The intention of the Maths curriculum

The intention of the maths curriculum is to follow the principles of Mastery Maths and ensure that children are exposed to wide range of concrete, pictorial and abstract concepts. All children regardless of their ability should have the opportunity to be fluent mathematicians and be able to problem solve and reasoning.

Mastery Maths Curriculum

What does it mean to *master* mathematics?

A mathematical concept or skill has been mastered when a pupil can represent it in multiple ways, has the mathematical language to communicate related ideas, and can independently apply the concept to new problems in unfamiliar situations.

Mastery is a journey and long-term goal, achieved through exploration, clarification, practice and application over time. At each stage of learning, pupils should be able to demonstrate a deep, conceptual understanding of the topic and be able to build on this over time.

This is not about just being able to memorise key facts and procedures, which tends to lead to superficial understanding that can easily be forgotten. Pupils should be able to select which mathematical approach is most effective in different scenarios.

All pupils can achieve in mathematics

A positive teacher mindset and strong subject knowledge are key to student success in mathematics. It is not the case that some pupils can do mathematics and others cannot.

No pupil should be left behind. The focus is keeping up over catching up. By making high expectations clear and emphasising the value of mathematics education, pupils are encouraged to build confidence and resilience.

Abilities are neither fixed nor innate, but can be developed through practice, support, dedication and hard work. Natural talent is just a starting point and does not determine who has more or less potential to achieve. A positive teacher mindset in maths encourages a love of learning and resilience that enables everyone to achieve.

One curriculum

All pupils are entitled to learn key concepts and skills

A scheme of work based around the principles of mastery really can be suitable for all. Pupils should have the opportunity to stay together and work through new content as a whole group. While mastery schemes of work may be challenging for some, the vast majority should be aiming for this standard. In extreme cases, where students have considerable learning difficulties, individual schools may want to put some alternatives in place.

It is important that high-attaining pupils fully understand key number concepts, rather than simply memorise a process. This will reap its rewards in the future at KS3, GCSE and A-level. Teachers can extend high-attaining students through depth, as opposed to acceleration onto new content.

Focus on depth

Deepen understanding before accelerating content coverage

All pupils benefit from deepening their conceptual understanding of mathematics, regardless of whether they've previously struggled or excelled. Pupils must be given time to fully understand, explore and apply ideas, rather than accelerate through new topics. This approach enables pupils to truly grasp a concept, and the challenge comes from investigating it in new, alternative and more complex ways.

Multiple representations for all

Concrete, pictorial, abstract

Objects, pictures, words, numbers and symbols are everywhere. The mastery approach incorporates all of these to help pupils explore and demonstrate mathematical ideas, enrich their learning experience and deepen understanding. Together, these elements help cement knowledge so pupils truly understand what they've learnt.

All pupils, when introduced to a key new concept, should have the opportunity to build competency in this topic by taking this approach. Pupils are encouraged to physically represent mathematical concepts. Objects and pictures are used to demonstrate and visualise abstract ideas, alongside numbers and symbols.

Concrete – Students should have the opportunity to use concrete objects and manipulatives to help them understand and explain what they are doing.

Pictorial – Students should then build on this concrete approach by using pictorial representations. These representations can then be used to reason and solve problems.

Abstract – With the foundations firmly laid, students should be able to move to an abstract approach using numbers and key concepts with confidence.

Fluency, reasoning and problem solving

Teaching supports the aims of the National Curriculum

Problem solving

Mathematical problem solving is at the heart of our approach. Pupils are encouraged to identify, understand and apply relevant mathematical principles and make connections between different ideas. This builds the skills needed to tackle new problems, rather than simply repeating routines without a secure understanding.

Mathematical concepts are explored in a variety of representations and problem-solving contexts to give pupils a richer and deeper learning experience. Pupils combine different concepts to solve complex problems, and apply knowledge to real-life situations.

Reasoning

The way pupils speak and write about mathematics transforms their learning. Mastery approaches use a carefully sequenced, structured approach to introduce and reinforce mathematical vocabulary. Pupils explain the mathematics in full sentences. They should be able to say not just what the answer is, but how they know it's right. This is key to building mathematical language and reasoning skills.

Fluency

Pupils should be able to recall and apply mathematical knowledge both rapidly and accurately. However, it is important to stress that fluency often gets confused for just memorisation – it is far more than this. As well as fluency of facts and procedures, pupils should be able to move confidently between contexts and representations, recognise relationships and make connections in mathematics. This should help pupils develop a deep conceptual understanding of the subject. Frequent, carefully designed, intelligent practice will help them to achieve a high level of fluency.

Number at the heart

Secure the fundamentals

A large proportion of time is spent reinforcing number to build competency and fluency. Number is usually at the heart of any primary mastery scheme of learning, with more time devoted to this than other areas of mathematics. It is important that pupils secure these key foundations of maths before being introduced to more difficult concepts.

This increased focus on number will allow pupils to explore the concepts in more detail and secure a deeper understanding. Key number skills are fed through the rest of the scheme so that students become increasingly fluent.

Variation

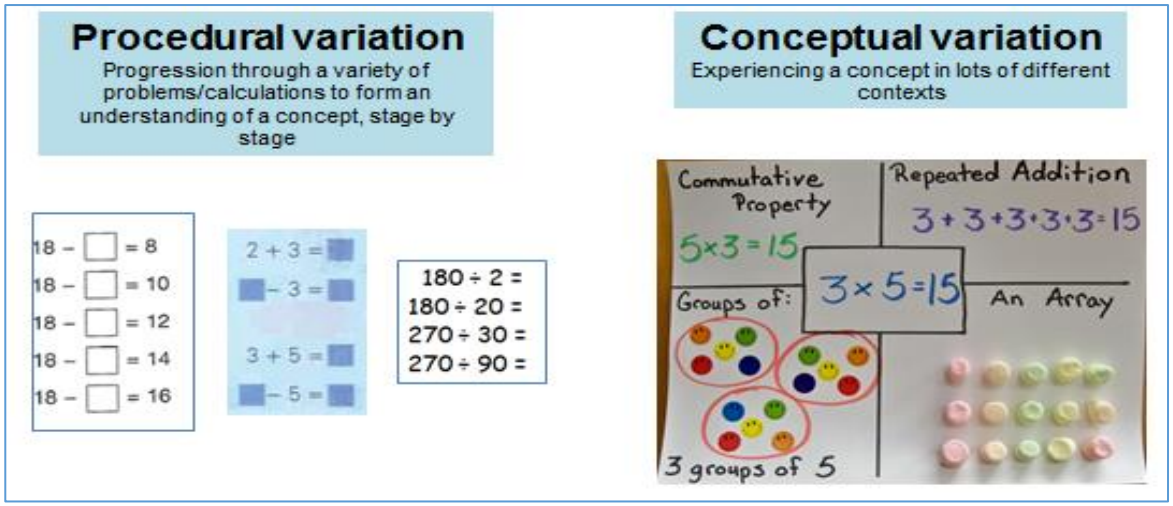
Purpose of Variation:

- Supports deep learning by providing rich experience rather than superficial contact
- Provides the necessary consolidation (in familiar and unfamiliar situations) to embed and sustain learning
- Focuses on conceptual relationships and make connections between ideas
- Supports pupils' ability to reason and to generalise

There are two types of variation: Procedural variation and Conceptual variation.

Procedural variation provides the opportunity for practice (intelligent rather than mechanical); to focus on relationships, not just the procedure; to make connections between problems; to use one problem to work out the next; to create other examples of their own.

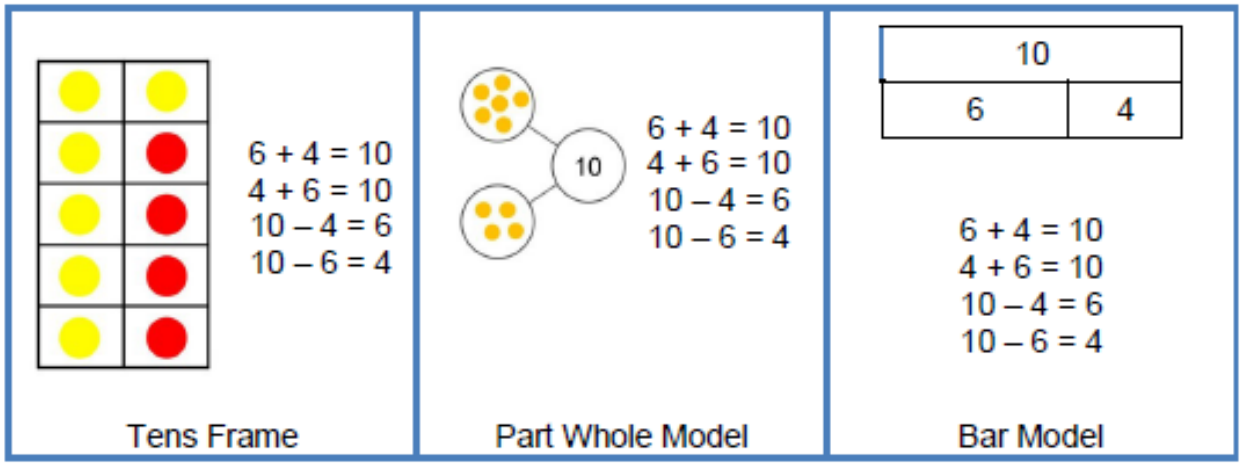
Conceptual variation means to develop an understanding of mathematical concepts from multiple perspectives. Conceptual variation also draws attention to what something is as well as what it is not.



Using other structures and models

Children should be exposed to a wide range of mathematical models and images. Connections between these models should be made, so that children understand the same mathematics is represented in different ways. Asking the question "What's the same what's different?" has the potential for children to draw out the connections.

Illustrating that the same structure can be applied to any numbers helps children to generalise mathematical ideas and build from the simple to more complex numbers, recognising that the structure stays the same; it is only the numbers that change.



Use questioning to develop mathematical reasoning

Teachers' questions in mathematics lessons are often asked in order to find out whether children can give the right answer to a calculation or a problem. But in order to develop children's conceptual understanding and fluency, there needs to be a strong and consistent focus on questioning that encourages and develops their mathematical reasoning.

This can be done simply by asking children to explain how they worked out a calculation or solved a problem, and to compare and contrast different methods that are described. Children quickly come to expect that they need to explain and justify their mathematical reasoning, and they soon start to do so automatically – and enthusiastically. Some calculation strategies are more efficient and teachers need to scaffold children's thinking to guide them to the most efficient methods, whilst at the same time valuing their own ideas.

Rich questioning strategies include:

· "What's the same, what's different?"

· "Odd one out"

· "Here's the answer. What could the question have been?"

· Identify the correct question

· True or False

· Greater than, less than or equal to >, <, or =

Identify difficult points

Difficult points (possible misconceptions or tricky examples) are identified and anticipated when lessons are being designed and these are made an explicit part of the teaching, rather than the teacher just responding to children's difficulties if they happen to arise in the lesson. The teacher should be actively seeking to uncover possible difficulties because if one child has a difficulty it is likely that others will have a similar difficulty. Difficult points also give an opportunity to reinforce that we learn most by working on and through ideas with which we are not fully secure or confident.

Expect children to use correct mathematical terminology and to express their reasoning in complete sentences

The quality of children's mathematical reasoning and conceptual understanding is significantly enhanced if they are consistently expected to use correct mathematical terminology (e.g. saying 'digit' rather than 'number') and to explain their mathematical thinking in complete sentences.

I say, you say, you say, you say, we all say

This technique enables the teacher to provide a sentence stem for children to communicate their ideas with mathematical precision and clarity. These sentence structures often express key conceptual ideas or generalities and provide a framework to embed conceptual knowledge and build understanding. For example:

If the rectangle is the whole, the shaded part is one third of the whole.

□	□
ones	units
is equal to	equals
zero	oh (the letter O)

Contextualise the mathematics

A wide range of contexts should be used to

For example, a lesson about addition and subtraction could start with this contextual story:

"There are 11 people on a bus. At the next stop 4 people get on. At the next stop 6 people get off. How many are now on the bus?"

This helps children develop their understanding of the concepts of addition and subtraction. During the lesson the teacher should keep returning to the story. For example, if the children are thinking about this calculation

$$14 - 8$$

then the teacher should ask the children:

"What does the 14 represent? What does the 8 represent?", expecting that children will answer:

"There were 14 people on the bus, and 8 is the number who got off."

Then asking the children to interpret the meaning of the terms in a sum such as 7 + 7 = 14 will give a good assessment of the depth of their conceptual understanding and their ability to link the concrete and abstract representations of mathematics.

Contexts should be used for all mathematical learning. Measures contexts in particular should be used to apply children's knowledge.

Mathematics Curriculum Planning

Mathematics is a core subject in the National Curriculum, and we use the Mathematics Programmes of Study from the DfE: Key stages 1 and 2 (dated September 2013) as the basis for our school curriculum, ensuring we teach the relevant statutory content. We refer to the White Rose Maths Hub Mastery resources, with 'Maths No Problem' text books for additional lesson ideas. These resources also provide plenty of time to

build reasoning and problem solving elements into the curriculum. Other resources such as Nrich and NCETM are used to supplement the teaching.

The school's Calculation Policy details the approach and learning progression in the main operations of addition, subtraction, multiplication and division, and also includes examples of how to use the policies through representations.

Coherent Journey

When planning (Long-term and Medium term) it is important that a coherent learning journey is planned. Coherence is a comprehensive, detailed conceptual journey through the mathematics with a focus on mathematical relationships and making connections. Very often learning objectives have encapsulated several new conceptual ideas in one lesson. A mastery approach selects just one key idea and explores it in depth (small steps to success). When planning for a particular area of maths, you must consider the following:

- What would have come before (prior learning)? Is this a sensible starting point?
- What will the difficult points be? How will you plan for them?
- What will come after?

When short-term planning, the learning objective and success criteria must be broken down into small steps to ensure a coherent learning journey.

All planning must take into account the following: key concepts, learning objective, task/s, Challenge for All, Deeper Challenge, variation, questioning, equipment and misconceptions that could arise.

Lesson Structure

Pupils are taught through whole-class interactive teaching (Ping-Pong), where the focus is on all pupils working together on the same lesson content at the same time. This ensures that all can master concepts before moving to the next part of the curriculum sequence, allowing no pupil to be left behind.