

Mathematics

The aim of the Mathematics Department at Admiral Lord Nelson School is to enable our students to become independent problem solvers and lifelong mathematicians as a product of engaging and research-driven teaching and learning. Our team of enthusiastic mathematics specialists strive to promote interest, curiosity and enjoyment in the learning of mathematics by providing a supportive yet challenging environment, where students believe they can achieve.

How is the curriculum planned?

The curriculum is more than a list of mathematical statements to be ticked off as students pass through school. The curriculum embodies everything that contributes to students learning mathematics. Mathematics is a highly interconnected and cumulative subject and is taught as such. The aim of our mathematics curriculum is for teachers to deliver content in a way that ensures that students' knowledge is developed through the layering of interconnected topics, allowing students to develop an understanding of the relationship between mathematics and problem solving. As students develop fluency, they also begin to build connections and develop their reasoning skills, their understanding deepens and their knowledge grows. Ensuring students leave ready for the next steps in their education or employment.

Students have opportunities to learn increasingly sophisticated mathematical ideas relative to their mathematical ability and prior attainment. We provide opportunities within the curriculum to review mathematical content regularly during starters and assessments. Students are exposed to a standard of mathematics in Key Stage 3 which builds upon concepts already studied at Key Stage 2 and ensures no wasted time in year 7. A focus on algebra and number prepares students for the increasing challenge of mathematical problem solving they will face in Key Stage 4.

Teachers continually gather information about their students through questioning, written classwork, homework and assessments. They use their expert knowledge to ensure students have the expected prior knowledge required to access more challenging learning. Teachers use direct instruction to explain key mathematical concepts and processes, ensuring they have planned to uncover and address students' key misconceptions about topics.

Lesson structure across the department ensures that students are challenged to demonstrate proficiency in these three core strands of the mathematics curriculum: Fluency, Cognitive Reasoning and Problem Solving.

Through marked reviews students are regularly challenged with carefully selected mathematical problems that force students to recall previously covered key content from multiple topics. As a result, students become more confident in their ability to select the mathematics required to solve problems, more independent and more willing to persevere when faced with challenging mathematics.

It is this clear focus on connecting mathematical concepts through problem-solving that allows our students to become enthusiastic and successful mathematicians.

Students are encouraged to ask questions and make links between topics learned in mathematics and other subjects. Teachers work hard to make explicit the links between topics being taught and their usefulness in other subjects and explain why topics are useful for potential future employment. The key skills of numeracy and graphicacy are taught using common approaches; consistency across the school ensures students are able to apply mathematical skills easily in other areas.

In Mathematics we actively seek opportunities to ensure all students have the chance to acquire the cultural capital they need to help them become successful in the future. Prime examples of this include the stock market challenge, where students get the chance to experience a live trading floor. The chance to buy and sell stocks and shares and make a nice profit gives students the chance to gain a greater understanding of the stock market and the economy in general. This just one of the ways we highlight potential career paths that mathematics can open up. Teachers also seek opportunities to make links to famous mathematicians and historical mathematical discoveries and when appropriate make links to real life applications of mathematics.

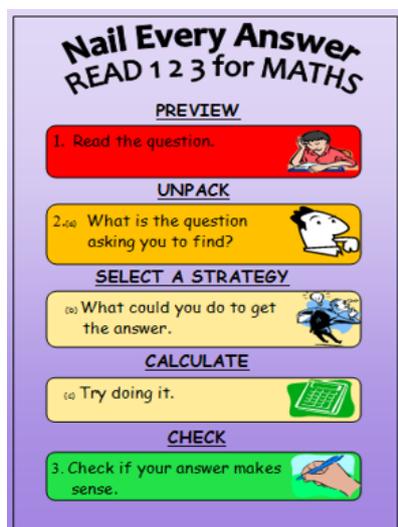


How is the curriculum delivered/taught?

Teachers ensure students receive quality-first teaching by ensuring examples are well modelled (using the *I go, we go, you go* approach when appropriate) making explicit the skills being used. Students are given the opportunity to practice key skills in isolation before combining them to solve multistep problems. Teachers make use of multiple representations and manipulatives when appropriate. Students are regularly given the opportunity to develop success criteria which they can refer back to in later lessons.

When learning new content, students are encouraged to reflect on what skills they already have and consider how they can be used to tackle new problems. Where students lack a well-rehearsed and readily available method to solve a problem they need to draw on problem-solving strategies to make sense of the unfamiliar situation. Research shows that by thinking hard about a problem, students are more likely to remember the new content as it will be viewed as useful. Dan Meyer refers to this method as headache and aspirin. Problems that cause students to think causes a headache and the new learning is the aspirin. Selecting problem-solving tasks for which students do not have readymade solutions makes learning more memorable.

Teachers understand that memory is a highly complex process and in order to build strong neural paths students must be exposed to new content more than once. The use of spaced learning is common practice across the department, with the aim being to help students commit key concepts into long term memory. This is done in a variety of ways including the use of recall starters, low stakes quizzes, key formula tests, games, revision cards and mind maps.



Teachers understand that using the language of mathematics is essential to helping students develop the means to acquire new concepts. Displays containing key command words are in all classrooms. Teachers also encourage students to use mathematical language as this is the best way for them to be confident in the language of mathematics. Understanding the language of math gives students the skills they need to think about, talk about, and understand new mathematical concepts. For example, knowing how to label lengths and angles allows students to discuss congruency. When meeting new vocabulary teachers ensure key meanings are recorded in student friendly language. Students are also encouraged to read questions carefully and underline key words.

How is the curriculum assessed?

Marked reviews are used weekly to assess the learning of current and previously learned topics. Teachers select questions that support both fluency and problem-solving skills with the aim being that students are able to confidently answer questions which require them to select methods from different branches of maths, for instance using circle theorems to find a missing angle to enable students to use trigonometry. Marked reviews allow teachers to focus on giving high quality feedback on topics they have identified as weaknesses in a way that promotes spaced learning. When the class are receiving feedback and making corrections, the use of peer-support for targeted students is widely used.

One of our key strengths in assessing students has been on developing “cognitive reasoning” type problems as much as possible in our lessons, such as “show that” and “spot the mistake” style problems - this ensures students have to show their workings and explain their answer rather than just simply answering a question. These questions are becoming more and more common in GCSE examinations and examiners’ reports suggest students across the country regularly miss them out or gain few/no marks on them. We aim to ensure students are practising these skills regularly by including them in marked reviews.

Key skills and knowledge are also assessed more formally using half termly assessments. Students sit assessments each half term as identified on an assessment calendar. Assessments have been created to be cumulative, with 50% of questions based on the current half terms learning and 50% spaced on previous learned content. Students in sets 1 and 2 also have an extension test to reflect the challenge KPIs they complete that other classes don’t.

At Key Stage 4 both foundation and higher tier papers have been created. At both Key Stages, students alternate between a calculator and non-calculator paper each half term.

ID	Topic	Marks	Actual	Score
1	Positive powers and roots	1	0	0%
2	Rounding numbers	1	0	0%
3 a	Simplifying i.e. $A \times D \div AB$	1	1	100%
3 b	Solving linear equations	1	0	0%
4	Fractions and %	1	0	0%
5	Percentage of an amount	2	2	100%
6 i	Use probability scale	1	1	100%
6 ii	Use probability scale	1	1	100%
7	Problem solving with money	3	2	67%
8 a	Multiplication - fractions	1	0	0%
8 b	Subtraction - fractions	2	0	0%
9	Mixed - four operations	6	0	0%
20	Using ratio	2	1	50%
11 a	Sequences from pictures	2	2	100%
11 b	Sequences from pictures	2	2	100%
11 c	Reasoning with sequences	2	0	0%
12	Calculate probabilities	2	2	100%
13 a	Measure lines	1	0	0%
13 b	Scale drawings	2	2	100%
14 a	Construct pie charts	3	3	100%
14 b	Interpret pie charts	1	0	0%
25	Form an equation - area	4	3	75%
26	Substitution	2	0	0%
27	Proportional reasoning	6	4	67%
28 a	Area of circle in context	4	0	0%
28 b	Under/over-estimate	1	0	0%
29 a	Solving linear equations	2	0	0%
29 b	Lot inequalities	2	0	0%
26	% change	2	0	0%
21 a	Identify outliers	1	1	100%
21 b		1	1	100%
21 c	Scatter graphs	2	2	100%
21 d		1	1	100%
22	Prime factorisation	2	0	0%
23	Multiplication - decimals	3	3	100%
24	Form and solving equations	3	0	0%
25	Pythagoras' Theorem	5	0	0%
26	Use $y = mx + c$	2	0	0%
27 a		1	0	0%
27 b	Vectors	1	0	0%
27 c		1	0	0%
Total Marks		80	34	43%

Question Level Analysis (QLA) is then used to inform data meetings with maths leadership which in turn then inform topics to focus on during re-teach weeks. Students are encouraged to use Hegarty Maths as a tool to respond to feedback from QLA.

Teachers understand that assessment should be used not only to track students’ learning but also to provide teachers with information about what students do and do not know.

Targeted questioning using no hands up in lessons is a common approach used in the department. Assessment for Learning (AFL) is used to give regular verbal feedback that is specific and clear.

Use of diagnostic questions and Mini White Boards (MWBs) are common across the department in most lessons as a way for teachers to assess the whole class quickly. When students give wrong answers, teachers encourage and support further effort and don’t allow students to give up.

Teachers not only address misconceptions but also understand why students may persist with errors and plan for these accordingly.

Use of whole class feedback using MWBs addresses common misconceptions and with best practice, teachers are planning lessons which address errors before they arise.