St Mark's Mathematics Provision

(Updated May 2023)

Our Vision and Rationale:

At St Mark's, our primary aim for Mathematics is to equip children with the skills essential to enhance life opportunities. We want to grow a generation of learners who feel positively and passionately about their Mathematical experiences. Our Maths provision endeavours to enable children to develop deep, sustained knowledge which allows them to make links between the different strands of the Maths curriculum, as well as the wider curriculum and their own lives. We want children to be able to enjoy and explore the beauty of Mathematics, developing an awe and wonder for this subject which will inspire them to ask questions, make connections and spot patterns. Children will learn Mathematics through a 'Teaching for Mastery' approach which is underpinned by ideologies which support learning to be inclusive, where all children can experience success. Number fluency is a core principle, ensuring that children have solid foundations which are built on year by year through a coherent journey. Children are given daily opportunities to retrieve and apply prior learning resulting in a higher knowledge retention. Through the exposure and modelling of rich Mathematical language and the use of stem sentences, we want our learners to verbally reason and explain their mathematical thinking as standard practice. We aim to build resilience in learning by helping our learners to be independent, have strategies to approach unknown problems as well as reflect and learn from mistakes.

Curriculum Aims:

The National Curriculum for Mathematics aims to ensure that all pupils:

- Become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- **Reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- Can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

The EYFS Curriculum for Mathematics aims to ensure that all pupils:

- Can **count** confidently, developing a deep understanding of the numbers to 10, the relationships and connections between them and the patterns within those numbers.
- Develop a secure base of knowledge and **vocabulary** from which mastery of mathematics can be built.
- Develop their spatial **reasoning** skills across all areas of mathematics, including shape, space and measures.

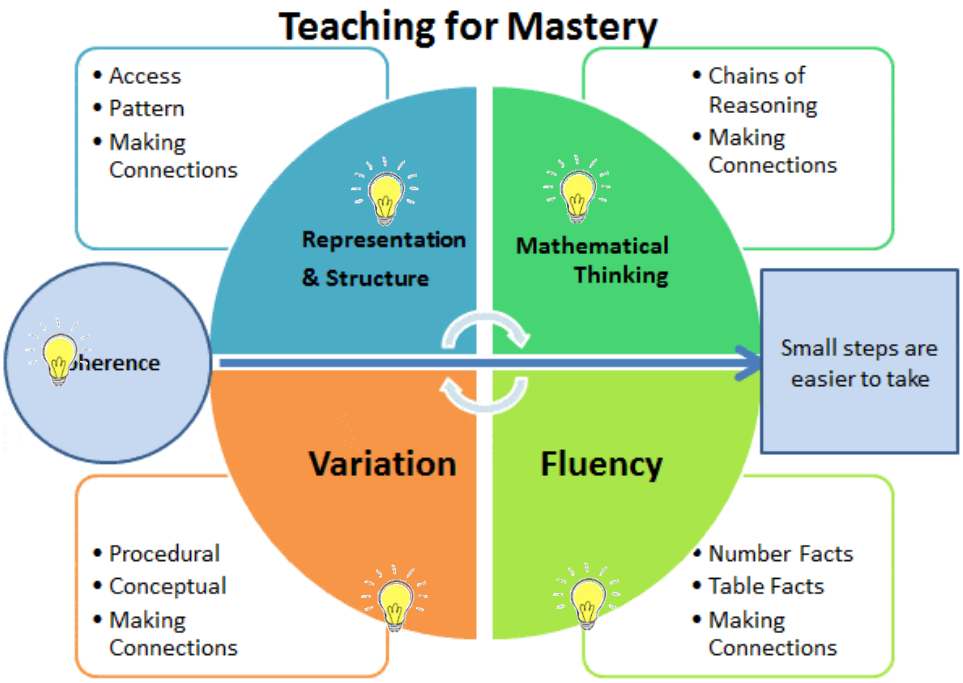
Our Aims:

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programmes of study are, by necessity, organised into apparently distinct domains, but pupils should make rich connections across Mathematical concepts to develop fluency, Mathematical reasoning and competence in solving increasingly sophisticated problems. The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace although some pupils may require more support and intervention. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on. In order to achieve these aims, we have sculpted a bespoke Maths curriculum at St Mark's which leads to quality first teaching and learning underpinned by the elements of Teaching for Mastery. Key elements of our curriculum are outlined in this document as an overview.

Teaching for Mastery

At St Mark's, we adopted a 'Mastery' approach to teaching Mathematics in 2017. In essence, 'Teaching for Mastery' allows pupils to acquire a deep, long-term, secure and adaptable understanding of the Mathematics.

In order for children to master their Mathematics, there are five core principles which are paramount in teaching and learning. The NCETM represent these principles using the following visual to show how they are interconnected:



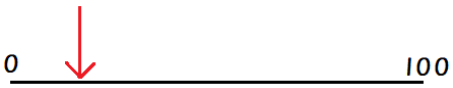
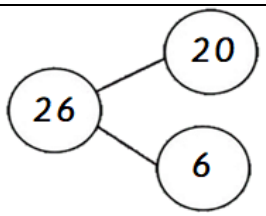
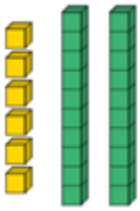
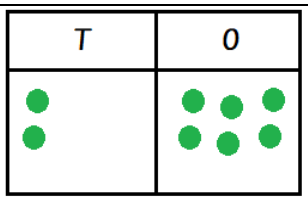
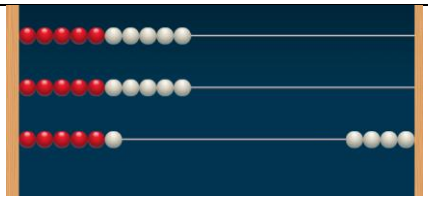
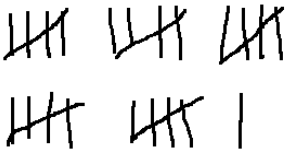
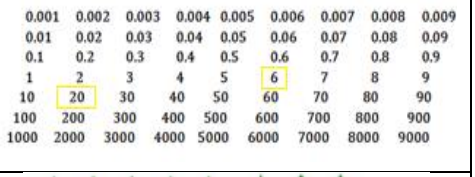
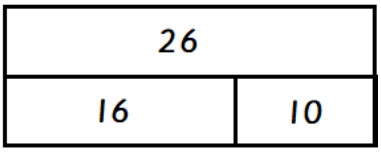
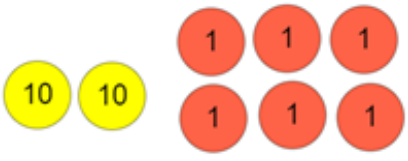
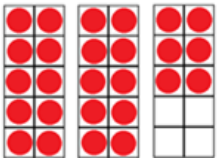
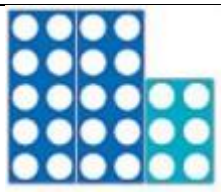
Since our Maths provision moved to the Mastery approach in 2017, our school has seen significant positive outcomes including raised attainment, progress and most importantly – enjoyment and confidence for our learners.

Here is an explanation of each of these principles, and how they fit in with our everyday Maths provision:

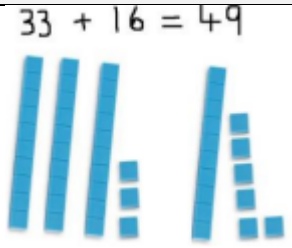
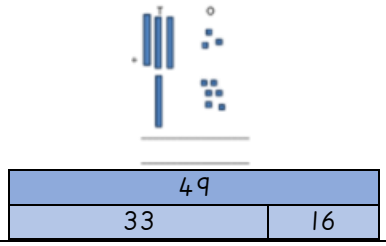
1) Representation and Structure

In order for children to have a true conceptual understanding of Maths, representations and structures are used. Seeing Maths in different ways, as well as visually, allows children to make connections and spot patterns. Different visual representations lend themselves well to different aspects of Maths and each representation draws out a different element or learning point of the Mathematics.

When we talk about the 'representation' of a number for example, it means showing a number in a wide variety of ways in order to truly know its value and also how it relates to other numbers. Observe the many different representations of the number 26:

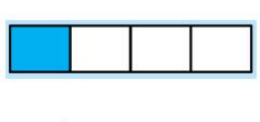
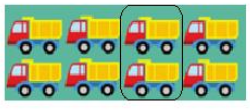
26		XXVI
	six ones and two tens	
1 more than 5 x 5		
	Four less than thirty	
10 + 10 + 6		
		
		26 ones
	Twenty-six	

Representations and structures can also be used to support a CPA (concrete, pictorial, abstract) approach where children learn the meaning and value of Maths before using it in the abstract form.

C		P		A
Concrete manipulatives		Pictorial representations and structures		Abstract
	→		→	33 + 16 49

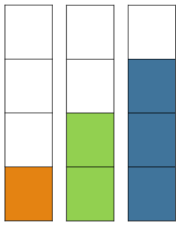
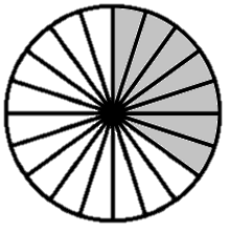
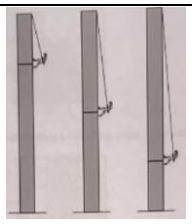
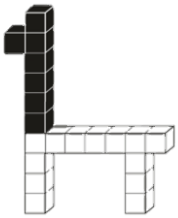
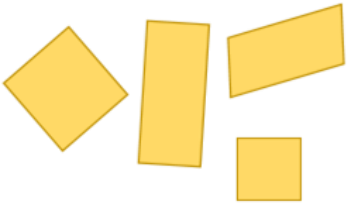
2) Variation

Simply put, variation means to make small changes. When we want to draw children's attention to an aspect of the Mathematics, then we can carefully select practice exercises where a connection is made from one question to the next. These connections enable children to spot patterns, make links and form generalisations. Having variation and connections within a set of questions also means that the Maths is 'small step' and coherent so that children are more likely to be successful as the complexity of their work increases throughout a lesson.

Procedural Variation Examples: A set of calculations (or questions) which have a link or connection from one to the next	**Conceptual Variation Examples:** Different representations of the same Mathematical idea
10, 20, 30, 40, ___, ___, ___ 11, 21, 31, 41, ___, ___, ___ 12, 22, 32, 42, ___, ___, ___ ___ = 10 + 9 ___ = 11 + 9 ___ = 12 + 9 ___ = 13 + 9 ___ = 14 + 9 ___ = 15 + 9 132 x 7 = 132 x 8 = 133 x 8 = 143 x 8 = 145 x 9 = 265 x 9 = 1/3 ÷ 2 = 1/3 ÷ 3 = 1/3 ÷ 4 = 1/3 ÷ 5 = 1/3 ÷ 6 = 1/3 ÷ 2 =	4 = 1/4 of 16   Finding Quarters  

Routine and Non-Routine Conceptual Examples

When we are using conceptual variation and are giving examples of a concept to children, we must ensure that we are showing it more typically (routine) but also other more original examples (non-routine) so that children have wide breadth and depth of concepts, rather than a superficial understanding.

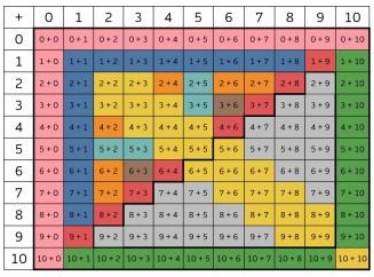
	What fraction is being represented?	What percentage is shaded?	Tick the largest square
Routine or standard examples			
Non-Routine or non-standard examples			

3) Fluency

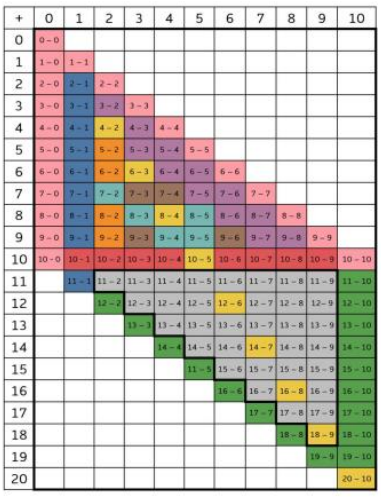
One of the aims of the National Curriculum is for children to be 'fluent'. This means having a quick and efficient recall of knowledge without a heavy cognitive load. Knowing number fluency facts will provide good foundations to then be able to solve more sophisticated problems. Some fluency may be known as an instant recall such as just knowing 7 x 8 = 56 or that double 8 is 16 because it has been a memorised fact. At other times, children may show their fluency by quickly deriving the answer using their existing knowledge; for example knowing that 9 + 6 will be one less than 16 because 9 is one less than 10, or that 180 ÷ 6 will be ten times larger than 18 ÷ 6. This type of thinking is known as automaticity. It is important that even when facts are memorised, that children still have a secure understanding of the meaning behind these facts. Having fluency and being able to recall or quickly derive facts eases cognitive load which can free up thinking for more complex problems. Children may also show fluency within their written methods and procedures and use these to solve problems. It is important that we encourage children to be efficient in their thinking and that they choose the best way to solve a problem based on their existing mathematical knowledge. In order to have fluency and be efficient, children need to have an excellent foundation of 'number sense' which they build upon each year. In KS1 for example, our aim is for children to know and recall their addition and subtraction facts to 20, so that these can be built upon within KS2. We use a programme recommended by the NCETM called 'Number Sense' from Year 1 which builds on the children's understanding of subitising to develop strategies to quickly recall these all-important facts.

A snapshot of the strategies taught within this programme are shown here:

Addition Grid Facts



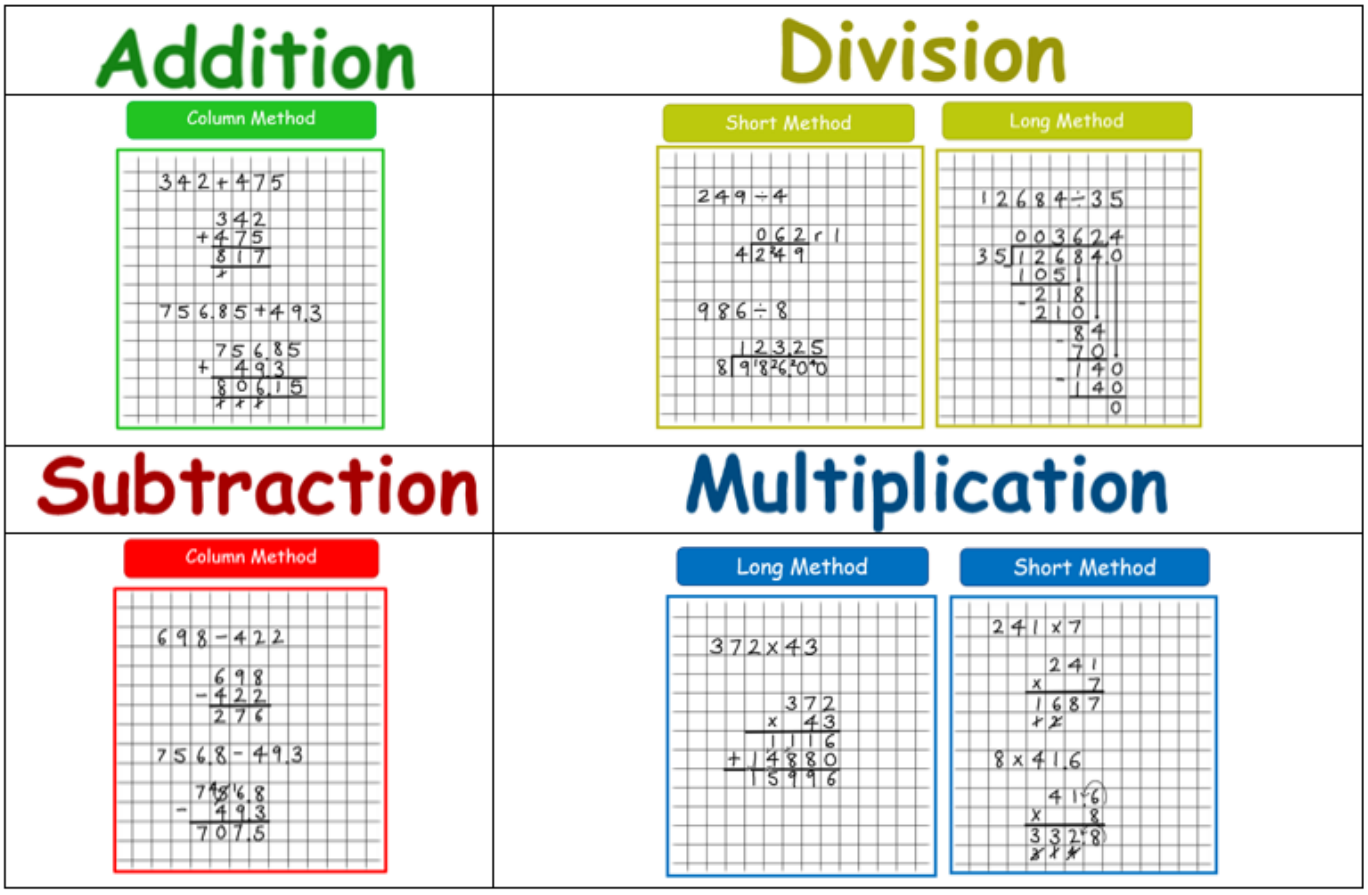
Subtraction Grid Facts



Calculation Strategies

In KS2, children will learn the formal written methods for all four operations. Using the national curriculum as a guide, we have developed calculation posters which demonstrate the expectations for presentation and layout across this key stage.

Presentation of Formal Written Methods for Calculation

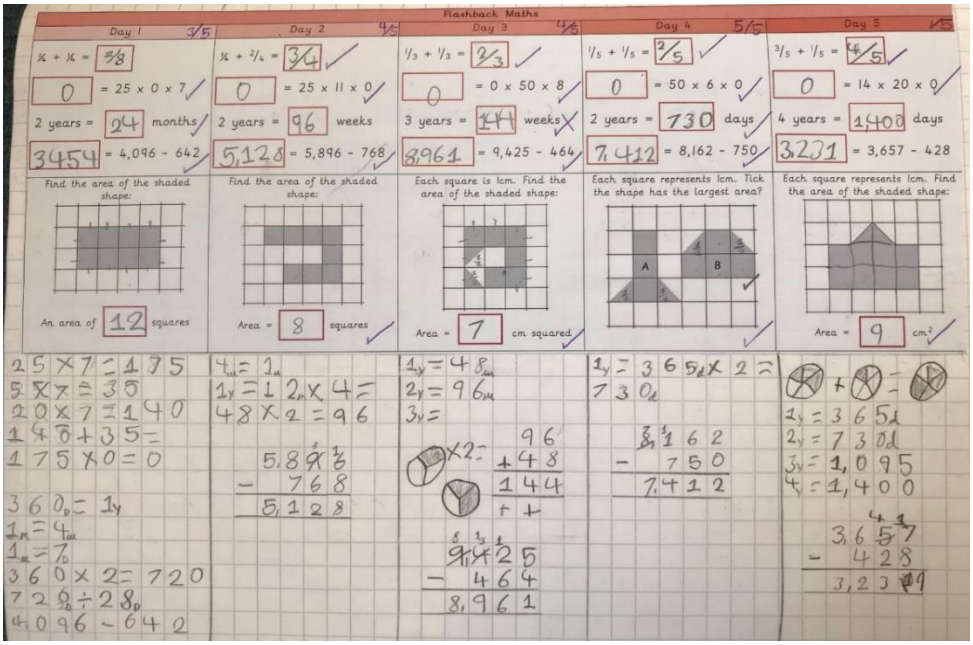


Within KS2, an aim of the National Curriculum is that children know all their multiplication and related division facts by the end of Year 4. At St Mark's, we have a times table system which is introduced in Year 2. Children understand and learn their tables in a coherent journey within their Maths lessons. Discrete time is also allocated to embed and assess the children on this knowledge. See our Times Tables Policy for more detail.

To supplement learning, times tables and other key fluency facts, we encourage the children to use the online learning platform of 'Numbots' and 'Rockstars'. As with all Maths, learning fluency facts is just the start; it is vital that we give children regular opportunities to continue to strengthen their retrieval.

Flashback Maths

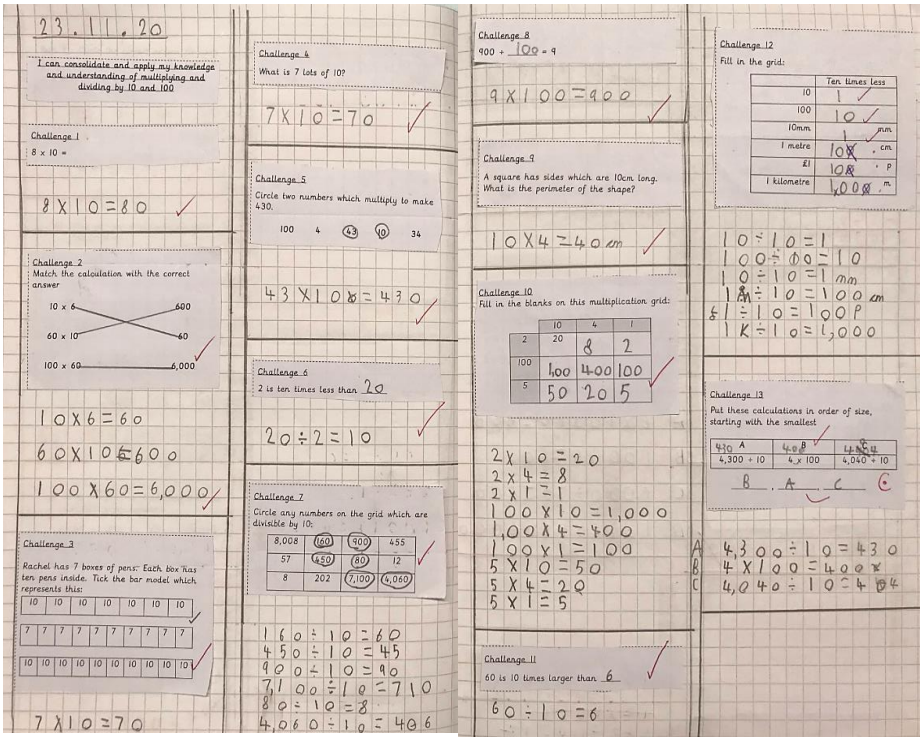
To aid fluency, at the start of every Maths lesson, children will revisit and retrieve prior learning within their 'Flashback Maths' session. This ten minute session is comprised of a set of arithmetic-style questions and one reasoning question. There will be Mathematical themes each week so that children can practise a skill multiple times over the week using similar Mathematical thinking. Children will have a space for working out and may use formal methods, jottings or even representations to support their thinking. This session is also an excellent opportunity to build upon and encourage good number sense and efficient methods to solve problems.



Example from a Year 4 child's Flashback Maths over a week period

Consolidation Practice

We teach Mathematical concepts in in-depth learning units, sometimes up to 6 weeks long. At the end of a unit, children will have the opportunity to revisit and retrieve their learning through consolidation lessons. In these lessons, children will answer questions related to their newly-learned Mathematical concept in a mixed practice style with a wide range of different problem solving questions available.

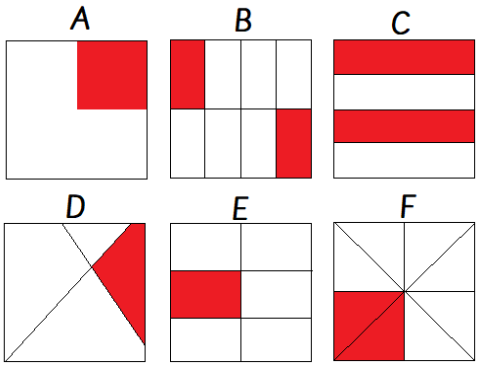


Example of questions from Year 4 consolidation lesson following a unit about multiplying and dividing by 10 and 100

4) Mathematical Thinking

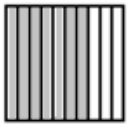
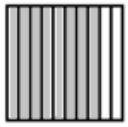
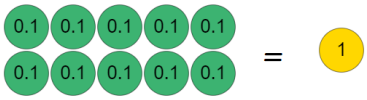
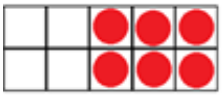
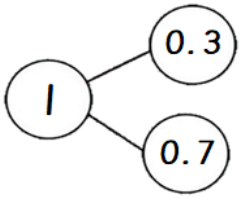
In order to master a concept in Maths, children need to have opportunities to think deeply. There are many types of tasks which can be used in lessons to enable children to think mathematically by problem solving and reasoning. We may offer them tasks which allow them to think about an idea deeply such as missing number problems, or reversing a problem or even starting with the answer and the children working out the question. In many lessons, we want to give children opportunities to see and apply the Maths in real life contexts so it becomes purposeful and real. If children can talk and explain the Maths, this also helps to cement their understanding. When children are using mathematical thinking, this is an excellent opportunity to link the newly learned knowledge with other mathematical concepts which have previously been learned.

Examples of how a child's learning about quarters and halves could be deepened through mathematical thinking tasks:

<table>
<tr><th>Breadth and depth within a concept</th><th>Applying a concept to real life contexts</th></tr>
<tr><td>1/2 of 12 = ☐
1/2 of ☐ = 8
☐ of 32 = 8</td><td>Raz has 24 dolls and one quarter have black hair.
 
Aria has 20 dolls and one half have black hair.
Which child has more dolls with black hair?</td></tr>
<tr><th>Cross-concept learning</th><th>Reasoning through explanation</th></tr>
<tr><td>Rachel runs 2km in total and stops ¼ of the way to have a drink. How many metres has she run when she stops?
  </td><td>Which visuals do not show a quarter?
  </td></tr>
</table>

Stem Sentences

Stem sentences give children a tool to be able to talk about and articulate Maths whilst also helping children to understand the learning. Stem sentences are similar to that of sentence frameworks. The child may be given a whole stem sentence to begin with, but over time, parts of the stem sentence will be missing and the child will fill in the gaps verbally or in written form. When children use stem sentences over a long period of time, they will be equipped with the Mathematical vocabulary to talk about and explain their Mathematical thinking. These sentence frameworks can be using during teaching inputs, as chants, to learn facts, or even feature within the children's independent practice.

<table>
<tr><th colspan="2">Example Stem Sentences used within a sequence of lessons on decimal tenths:</th></tr>
<tr><td>Verbally repeat a key principle of learning through stem sentences</td><td>"The whole is divided into ten equal parts. Each part represents a tenth or 0.1."
  </td></tr>
<tr><td>Verbal 'Ping-pong' stem sentences during inputs</td><td> 
Teacher: "I say six tenths"
Children: "We say zero point six"
 
Teacher: "I say seven tenths"
Children: "We say zero point _____"
 
Teacher: "I say eight tenths"
Children: "We say _____"</td></tr>
<tr><td>Verbal chants of stem sentences to support children in spotting patterns and connections</td><td> 
"10 tenths is equivalent to 1 one"
"20 tenths is equivalent to 2 ones"
"30 tenths is equivalent to __ ones"</td></tr>
<tr><td rowspan="2">Written stem sentence framework in independent practice to support learning</td><td>The whole is divided into ten equal parts. Each part represents a tenth.
 
There are __ parts on the tens frame which represents _____.
___ more parts are needed to make the whole.</td></tr>
<tr><td> 
1 represents the whole.
1 has been partitioned into two parts.
_____ is a part.
_____ is another part.
Combined, _____ and _____ make the whole.</td></tr>
</table>

5) Coherence

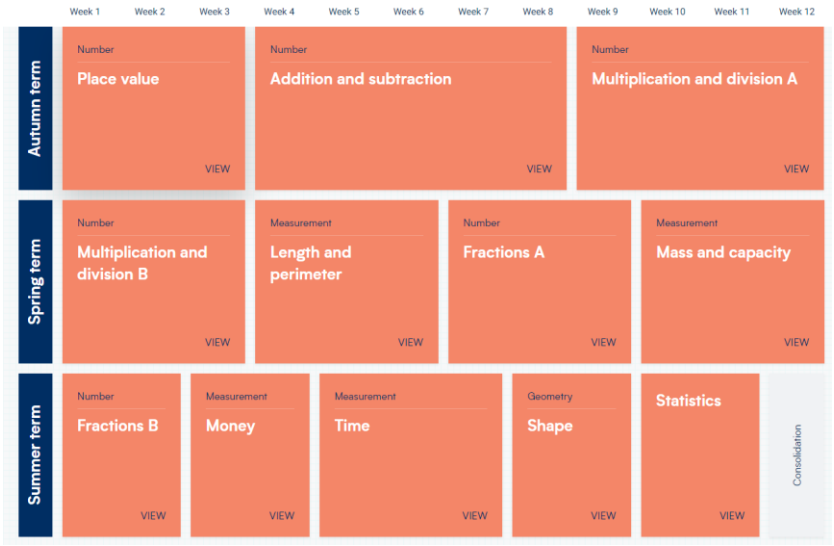
For teaching to be coherent, Mathematics needs to be planned and taught in a logical journey sequence and also broken down into bite-sized lessons often referred to as 'small steps'.

We use the overviews planned by 'White Rose' as a guide to the sequence we teach our Maths units over the year. This coherent, well-designed journey means that skills, knowledge and understanding taught in the autumn term for example, will be the foundations which will be built on and applied in the spring and summer units. In most year groups, place value and the four operations will feature as the first units of the year as this learning is fundamental before any other learning can take place.

Planning

We have used the White Rose planning guides for a number of years. We know that these are supported by the NCETM and are also updated yearly. Teachers plan from the yearly overviews, and then small steps provided in the teacher guides. These schemes are also supplemented by other useful documentation which supports secure subject knowledge and additional ideas such as the NCETM's Professional Development materials and the DfE's Mathematics Guidance.

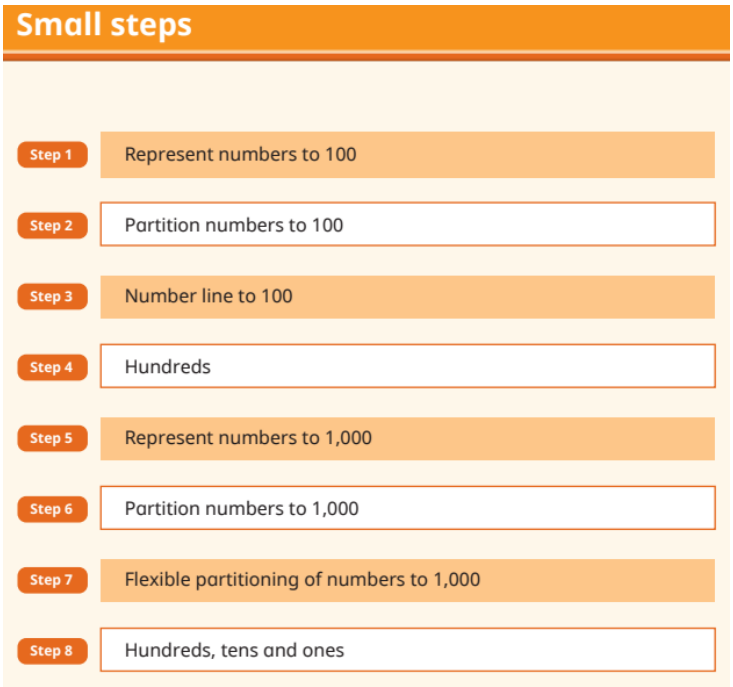
Yearly Planning Journey Overview



Example White Rose yearly overview for Year 3 showing the sequence of units:

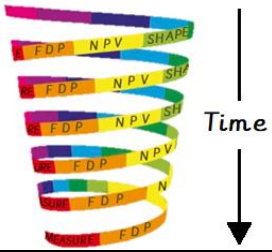
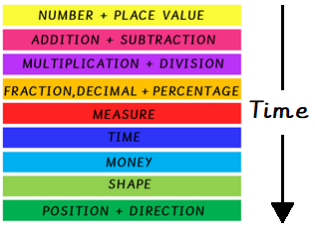
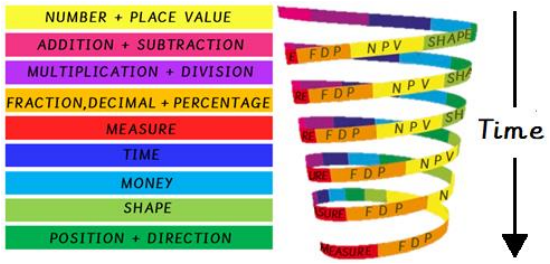
In a coherent Maths journey, units are broken down into small connected steps that gradually unfold the concept, providing access for all children and leading to a generalisation of the concept and the ability to apply the concept to a range of contexts. At St Mark's, we use learning objectives for each lesson so that is it clear to both the adults and children what the small step of learning is. The 'White Rose' schemes of Learning have suggested 'small steps' for each lesson which we use as a guide to inform our planning.

Short Term 'Small Steps' Planning Journey



Example White Rose small steps for a Year 3 place value unit

Concept Coverage

	Some local authorities and schools plan their Maths using a 'spiral' curriculum where the children learn in short units but revisit a Mathematical concept several times within a year.
	Some schools teach Mathematical concepts once within a year, but for a much longer period of time.
	At St Mark's, we use a hybrid approach which gives us a bespoke curriculum for our learners where we use both of these ideologies alongside each other reaping the benefits from both approaches. Primarily, learning happens through long units of work resulting in depth of learning. Additionally, prior learning is frequently revisited and retrieved within lessons, within flashback Maths and also within consolidation lessons. Evidence clearly states that if a concept is revisited regularly, it is less likely to be forgotten and will stay in long-term memory.

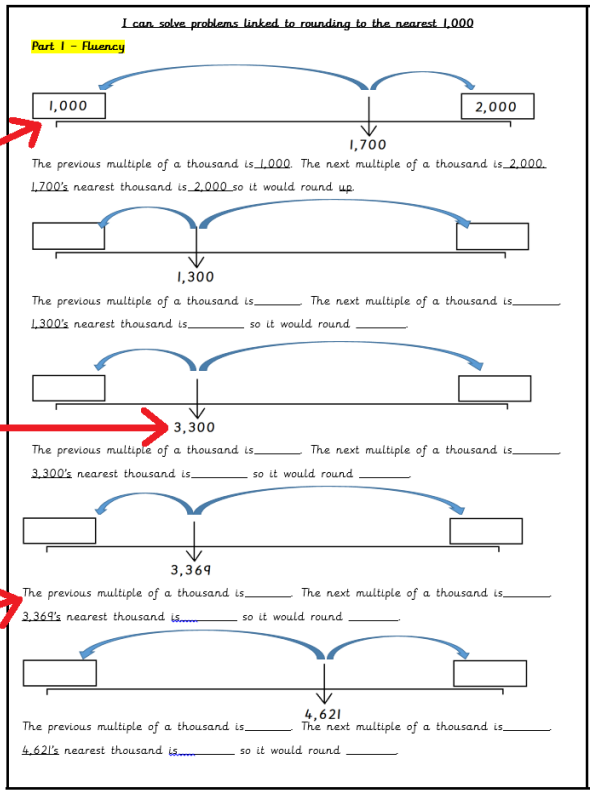
Differentiation

At St Mark's, we believe that all children should have the same opportunities to access and succeed within learning. In each year group, the vast majority of pupils will access the same learning in order for children to move through the curriculum at broadly the same pace. Within lessons and independence practice, differentiation occurs by adult support, pace, outcome and time rather than differentiation by task. Research has shown that this way of working has a positive impact on both attainment and on the attitudes of our young learners towards their Mathematics education.

We design our lessons so that they are coherent and 'small step' so that independent practice tasks begin more simplistically then increase in complexity as the child moves through the lesson. The earlier parts of the lesson will be the foundations of learning, which need to be secure before children move on. Each lesson should also have opportunities to challenge children to a 'greater depth' level so that every child is both supported yet challenged in a way that is appropriate for the individual.

Independent Practice and Task Design

Lesson design will change depending on where the children are on their journey within a concept however there are key elements which should feature within most independent practice tasks. When the children come to complete their independent practice, this is when they practice the learning from the lesson input and also use this learning to solve problems and reason. When making lesson resources for the children's independent practice, it is important to keep the 5 principles of Teaching for Mastery in mind. Here is an annotated lesson which highlights some of these key elements.



I can solve problems linked to rounding to the nearest 1,000

Part 1 – Fluency

1,000 — 1,700 — 2,000

The previous multiple of a thousand is 1,000. The next multiple of a thousand is 2,000.
1,700's nearest thousand is 2,000 so it would round up.

1,300

The previous multiple of a thousand is_____. The next multiple of a thousand is_____.
1,300's nearest thousand is_____ so it would round _____.

3,300

The previous multiple of a thousand is_____. The next multiple of a thousand is_____.
3,300's nearest thousand is_____ so it would round _____.

3,369

The previous multiple of a thousand is_____. The next multiple of a thousand is_____.
3,369's nearest thousand is_____ so it would round _____.

4,621

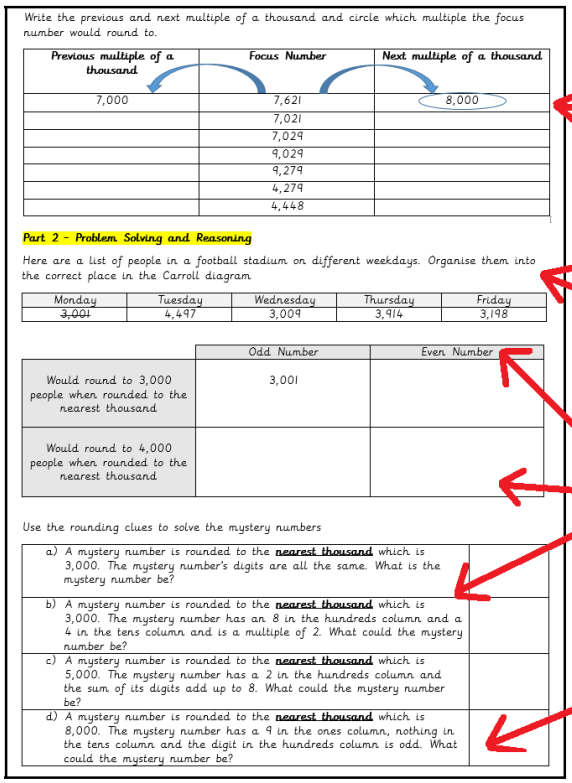
The previous multiple of a thousand is_____. The next multiple of a thousand is_____.
4,621's nearest thousand is_____ so it would round _____.

A number line visual is used as a representation which supports the understanding of rounding

Small changes in the numbers being used allows children to move 'small step' and take notice of the Maths

feature as a continuation from the lesson input. These give children the understanding and language to articulate the Maths

Example 'independent practice' task for a Year 4 lesson on rounding



Write the previous and next multiple of a thousand and circle which multiple the focus number would round to.

Previous multiple of a thousand	Focus Number	Next multiple of a thousand
7,000	7,621	8,000
	7,021	
	7,029	
	9,029	
	9,279	
	4,279	
	4,448	

Part 2 – Problem Solving and Reasoning

Here are a list of people in a football stadium on different weekdays. Organise them into the correct place in the Carroll diagram.

Monday	Tuesday	Wednesday	Thursday	Friday
3,001	4,497	3,009	3,914	3,198

	Odd Number	Even Number
Would round to 3,000 people when rounded to the nearest thousand	3,001	
Would round to 4,000 people when rounded to the nearest thousand		

Use the rounding clues to solve the mystery numbers

a) A mystery number is rounded to the **nearest thousand** which is 3,000. The mystery number's digits are all the same. What is the mystery number be?

b) A mystery number is rounded to the **nearest thousand** which is 3,000. The mystery number has an 8 in the hundreds column and a 4 in the tens column and is a multiple of 2. What could the mystery number be?

c) A mystery number is rounded to the **nearest thousand** which is 5,000. The mystery number has a 2 in the hundreds column and the sum of its digits add up to 8. What could the mystery number be?

d) A mystery number is rounded to the **nearest thousand** which is 8,000. The mystery number has a 9 in the ones column, nothing in the tens column and the digit in the hundreds column is odd. What could the mystery number be?

Learning moves onto procedural variation where the visual has now been removed as a structure, so their understanding will be checked

Applying learning to real life contexts allows children to see the Maths in a purposeful way

Cross concept learning allows children to retrieve and apply previous Maths learning

Opportunities for children to solve complex and sophisicated problems which relate to the Maths learning