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, either as abstract concepts and Applied Mathematics is where the knowledge learned is applied to other disciplines such as statistics, physics and engineering.

At Key Stage 3 your mathematics study focuses on mastery building 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. Your study of mathematics at Outwood will make you think about the beauty of how numbers 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, someone who sees that the answer is only the beginning. 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.

From Year 7 you will have the exciting opportunity to explore the four rules of number in great depth – how addition leads to multiplication, and how these two lead to subtraction and division. You will discover how these four rules can be applied to fractions, decimals 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, algebra, shape and space and statistics. Lessons will provide a wide range of opportunities for constructing your own learning and discovering your own 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!

Big Questions such as: How tiny is the earth in comparison with the universe?, How can solutions to difficult engineering problems can be found by using graphs and calculus?, How do people predict what is going to happen in the economy? and other such seemingly bewildering questions will be answered … you just need to learn the basics, be an inquisitive learner, and the rest will follow.

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 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, switching easily between representations of the same function by tables, charts, graphs, and analytic 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 detect unstated assumptions in a problem, and either to explicate and utilise them, or to reject the problem as ill-defined.
- 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.
- To use rapid abbreviation, compression or a curtailment of reasoning in problem solving e.g. algebra.
- How to grasp encapsulation and de-encapsulation of mathematical objects and procedures.

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 touches on many other subjects such as geography and science, any subject that analyses data, looks at trends, 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. The Social Sciences, particularly at Post 16 and at undergraduate level have a strong need for the use of data, for understanding of exponential growth and decay, for manipulation of formulae – and this is one reason why the Core Maths AS Level was introduced recently.

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, engineering and mathematics departments in STEM activities.
Outside of Mathematics lessons there are a range of initiatives that help you deepen your understanding of mathematics such as Weekly Puzzles, Enrichment Clubs, Maths Challenges and online learning programmes such as the wonderful Sparx Maths.

How are you assessed in MATHEMATICS?

Throughout the 5 years 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 6 assessment points each year that we term Praising Stars©. In Year 7, 8 and 9 we assess against age related expectation. In Years 10 and 11 we assess against GCSE specification criteria.

Key Assessment Objective 1: 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

Key Assessment Objective 2: 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

Key Assessment Objective 3: 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

How can Mathematics support your future?

We offer the study of GCSE Mathematics and Level 3 Algebra and strongly encourage your continued study in this fantastic subject if you have demonstrated a passion for it, a flair and an ability.

However, whether you have chosen to study of Mathematics into A level or not you will have gained a lot from its study over the 5 years from years 7-11. 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.

A high level of qualification in mathematics is a pre-requisite for honours degrees in many engineering and physics related subjects.
It is also cited that an A level in maths demonstrates the very high level of analytical thinking that many universities are looking for in their applicants. The very fact that you have been able to study mathematical thinking post 16 will help your future application be they for colleges, universities, apprenticeships or employment.

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:
- Actuary
- Chartered accountant
- Chartered certified accountant
- Data analyst
- Data scientist
- Investment analyst
- Secondary school teacher
- Software engineer
- Statistician
- Civil Service fast streamer
- Financial manager
- Financial trader
- Insurance underwriter
- Meteorologist
- Operational researcher
- Quantity surveyor
- Software tester

	Year 7	Year 8	Year 9	Year 10	Year 11
			CURRICULUM PROGRESSION PATHWAY FOR MATHEMATICS AT OUTWOOD ACADEMY Haydock		
Autumn 1 - Title of unit(s) of learning	• Introduction to algebra • Multiplicative reasoning and interpreting pie charts • Place value, properties of number and decimals	●Sequences ●Ratio & Proportion ●Rounding & Estimating ●Coordinates and Linear Graphs	• Statistical Analysis including scatter graphs • Constructions • Ratio & Combining Ratio	• Introduction to Algebra • Measures of Spread • Prime Factors, Indices & Surds Additional Higher Content • Cumulative Frequency, Histograms & Box Plots	• Bearing & Scale Diagrams • Proportion • Percentages • Probability • Algebraic Graphs • Bespoke Revision Additional Higher Content • Higher Trigonometry • Direct & Inverse Proportion
Assess information What key assessments will be evident in student books by the end of this unit of learning?	Baseline assessment Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term.	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term.	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term.	Key Assessment on each unit of work using past GCSE exam questions.	Key Assessment on each unit of work using past GCSE exam questions. Additional staples challenges.

Autumn 2 Title of unit(s) of learning	• Measurement and decimals • Data 1 - Displaying data (including scatter graphs) and Mean	• Frequency Diagrams • Congruency & Similarity	• Simultaneous Equations • Use of data • Expanding and factorising quadratics	• Simultaneous Equations • Data Handling including Frequency Polygons & Stem Leaf Diagrams Additional Higher Content • Ratio Problems	• Transformation • Sequences • Bounds • Bespoke Revision Additional Higher Content • Upper & Lower Bounds
Assessment information What key assessments will be in student books?	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term	Key Assessment on each unit of work using past GCSE exam questions.	Key Assessment on each unit of work using past GCSE exam questions. One staples challenge and full series of exam papers for November assessments

Spring 1 - Title of unit(s) of learning	• Lines, Angles and 2D Shapes • Add & Subtract Fractions • Multiply & Divide Fractions • Perimeter & Area	• Compound Measures • Real Life Graphs • Fractions & Mixed Numbers	• Indices & Surds • Solving Quadratic Equations • Pythagoras' Theorem	• Lines & Angles on Parallel Line and in Polygons • Drawing Linear Graphs • Perimeter & Area including Circles	• Quadratics Revision • Congruency & Similarity • Bespoke Revision Additional Higher Content • Completing the square
Assess information What key assessments will be evident in student books by the end of this unit of learning?	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term	Key Assessment on each unit of work using past GCSE exam questions.	Key Assessment on each unit of work using past GCSE exam questions. February Mock Assessments

Spring 2 Title of unit(s) of learning	• Fraction, Decimal and Percentages • Add & Subtract Negative Numbers • Multiply & Divide Negative Numbers • Averages (Mode & Median)	• Solving Equations & Algebraic Manipulation • Circumference of Circles	• Direct & Inverse Proportion • Surface Area • Non-Linear Sequences	• Calculating with fractions & decimals • Contextual Calculations with ratio, FDP and Best Buys • Solving Quadratic Equations Additional Higher Content • Congruency & Similarity • Scatter Graphs & Time Series	• Functions • Bespoke Revision Additional Higher Content • Transformation of graphs • Vectors • Algebraic Proof
Assessment information What key assessments will be evident in student books?	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term	Key Assessment on each unit of work using past GCSE exam questions.	Key Assessment on each unit of work using past GCSE exam questions. One staples challenge and practice papers

Summer 1 - Title of unit(s) of learning	● Properties of Number ● Order of operations & Simplifying Expressions ● Percentages of an amount	● Indices and Surds ● Angles on Parallel Line & in Polygons ● Pie Charts	● Volume ● Probability including tree diagrams	● Scatter Graphs & Times Series ● 3D Shapes ● Compound Measures ● Solve equations including fractions Additional Higher Content ● Rates of Change ● Algebraic Fractions	● Bespoke Revision & Exam Preparation
Assessment information What key assessments will be evident in student books by the end of this unit of learning?	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term	Key Assessment on each unit of work using past GCSE exam questions.	

Summer 2
Title of unit(s)
of learning
	● Substitution & Solving
	  Equations
	● Probability
		● Fractional &
		  Percentage Change
		● Area of circles
		● Standard Form
			● Similarity &
			  Trigonometry
			● End of Key Stage
			  Assessment and
			  introduction to KS4
				● Pythagoras' Theorem &
				  Trigonometry
				● Direct & Inverse
				  Proportion
				● Bearing & Scale Diagram
				
				Additional Higher Content
				● 3D Trigonometry
				● Sine & Cosine Rule
					● Bespoke Revision & Exam
					  Preparation

Assessment information What key assessments will be evident in student books?	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term	Each module is assessed by a key piece of work in lessons. Maths Assessments covering all topics covered during the year are completed each term	Key Assessment on each unit of work using past GCSE exam questions.	