having all resources on the KS4 Maths google sites means students can find everything they need in one place.

The inclusion of problem solving within the GCSE Maths course equips students with skills to tackle the types of problem solving they might face in the workplace. Additional problem solving is covered in participating in various Maths challenges which can help students prepare for the Oxbridge application process.

Key Stage 5

Students have secure reasoning and modelling skills.

Students are able to demonstrate their problem solving skills through being able to tackle problems across Pure and Applied Mathematics.

Students are able to proficiently use technology and calculators to perform various numerical and statistical calculations. Their enhanced statistical knowledge allows them to analyse and interpret large real life data sets and from this they are able to draw conclusions about real world situations.

Student's long term memory is strategically influenced by distributing learning and retrieval opportunities over a longer period of time. Student's mathematical confidence grows through constant Interleaving within the same lesson.

Through fortnightly spot-tests students are constantly challenged to retrieve prior knowledge. Further Mathematicians are provided with the opportunity and skills to study Mathematics and Engineering based courses at university.