



MATHS

MATHEMATICS:

Why is the study of MATHEMATICS important?

MATHEMATICS has two disciplines: Pure and Applied – Pure Mathematics is the abstract science of number, quantity and space as concepts and Applied Mathematics is where the knowledge learned is applied to other disciplines such as statistics, physics and engineering.

Initially your mathematics study focuses on building firm foundations, including your fluency and understanding in readiness for your future GCSE and even A level mathematics study. Our curriculum is carefully designed to ensure that all students get a firm grounding in the basic rules of number. This is differentiated by depth, as opposed to students racing onto the next topic. This approach develops more confident mathematicians as students move through the curriculum and helps them to retain their new learning for longer. Your study of mathematics at Outwood will make you think about the beauty of how different topics connect and how processes relate to each other. Mathematics encourages you to discover those connections for yourself, to make you a detective of mathematics and to explore how to solve problems. This enables you to become an analytical thinker, knowing that the answer is only the final part of a process. It will help you to learn how to make conjectures (a conclusion based on evidence, patterns and thought, but not yet confirmed with proof) to reason and to prove. It will enable you to be more logical in your approach to complex issues and be more analytical.

You will discover how the basic four rules can be applied to fractions, decimals, standard form and algebra and how multiplicative reasoning can be applied to many areas of maths, such as percentages, ratio, proportion and enlargement to name but a few. You will get to investigate the beauty of mathematics connected to shape, and the usefulness it brings in analysing data and solving mechanical problems.

Your study of Mathematics will encourage you to think deeply and help you to problem solve more effectively – a great life skill that all universities and employers will appreciate. Across your study you will explore number, proportion, algebra, shape & space and probability & statistics. Lessons will provide opportunities for constructing your own learning and discovering mathematical rules, through the use of concrete materials such as counters, through pictorial representations to demonstrate mathematical concepts and to apply these to solve problems, both abstract and from real-life.

Maths lessons will be full of discussion, questioning, proving and explaining. You are going to love it! Mathematics will expand your mind!

What skills will the study of Mathematics teach you?

You are a citizen in this world and you need to know the basic skills of number and how to apply them to a range of problems – known as ‘being numerate’. It will teach you:

- Not to be afraid of “being lost” and having to struggle to find one’s way through the problem – RESILIENCE!
- To use calculation to solve basic problems
- To be financially aware
- To make and use generalisations – often quite quickly. One of the basic abilities, easily detectable even at the level of primary school: after solving a single example from a series, a child immediately knows how to solve all examples of the same kind.
- To have rapid and sound memorisation of mathematical material.
- To be able to concentrate on mathematics for long periods without apparent signs of tiredness.
- To be able to offer and use multiple representations of the same mathematical object. (For example, a mathematical function can be represented in tables, sequences, graphs, and algebraic expressions.)
- An instinctive tendency to approach a problem in different ways: even if a problem has been already solved, you are keen to find an alternative solution.
- To utilise analogies and make connections.
- Skills to link two (or more) elementary procedures to construct a solution to a multi-step problem.
- To recognise what it means to “know for certain”.
- To know how to prove or disprove a conjecture through mathematical reasoning.
- To be efficient, a distinctive tendency for “economy of thought,” striving to find the most economical ways to solve problems, for clarity and simplicity in a solution.
- To be aware of the presence and importance of an underlying structure, for example, a proportional relationship.
- How to use algebra to generalise numerical and physical models.

How does your study of MATHEMATICS support your study in other subjects?

Study of any subject in our curriculum takes full advantage of links with other subject areas – we term these as interdisciplinary links and we make the most of them because we know that deep learning requires the transference of knowledge and skills from one topic of learning to another. Once you can transfer your learning across topics and subject areas then you are really mastering what you know and how to apply your understanding and skills.

Mathematics impacts on many other subjects such as geography and science, any subject that analyses data, looks at trends and uses formulae. Computer Science is a subject that uses the algorithmic approach that many topics in mathematics also use. The ability to follow a process accurately is applicable to many other subjects too.

Across the other subjects, teachers will make reference to your learning in maths and this will help you to develop your understanding. There may be opportunities to explore the links between science, technology, engineering and mathematics departments in STEM activities.

Outside of Mathematics lessons there are a range of initiatives that can help you deepen your understanding of mathematics such as Numeracy Ninjas, Times Table Rock Stars and online learning programmes such as the wonderful Sparx. Previously we have participated in the UKMT Maths Challenge, this year we intend to compete again; this alongside creating our new Axiom Maths Circle will provide further stretch and challenge for our more able mathematicians.

How are you assessed in MATHEMATICS?

Throughout the 5-year MATHEMATICS course you are assessed using the following assessment objectives, which ensure that you can cumulatively build your subject understanding in preparation for future GCSE and A Level study. There are assessment points throughout each year that we term Praising Stars®. For younger years we base our assessment on our subject mapping of the age-related expectations across the curriculum, assessing students' performance at their current stage of study against expectation. At GCSE, we make predictions informed by our holistic assessment of their progress against the key assessment objectives and their aspirational GCSE targets. These are also the basis for any appropriate support and intervention.

Key Assessment Objectives

AO1: Use and apply standard techniques

Students should be able to:

- accurately recall facts, terminology and definitions
- use and interpret notation correctly
- accurately carry out routine procedures or set tasks requiring multi-step solutions

AO2: Reason, interpret and communicate mathematically

Students should be able to:

- make deductions, inferences and draw conclusions from mathematical information
- construct chains of reasoning to achieve a given result
- interpret and communicate information accurately
- present arguments and proofs
- assess the validity of an argument and critically evaluate a given way of presenting information

AO3: Solve problems within mathematics and in other contexts

Students should be able to:

- translate problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes
- make and use connections between different parts of mathematics
- interpret results in the context of the given problem
- evaluate methods used and results obtained
- evaluate solutions to identify how they may have been affected by assumptions made

GCSE specifications in mathematics should enable students to:

1. develop **fluent** knowledge, skills and understanding of mathematical methods and concepts
2. acquire, select and apply mathematical techniques to **solve problems**
3. **reason mathematically**, make deductions and inferences and draw conclusions
4. comprehend, interpret and **communicate mathematical information** in a variety of forms appropriate to the information and context.

How can Mathematics support your future?

A strong GCSE in maths opens doors for your future career – employers look favourably on this and it would put you in a very strong position when looking for jobs or placements post-16 and in colleges.

Careers that the study of MATHEMATICS supports include:

- Actuarial analyst
- Actuary
- Chartered accountant
- Chartered certified accountant
- Data analyst
- Data scientist
- Investment analyst
- Research scientist (maths)
- Secondary school teacher
- Software engineer
- Statistician
- Civil Service fast streamer

- Financial manager
- Financial trader
- Insurance underwriter
- Meteorologist
- Operational researcher
- Quantity surveyor
- Software tester

The delivery of our SOL will provide a strong foundation if you choose to continue your studies post-16. Whether you choose to study Mathematics into A level or not, you will have gained a lot from its study over the five years from years 7 to 11. We know that the depth of understanding we encourage and support you to achieve will set you up well to be not only numerate, but a really logical and analytical thinker, who is resilient and ready to solve problems.

Mathematics is offered at prestigious universities either as a single honours or a joint honours subject studied alongside other disciplines e.g. Statistics, Computer Science, Science, Philosophy, Engineering. Additionally, a high level of qualification in mathematics is a prerequisite for honours degrees in many engineering and physics related subjects.

An A level in maths demonstrates the very high level of analytical thinking that many universities are looking for in their applicants. We strongly suggest you continue with your studies in mathematics post-16 as this will develop your mathematical thinking and will help your future applications be they for colleges, universities, apprenticeships or employment.

Our Maths Core Scheme of Work is shown below. We will make bespoke adjustments to this to cater to the individual needs of their students. Units are grouped into key areas that will revise and extend the topics within number, algebra, shape, proportion and data.

Year 7	1	2	3	4	5	6	7	8	9	10	11	12	13
Autumn	Algebra 1 Generalisation		Baseline Assessment	Proportion 1 Multiplicative reasoning Interpreting pie charts		Number 1 Place value and powers of 10 Types of number, factors and multiples Basic HCF & LCM and primes Addition and subtraction of decimals		Proportion 2 Measurement and decimals		Revise, Assess and Respond	Data 1 (Science) Displaying data incl. scatter graphs The mean		
Spring	Number 2 Addition and subtraction of fractions	Shape 1 Lines, angles and 2D shapes		Shape 2 Perimeter	Number 3 Multiplication and division of fractions and decimals	Shape 3 Area		Proportion 3 Equivalence, conversion and ordering of fractions, decimals and percentages	Number 4 Addition and subtraction of negative numbers	Revise, Assess and Respond	Data 2 Averages and the range		
Summer	Number 5 Types of number Product of prime factors HCF and LCM using Venn diagrams	Number 6 Multiplication and division of negative numbers	Algebra 2 Order of operations Simplifying incl. expanding brackets and factorising expressions			Proportion 4 Percentage of amounts Percentage increase and decrease incl. using a multiplier	Revise, Assess and Respond		Algebra 3 Substitution and solving equations with an unknown on one side			Data 3 Probability	

Year 8	1	2	3	4	5	6	7	8	9	10	11	12	13
Autumn	Algebra 4 Sequences and finding the nth term	Proportion 5 Ratio and proportion		Number 7 Rounding and estimating incl. error intervals	Algebra 5 Coordinates Linear graphs			Revise, Assess and Respond	Data 4 Two-way tables Venn diagrams Frequency trees		Shape 4 Congruency Introduction to similarity Transformations		
Spring	Shape 4 Congruency Introduction to similarity Transformations	Proportion 6 Compound measures		Number 8 Four operations with fractions & mixed numbers incl. problem solving		Algebra 7 Equations with an unknown on both sides Changing the subject of a formula Substitution into scientific formulae Expanding double brackets			Revise, Assess and Respond	Shape 5 Parts of circles Circumference of circles and arc length Perimeter of semi-circles, quarter-circles and compound shapes		Number 9 Indices and surds	
Summer	Number 9 Indices and surds	Shape 6 Angles on parallel lines Angles in polygons			Data 5 Pie charts	Proportion 7 Fractional and percentage change		Revise, Assess and Respond		Shape 7 Area of circles, semi-circles, quarter-circles and compound shapes	Number 10 Standard form		

Year 9	1	2	3	4	5	6	7	8	9	10	11	12	13
Autumn	Data 6 Analyse data using averages and measures of spread Stem and leaf Scatter graphs		Shape 8 Constructions		Proportion 8 Writing and simplifying ratios Combining ratios Connecting ratio and fractions		Algebra 8 Solve linear simultaneous equations algebraically and graphically		Revise, Assess and Respond	Data 7 Use of data	Algebra 9 Expand and factorise quadratic expressions		
Spring	Number 11 Indices and surds Rationalise the denominator Fractional and negative indices		Algebra 10 Solve quadratic equations by factorising Plotting quadratic graphs Identify roots of quadratic equations graphically			Shape 9 Pythagoras' Theorem		Revise, Assess and Respond	Proportion 9 Proportion problems Introduce inverse proportion	Shape 10 Surface area		Algebra 11 Non-linear sequences incl. basic quadratic sequences	
Summer	Algebra 11 Non-linear sequences incl. basic quadratic sequences	Shape 11 Volume of cuboids, prisms, and cylinders		Data 8 Probability incl. tree diagrams		Shape 12 Similarity and trigonometry		Revise, Assess and Respond			Key stage 4 ready		

Year 10	1	2	3	4	5	6	7	8	9	10	11	12	13
Autumn	Algebra 12 Equations and inequalities		Data 9 Analysing and interpreting data		Number 12 Further indices and surds Calculations using standard form Recurring decimal proof Combinations and the product rule for counting			Revise, Assess and Respond	Algebra 13 Linear simultaneous equations		Shape 13 Angles on parallel lines Angles in polygons Basic circle theorems		
Spring	Algebra 14 Plotting linear graphs from a table $y=mx+c$ (incl. parallel and perpendicular lines) Identifying non-linear graphs			Shape 14 Perimeter and area incl. circles, arcs and sectors Worded problems with money links to algebra		Algebra 15 Solving quadratic equations and using quadratic graphs		Data 10 Data Handling Scatter graphs Time series	Revise, Assess and Respond	Shape 15 Volume	Proportion 10 Compound measures Real-life graphs		
Summer	Proportion 11 Contextual calculations and multi-step problems	Algebra 16 Algebraic fractions	Revise, Assess and Respond	Shape 16 Pythagoras' Theorem and trigonometry incl. 3D			Proportion 12 Direct and inverse proportion and graphs	Shape 17 Bearings & scale diagrams	Revise, Assess and Respond		Proportion 13 Percentages incl. finance		

Foundation:

Year 11	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Autumn	Number Fractions Percentages Use of Calculator		Ratio and Proportion Solve problems with fraction/ratio and percentage Best Buy Scaling problem Similar Shapes Ratio		Shape Area Perimeter Compound Shapes	Algebra Multiplying two algebraic brackets Factorise algebraic brackets Forming and solving equations. Solve equations with unknown on one side Solve equations with unknown on both sides.		Number HCF and LCM Prime Factors	Data and Probability List all the outcomes for events Two way tables Frequency Trees Venn Diagram - notation Venn Diagram - construction Relative Frequency		Shape Angle facts Sum of interior angles Sum of exterior	Shape Circles		Data and Probability Pie Charts - Construction Pie Charts - Interpret Independent events Successive events Averages	
Spring	Algebra Inequalities	Shape Transformations Enlargements		Ratio and Proportion Direct Inverse Context	Algebra Sequences	Number Laws of Indices Standard Form	Algebra Straight Line Graphs Midpoint Quadratic	Shape Pythagoras	Compound Measures Speed, Distance and Time Density, Mass and Volume Pressure, Area and Force Apply in context	Algebra Substitution Simultaneous equations Rearrange	Shape Trig	Revision	Revision	Easter	
Summer	REVISION	REVISION	GCSE Exams												

Higher:

Year 11	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Autumn	Number Indices and bounds. Percentages:reverse, change, interest. Standard form.		Algebra Factorising quadratics, completing the square, quadratic graphs solving and key features.		Shape Transformations, pythagoras, trig recap	Algebra Proportion	Data Cumulative frequency, box plots, capture recapture, frequency polygons, averages, histograms		Algebra Linear inequalities (including graphical), recurring decimals, linear graphs including parallel and perpendicular		Shape Circle theorems, arcs, sectors, area and volume conversions, similar shapes		Algebra Changing the subject, iteration, simultaneous equations, geometric and quadratic sequences		Number Surds, rationalising the denominator
Spring	Shape Non right-angled trigonometry, including area of triangle Vectors		Probability Probability (including conditional) tree diagrams, venn diagrams Set notation.		Algebra Quadratic formula, completing the square, quadratic simultaneous equations		Shape Velocity time graphs, trig graphs	Algebra Algebraic fractions, functions, equation of a circle		Algebra Algebraic proof, quadratic inequalities		Recap and revise		Easter	
Summer	Revision	Revision	GCSE exam / revision												