

Mathematics
Coordinator: Mrs L Baker



Important Terms

Curriculum drivers shape our curriculum breadth. They are derived from an exploration of the backgrounds of our students, our beliefs about high-quality education and our values. They are used to ensure we give our students appropriate and ambitious curriculum opportunities

Curriculum breadth is shaped by our curriculum drivers, cultural capital, subject topics and our ambition for students to study the best of what has been thought and said by many generations of academics and scholars.

Our curriculum distinguishes between subject topics and threshold concepts. Subject topics are the specific aspects of subjects that are studied.

Threshold concepts tie together the subject topics into meaningful schema. The same concepts are explored in a wide breadth of topics. Through this ‘forwards-and-backwards engineering’ of the curriculum, students return to the same concepts over and over, and gradually build understanding of them.

For each threshold concept a number of **Milestones**, each of which includes the procedural and semantic knowledge students need to understand the threshold concepts, provides a progression model.

Knowledge categories in each subject give students a way of expressing their understanding of the threshold concepts.

Knowledge webs help students to relate each topic to previously studied topics and to form strong, meaningful schema.

Pedagogy is the method and practice of teaching, especially as an academic subject or theoretical concept.



Our Curriculum Drivers

Specialist
Pedagogies



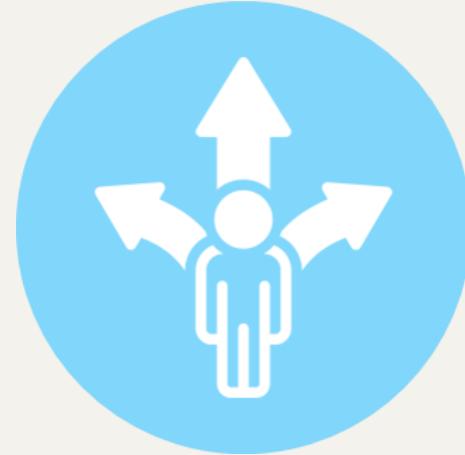
Powerful
Knowledge



S.M.S.C.



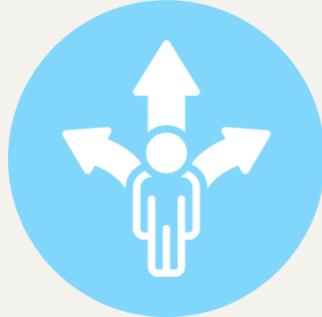
Flexible
Curriculum
Pathways



Vocabulary



Flexible Curriculum Pathways



At Melland we have Flexible Curriculum Pathways. These pathways at their core are the Pre-formal, Semi-formal and Formal pathways. Each of these core pathways are ambitious, carefully sequenced, well-considered and progressive. Each pathway has its own curriculum but they are part of a greater learning continuum with each student getting a personalised curriculum to meet their academic and personal development needs. There are some shared aspects, for example, Skills for Life, careers education, SMSC, Fundamental British Values, personal safety, health education and Preparation for Adulthood. Students can move between the pathways or experience elements of more than one.

Specialist Pedagogies



We use research and training to ensure our staff are equipped with specialist pedagogical knowledge to meet the needs of all our students. All staff understand the needs of students with SEND and they use informed specialist methodologies to deliver accessible and aspirational learning opportunities for all. The specialist pedagogies required can be different depending on the Key Stage, pathway or subject.



Powerful Knowledge

Powerful knowledge refers to the essential knowledge and cultural capital that students may not typically acquire from everyday life. It requires expert teaching and explicit content delivery to prepare students for adulthood and life beyond education. It introduces them to the best that has been thought and said and will help engender an appreciation of human creativity and achievement. Students acquire bespoke and targeted powerful knowledge based on their pathway or personalised curriculum.

Vocabulary

Vocabulary is important as it helps shape our thinking. The explicit teaching of vocabulary is essential for our students as they may not acquire vocabulary incidentally through indirect exposure.

All our students benefit from developing their vocabulary. Our curriculum strikes an appropriate balance between functional vocabulary and enriching vocabulary. The development of vocabulary is not restricted to academic development but also enriches personal development.



S.M.S.C.

Students and their well-being are at the core of our school curriculum.

Having SMSC as a driver allows us to bring into focus how our curriculum helps encourage our students to become successful learners, confident individuals and responsible citizens and ensures we do not lose sight of it.

Our overarching ethos for SMSC encompasses personal development across the whole curriculum and supports us in providing opportunities for students to explore themselves and discover their identity. Additionally, it equips them with strong values for living in an increasingly diverse world.





Quality of education

Intent, Implementation, Impact



Vision

Our vision is to foster **positive attitudes**, fascination and excitement of discovery through the teaching and learning of mathematical concepts. It should develop a '**can do**' attitude in our students, especially when problem solving, and broaden their knowledge and understanding of how mathematics is used in the wider world by making rich and varied **real life connections**.

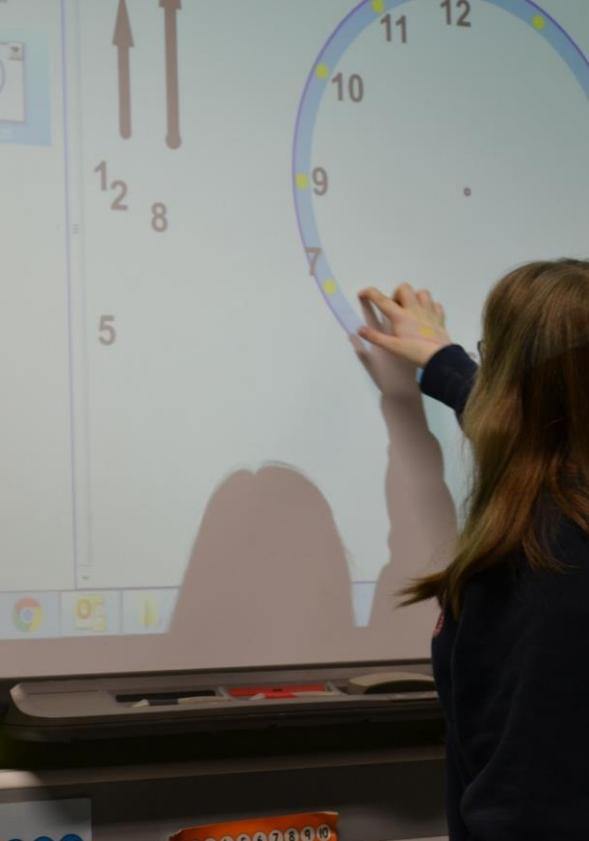
The teaching in Mathematics will nurture **transferable skills** such as the ability to reason and solve problems, and a well-developed vocabulary, communication and deep thinking.



Aim

A high-quality Mathematics education provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

We aim for all students to enjoy and achieve in mathematics and become confident mathematicians.





Essential Characteristics of a Mathematician

Curious

Resilient

Courageous

Resourceful

Innovative

Determined

Communicative

Independent

Critical Thinker

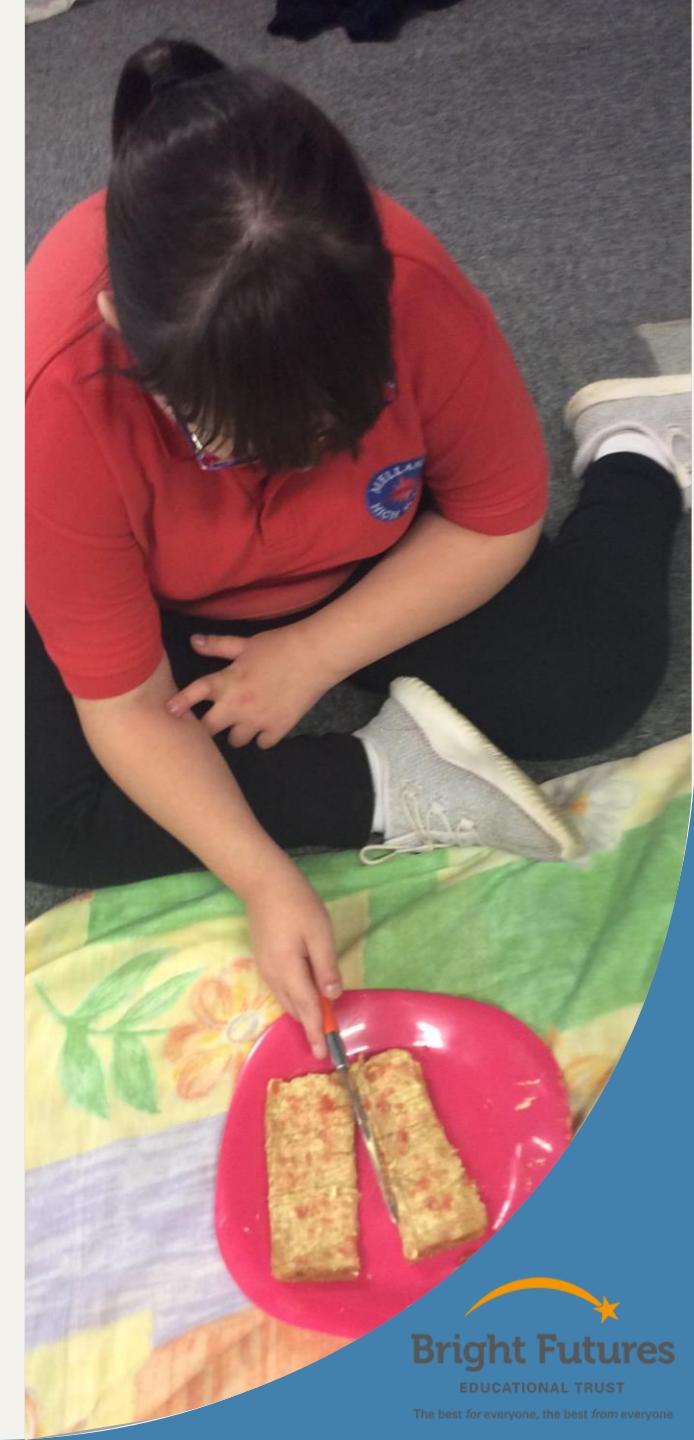
Mathematics Curriculum

The Mathematics curriculum is bespoke and informed by:

The National Curriculum

Chris Quigley Education

Years of Mathematics teaching experience





Curriculum Breadth and Depth

Breadth

The Mathematics curriculum follows an amalgamation of the KS1, KS2 and KS3 national curriculum.

This breadth provides accessibility to all our formal learners.

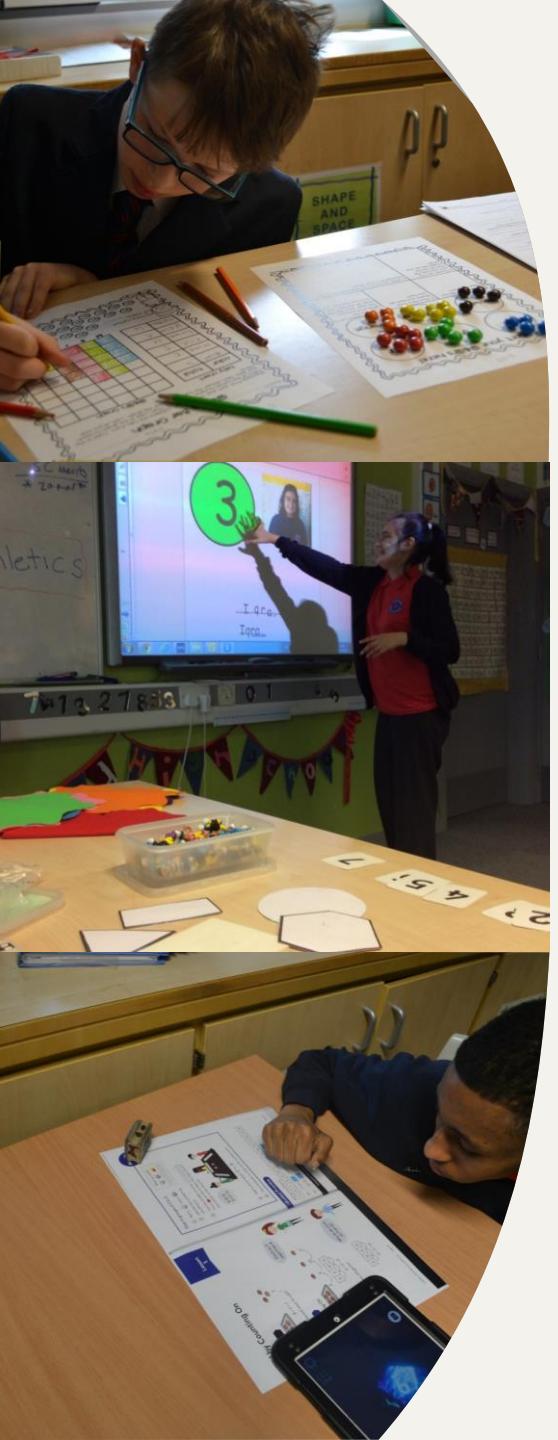
- Interconnected subject
- Move fluently between representations of mathematical ideas
- Make rich connections across mathematical ideas
- Apply their mathematical knowledge to science and other subjects

Depth

Intra-curricular links which are at the center of the Mathematics curriculum is structured.

This allows constant opportunities for interleaving and building of long-term memory.

- Move at broadly the same pace. Progress when students' understanding is secured and they are ready.
- Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content.
- Not fluent should consolidate understanding, including through additional practice, before moving on.

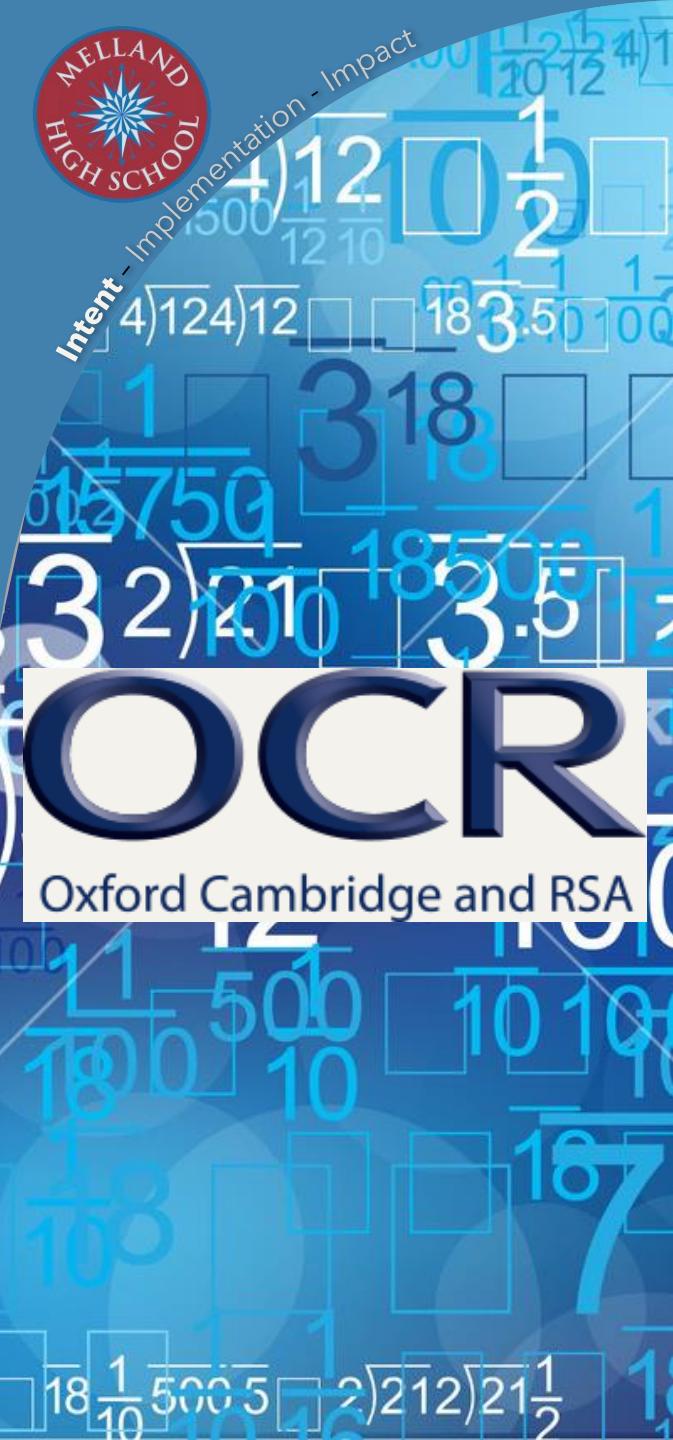


Curriculum Content

The Mathematics curriculum has been created with the main aim of breaking down the walls that can sometimes be created by compartmentalization.

We ensure that a full diet of Number, Geometry, Measure and Statistics is taught. This is done through subject matter that is relevant to our learners and not specifically one Mathematical topic.

- When students' understanding is secured and they are ready, only then move on to next threshold concept.
- Knowledge of pupils and their prior learning is essential as it informs our planning and therefore teaching and differentiation.
- Knowledge and skill built over time by depth of threshold concepts and repetition through interconnectedness of subject allowing for consolidation.



Accreditation

In KS3 students following the accreditation pathway will be prepared for the rigor and expectations of an entry level qualification. This includes taking short practice assessments

At KS4 students will work hard to attain the OCR entry level through examination.



Planning

LONG-TERM

This focuses on a strategic overview of the year. Providing a forward vision focusing on broad progression. It also provides a pathway from KS3 to KS4.

 Woolard High School <small>Woolard ISD San Antonio, Texas</small>		Mathematics: Medium Term Plan (Prog Service of Staff)
		Medium (P6 - L1)
Half Term		
Actions 1	Actions 2	Actions 3
Number Addition & Place Value	Number Addition & Subtraction	Number: Multiplication
Measure: Time	General: 2D & 3D Shapes	Number: Division
	Number: Money	General: Position, Direction
	Measure: Length, Capacity	General: Fractions
Please refer to the attached National Curriculum website for more details on Statutory Requirements within each Progression of Study		
Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The progression of study is, as it needs to be, organised into separate distinct domains, but pupils should make rich connections across mathematical ideas in the two themes: mathematical reasoning and competence in solving increasingly sophisticated problems. They should also have their mathematical knowledge applied to science and other subjects.		
<p>The expectation is that the majority of pupils will move through the programme of study at broadly the same pace. However, decisions about the pace should take into account the needs of pupils underpinning the teaching and learning of mathematics. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.</p>		
		Woolard ISD San Antonio, Texas Page 2 of 2

MEDIUM-TERM

The design of the mid-term plan brings the concept of sequencing to the forefront of the plan. It also highlights what specific threshold concept and skills assessment strand is featured.

Mathematics Medium Term Plan	
Description / Aims of Module:	Group - Pupils 4D
Learning Objectives:	Timetable: Dates Spring Term Levels SC—EB
<p>Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas.</p> <p>The programmes of study are, by necessity, organised into apparently distinct domains, but pupils should make links across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects.</p> <p>Learning Objectives:</p> <ul style="list-style-type: none"> Number: Use different representation to show multiplication and division, simple time tables. Money: Add amounts of money and notes, add coins mentally to £5 and calculate change, suggest equivalent money and solve worded problems. Geometry: Position and direction, understand and give instructions to move objects. 	
<p>Activities Half Term 1</p> <p>Multiplication: Counting games, repeat addition, array word problems for mastery, Multiplication Games</p> <p>Money: How much? Money, worded problem worksheets, total the spending activity</p> <p>Remote Learning Opportunities: Challenges and assessments set on Purple Mash. Lessons include numeracy skills practice, scavenger hunts inside home and outside, online videos, worksheets and online games.</p>	<p>Learning Outcomes:</p> <ul style="list-style-type: none"> All students will use visual addition and digit counting, add by ones, understand, relate, and describe simple position and direction. Most students will add amounts of money and notes, add coins mentally to £5 and calculate change, suggest equivalent money and solve worded problems. Some students will calculate change, identify coins, calculate totals, calculate change. Expert students will calculate exact money multiplication and division, place greater than, less than symbols, solve calculations with money including how to spend total problems. <p>Activities Half Term 2</p> <p>Division: Matching word problems, Find even, odd, halve, double</p> <p>Position & Direction: Position Order pairs, Order two step directions, Battleship board games, Gardening</p>
<p>Assessment Opportunities Half Term 1:</p> <ul style="list-style-type: none"> Photocopy evidence Post's work B/Essential Teacher self observation Surveys <p>Key Vocabulary:</p> <p>Arrays, number patterns, skip count, times table, share, divide, multiply, how much, add, subtract, calculate change, coins, notes, pounds, coins, £, pence, increase,淨化器, from, maths, as far as from</p>	<p>Assessment Opportunities Half Term 2:</p> <ul style="list-style-type: none"> Photocopy evidence Post's work B/Essential Teacher self observation Surveys <p>Cross-curricular Numeracy, Literacy and ICT week:</p> <ul style="list-style-type: none"> Home learning Home learning Home learning Home learning

SHORT-TERM

This short lesson plan takes the focus off the obvious aspects of planning. Identifying specific barriers to learning before hand and providing possible strategies.

Mallard High School		Lesson Plan					
Subject / Content: Mathematics (Pre-Algebra)	Date: 10/01/2018	Term/Week: 2nd Term (Wk 10, 15-18)	Start time: 12:00 pm				
Teacher: L. Baker	TLA:	Other staff: Mr. Johnson, Mrs. Green	Learning objectives: 1. Solve linear equations 2. Solve systems of linear equations				
Class: 4D (11 - 16 SP)	National Curriculum Level: 1A - 3	Risk assessment: P = appropriate	Homework: None due this week.				
Learning objectives (as per curriculum)	Activity	Assessment (pg 40, etc., or other suitable resource)	Persuasion Opinions, negotiation Behaviour for learning				
Home / Introduction: Students will be asked to: 1. Explain what was learned with a “would you rather?”	Students will start off and answer questions while working with a mate. They will then explain their answers to the class.	Formative assessment as students work through the task. Would you rather? (pg 40) RC at back of book.	Assistance with pencils, rubbers, calculator if needed. RC at back of book.				
Main lesson: Students are learning to solve systems of linear equations problems.	Targeted audience who have completed a variety of worked examples and can apply one variable at a time to solve equations.	Targeted audience who have completed a variety of worked examples and TLA to isolate “y” terms. They will learn how to solve systems of linear equations by substitution and elimination methods.	In groups, students will self-assess and reflect on their learning. They will then self-assess and reflect on their learning with a mate and with the teacher.				
Plenary, reflection & review: Students are learning to solve systems of linear equations and what skills they need to succeed.	One problem is set out as a challenge for the class. Students will reflect on their learning and self-assessments. Pupil voice will be elicited for feedback on their learning.	Targeted questioning on the plenary. Self-assessment. Pupil voice will be elicited for feedback on their learning.	Students reflecting on their learning and self-assessments. Self and peer feedback for learning.				
Learning outcomes: All students will be able to calculate the slope of a line from two points and determine the equation of a line given two points.	Students will be able to calculate the slope of a line from two points and determine the equation of a line given two points.	Students will be able to calculate the slope of a line from two points and determine the equation of a line given two points.	Students will be able to calculate the slope of a line from two points and determine the equation of a line given two points.				
Key word / key vocabulary: Slope, gradient, y = mx + c	Key question: What does “slope” mean? How can we calculate it? What does “gradient” mean? How can we calculate it? What does “y = mx + c” mean? What does “m” mean?	Key question: What does “slope” mean? How can we calculate it? What does “gradient” mean? How can we calculate it? What does “y = mx + c” mean? What does “m” mean?	Key question: What does “slope” mean? How can we calculate it? What does “gradient” mean? How can we calculate it? What does “y = mx + c” mean? What does “m” mean?				
Links (incorporation of work, using, learning):							
MFL: Home, Money, Sport and Cultural experiences		Homework (if applicable): All due this Thursday unless otherwise specified.					
Collective Act of Worship (Advent/Christmas)		See					
Comments and Opportunities: Essential time for working will be discussed, referring to wall display, rules used in class. Problem solving team work, collaborative, using technology.							
Resources / Materials / ICT: Interactive white board, Clicker software, white board, manipulatives, pencils, sheets.							
Evidence of Planning: By interim, year end, marking, progress, reflection Discussion, pupils work, worksheets, photos, mid-term assessment & Pupil voice.							
Cross-curricular opportunities are highlighted (see diagram):							
							
Self Evaluation Evidence of effective teaching and learning: SW - What Went Well							
Evidence of effective teaching and learning: SW - What Went Well							
<table border="1" data-bbox="2245 1038 2324 1074"> <tr> <td>1. Evidence from lesson</td> </tr> <tr> <td>2. Evidence from self-assessment</td> </tr> <tr> <td>3. Evidence from peer assessment</td> </tr> <tr> <td>4. Evidence from teacher assessment</td> </tr> </table>				1. Evidence from lesson	2. Evidence from self-assessment	3. Evidence from peer assessment	4. Evidence from teacher assessment
1. Evidence from lesson							
2. Evidence from self-assessment							
3. Evidence from peer assessment							
4. Evidence from teacher assessment							
Complete and attach lesson evaluation prompts and use impact descriptors to reach your judgement.							
What could be shared as an example of best practice? EB - Even Better							



Research and CPD

In order to develop a strong bespoke curriculum and assessment system for our students a great deal of research took place.

We are working with Chris Quigley to develop our curriculum drivers as well as providing vital training regarding 'threshold concepts'.

The Mathematics curriculum will implement threshold concepts as well as a complex spiral curriculum plan allowing interleaving as well as allowing students to make connections between different mathematical concepts.

Use of technology

During Maths lessons technology can be utilized in several ways.

Accessibility – It can be used a tool to make Maths more accessible to a variety of learners.

Exploration – It can be used to immerse students in a particular concept.

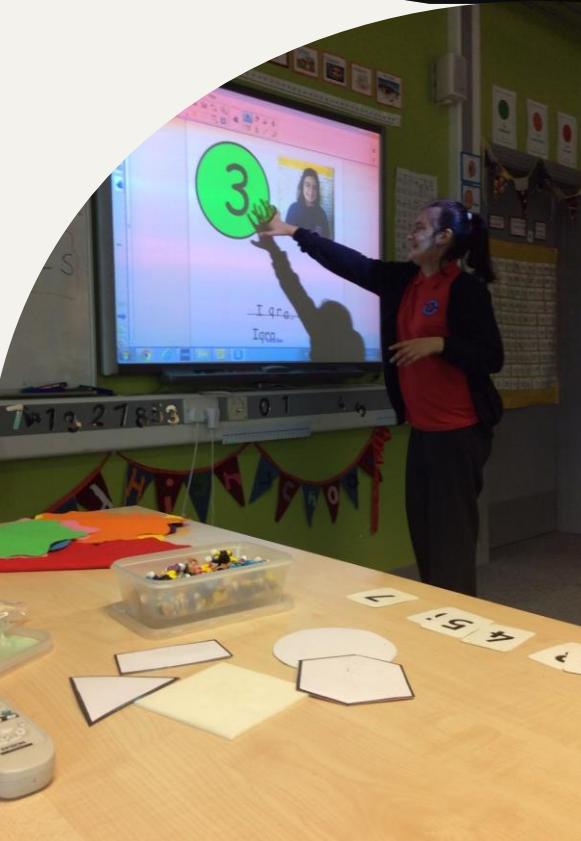
Research – Students can use technology to help them discover information for themselves.



Inclusion

In order to facilitate full inclusion into the Mathematics curriculum extra support is provided by the following:

- Concrete aids
- Abstract aids
- Touch screens
- iPads with specialist apps
- Communication aids



Pedagogy

We use research and training to ensure our staff are equipped with specialist pedagogical knowledge to meet the needs of all our students. All staff understand the needs of students with SEND and they use informed specialist methodologies to deliver accessible and aspirational learning opportunities for all. The specialist pedagogies required can be different depending on the Key Stage, pathway or subject.

Our pedagogy has been informed by personalised training opportunities from providers such as:

- [The Alliance for Learning](#)
- [Chris Quigley Education](#)
- This also includes training from our own specialist SEND outreach team.

Vocabulary

Within the formal curriculum pathway Tier 2 and Tier 3 words are at the forefront of students learning.

Within science the specialist (Tier 3) words are grouped into basic, intermediate and advanced to ensure that students cognitive load is not pushed beyond its limits.





Reading

Students' ability to understand and use specialist vocabulary is not only embedded in the Mathematics curriculum but it is also assessed under the 'key words' within each strand assessment.

Reading is encouraged in every lesson, with key words highlighted and paired with visuals.



Mathematics and Total Communication

At MHS we use a total communication approach.

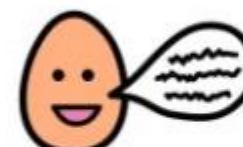
This means that we strive to find and use the right combination of communication methods for each student.

The 4 S's



Say less

Keep language short and simple.



Stress key words

Emphasize the important words and instructions.



Slow

Speak slowly and clearly.



Show

Use visuals to support what you say.



Assessment

Assessment of Mathematical capability will be achieved by planning appropriate curriculum activities in line with the school's policy on assessment.

Currently B Squared is being used to record pupil assessment data and progress, which are reported to SLT and Governors regularly.



Quality Assurance

Within all formal curriculum pathway subjects an internal quality assurance cycle takes place.

One aspect of this is the **Subject Evaluation Form** (SEF). This is completed after a period of reflection by the subject coordinator, usually at the end of an academic year. Its purpose is to highlight **good practice** and **areas for development**.

Specific QA that takes place in maths is:

- Accreditation moderation (Internal and external)
- Lesson observations
- Learning walks
- Scrutiny of work
- Moderation of POP tasks
- Progress meetings
- Coordinator meetings



Summative Assessment

Knowledge is assessed through Proof of Progress (POP) tasks. They are employed strategically throughout an academic year.

POP tasks provide evidence of progress towards specific curriculum milestones. A culmination of them provides an overall picture of a student's progress within science.





Personal development





British Values and Science

DEMOCRACY

Take into account the views of others in shared activities.
Voting when collecting data.

RULE OF LAW

To behave appropriately, allowing all participants the opportunity to work effectively. Take turns and share equipment.
Review each other's work respectfully.
Work collaboratively on projects/problems, help and advise others.

INDIVIDUAL LIBERTY

Working independently
Expressing personal opinions during debatable issues

TOLERANCE

Undertake safe practices, following class rules during tasks and activities for the benefit of all.
Understand the consequences if rules are not followed.

MUTUAL RESPECT

Learn about different faiths and cultures around the world.
Eg. looking at patterns/ shapes within Islam / Hindu religions.



SMSC and Mathematics

SPIRITUAL

Use imagination and creativity to explore ideas while learning mathematics by: identifying and applying patterns and rules to everyday problem-solving; writing own problems and challenges that use those patterns or rules.

MORAL

Understanding and appreciating personal influences: taking into account other people's views and understanding how to express own views. Eg. How to explain to someone where they may have gone wrong in a question.

SOCIAL

Understanding the consequences of actions: Eg. If you perform a particular action to one number, will the same outcome apply to other numbers? Is it always the case? 'Sometimes, always, never' statements.

CULTURAL

Developing personal qualities and using social skills: Working in pairs or groups to solve problems; Perseverance when struggling to answer questions; not being afraid to try - it's ok to be wrong, it's not ok not to try; taking turns when playing maths games. Participating, co-operating and resolving conflicts.



Enrichment

Having strong inter-curricular links allows our students' Mathematics education to be enriched throughout whole formal curriculum.

Our students are invited annually to an event celebrating 'British science week'. We also celebrate this in school through specialized STEM lessons.

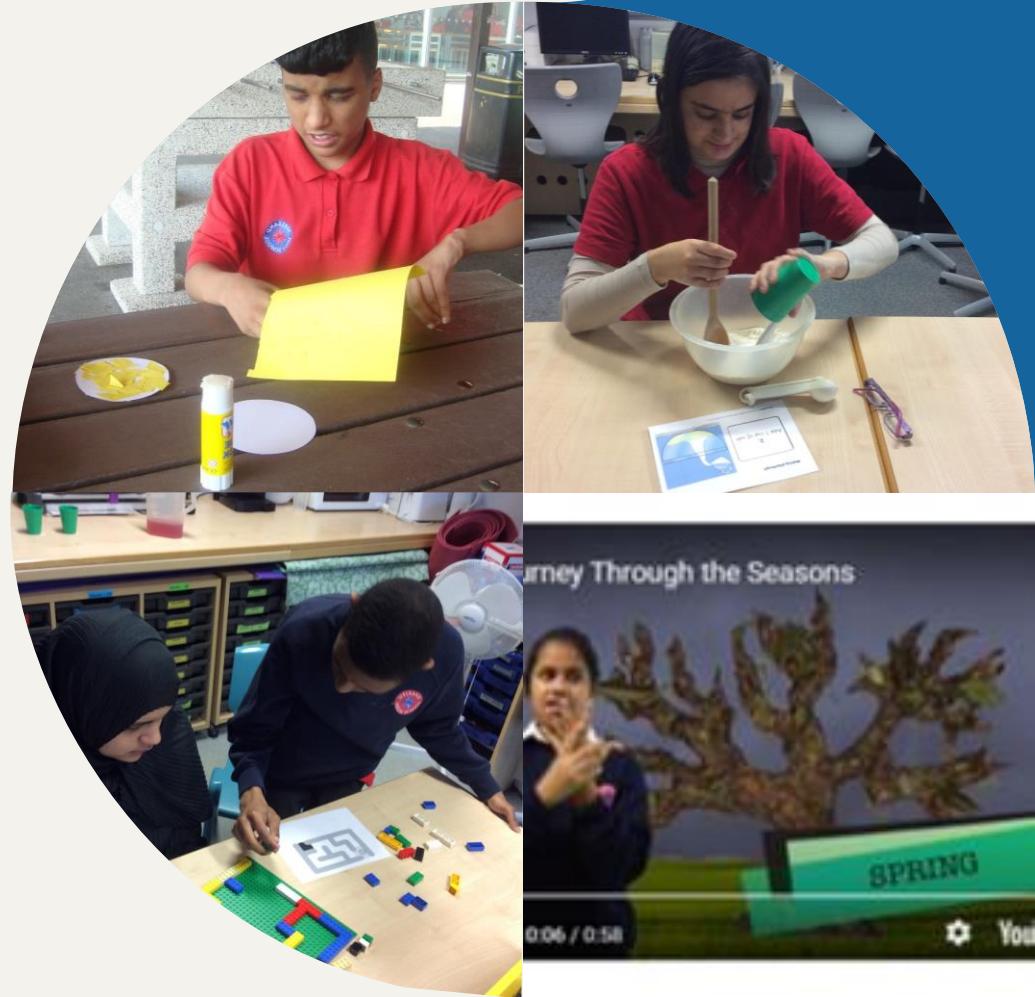
Other opportunities include:

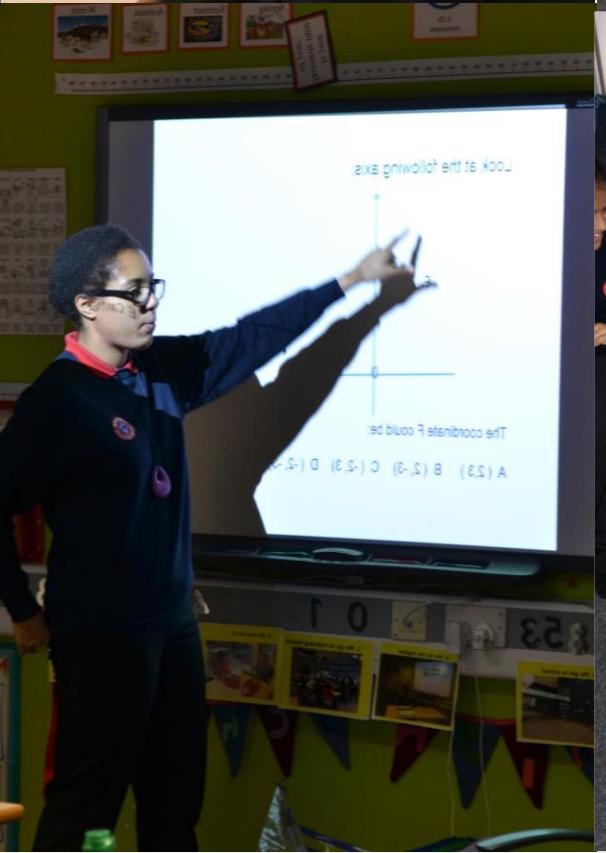
Joint projects with other groups and subjects

Big Draw Arts Festival

Maths Hub with Simon 3E & 4D

Art projects including Thank You X Wall Mural





Careers and Work Related Learning

Students have opportunities to develop life skills and learn about future careers in various industries. Students develop knowledge and skills about applying for college and jobs, filling job applications and taking part in interviews. All students experience work related learning and activities during careers week.

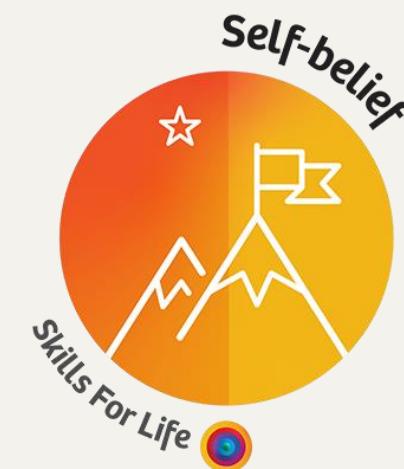


Skills for life

The Manchester City Council 'Skills for Life' is a universal approach that promotes the use of a common language to describe five key skills and a commitment to increase opportunities for children and young people to practice, reflect and record these skills.

In Manchester, Skills for Life is not only needed for young people and employers but also, for the cultural capital of our city.

The development of this work is as a way of supporting our children and young people to have the skills to be able to grow up happy, healthy, safe and successful.





Celebrating Achievement

Celebrating students achievement is a key part of our culture at MHS. In Mathematics, achievement is celebrated through:

- Awarding House Points
- Formal Awards Assemblies
- Postcards Home
- Tokens of Achievement i.e. stickers, stamps
- Mathletics End of Year Prizes
- Class Dojo
- OCR accreditation
- National Sumdog Challenges





Pupil Voice

It is very useful for your future you will always need maths because its a really important lesson to learn.

I do not really have a favourite thing about maths but I do enjoy of it

My favourite thing I learned in maths was multiplication and Division.
Maths is useful because it can help you with jobs money and more.

I enjoy my maths lessons.
I find maths fun and doable.