



Mathematics

Southville Primary School



Intent:

The aims of our mathematics teaching at Southville Primary School aligns with the aims of the National Curriculum: to encourage children to make connections across mathematical procedures and concepts to ensure fluency, mathematical reasoning and competence in solving problems in maths lessons and in other areas of the curriculum. Our aim is also for:

- Every child and every adult to get excited about maths
- Children to see evidence of maths happening in every aspect of their lives
- Children to see and share their observations, spotting patterns, exploring what happens next, asking what happens if we make a slight change, or investigating if something is always, never or sometimes like this
- Children to ask questions, reason, develop fluency and have a full toolkit of ways to approach problems.

Growth Mindset: Children are encouraged to believe they are all capable of learning and doing mathematics, given sufficient time, good teaching, appropriate resources and effort.

- Everyone can make progress in Maths if they work hard
- Mistakes are valuable if we learn from them and support others (“Good mistakes”)
- Asking questions is important (especially when unsure)
- Depth of understanding is more important than speed and providing quick answers
- Children are working towards their own goals and personal bests

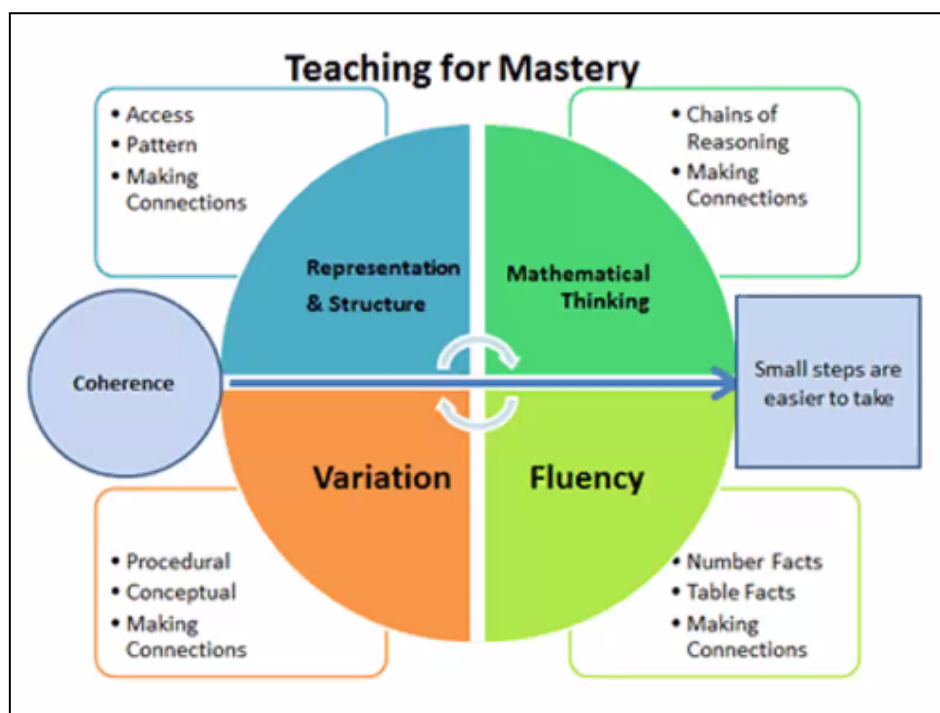
Implementation:

Certain principles and features of a mastery approach have been adopted:

- The large majority of pupils will progress through the curriculum content at the same pace. Differentiation is achieved by emphasising deep knowledge and through individualised support and intervention. Teachers intervene quickly to support those falling behind.
- Tasks are varied to challenge those with secure understanding; there should be no acceleration through new content.
- Learning and memorising key facts and procedures and practicing them regularly is essential – this involves developing a strong sense of number in KS1 and being able to solve problems using mental and written calculation methods with increasing efficiency.
- Teachers are encouraged to spend longer in class on a small number of fundamental maths topics, going into much more detail and depth. Teaching is focused, rigorous and thorough, to ensure that learning is sufficiently embedded and sustainable over time.
- Teaching is underpinned by methodical curriculum design with key concepts revisited and interlinked with one another.
- Lessons follow a gradual step-by-step teaching approach whereby the use of varied visual representations, carefully chosen resources, language structures and use of mathematical vocabulary foster deep conceptual and procedural knowledge.
- Teachers expect and support precise explanations and reasoning from pupils, when appropriate using sentence stems and worked examples to help them.
- Practice and consolidation play a central role. Carefully designed variation within this builds fluency and understanding of underlying mathematical concepts in tandem.
- Teachers plan questions carefully to test conceptual and procedural knowledge, and assess pupils regularly to identify those requiring intervention so that all pupils keep up.

‘Keep up, not catch up’

Regular assessments, based on content covered by the whole class, inform which children may require additional practice or may need to be taught missing prerequisite skills, in order to prevent them from falling behind as well as children who may need to be challenged and stretched.



Planning Overview:

Teachers should provide a long-term vision with children, explaining the importance of making links and developing relationships when introduced to new concepts. Teachers use the White Rose Medium term yearly planner, along with the small steps and key questions within units, as a basis for planning. The planning carefully sequences knowledge, concepts and procedures to build mathematical knowledge and skills systematically. There is flexibility in the planning so that teachers can address identified gaps in pupils' mathematical knowledge that hinder their capacity to learn and apply new content, e.g. teachers may extend a unit of work if the children have not consolidated their knowledge and embed and revisit key units throughout the year.

Teachers also refer to the relevant [DfE Maths guidance documents](#) to support long-term, medium-term and short-term planning. At the long-term planning stage, the guidance can be used to ensure that the most important elements that underpin the curriculum are covered at the right time, and to ensure that there is continuity and consistency for pupils as they progress from one year group to the next. At the medium-term planning stage, teachers can use the guidance to inform decisions on how much teaching time to set aside for the different parts of the curriculum. Teaching time can be weighted towards the [ready-to-progress criteria](#). The ready-to-progress tables at the start of each year group and the 'Making connections' features support medium-term planning by demonstrating how to make connections between mathematical ideas and develop understanding based on logical progression. At the short-term planning stage, the guidance can be used to inform teaching strategy, and the representations and 'Language focus' features can be used to make concepts more accessible to pupils.

Medium Term Planning Questions:

Choosing your topic / unit:

- Does it link to your last unit (or a prior unit - you must explain which transferable knowledge they will be using)?
- Are you clear what type of questions you want the children to be able to answer by the end of the unit (knowledge)?
- Pitch and expectations? Do you know the type of questions children should be able to answer at the end of the unit to be secure? This should form a firm basis of your planning

Identifying prior knowledge:

- Have you tested the children to see what they already know?

- Do they have the prerequisite skills and understanding to follow the initial steps (building blocks)?
- What activities and teaching can you do (or draw on) prior to the unit to help with this?

Key conceptual ideas and making connections:

- What steps in understanding are needed along the journey?
- What is the best way to order these steps?
- How are these steps going to be connected?
- How is this journey going to be connected to prior learning?

Difficult points:

- What are the common misconceptions within this area?
- Which parts are difficult to teach and difficult to learn?
- How can I plan to make the concept clearer to understand? (resources, support, language)

Language:

- What words / stem sentences do the children need to understand, use and repeat?
- Can I add an action to it to help them remember?
- Metalinguage? Am I modelling clearly at ALL parts of the lesson (start, mini-plenaires, plenary)

Representations:

- Which models and images will best support understanding of the different steps?
- Which models and images will expose the difficult points and misconceptions and support understanding in these areas?
- Which contexts will support the children to make sense of the maths and give the maths meaning and purpose?
- How will the children be expected to represent their thinking and understanding at different points on the journey (assessment)?

Variation:

- How can variation be used to support the understanding of the structure of the mathematics?
- What needs to be varied to expose the difficult points and misconceptions?
- How can variation be used to ensure depth of understanding?

Problem Solving:

- Are there opportunities for children to apply their knowledge to different contexts or problems?
- Does it involve 'mathematical thinking'? To specialise (choose particular examples to solve a problem), generalise (move from particular examples to a rule), speculate (take sensible guesses about what may be true) and reflect (think about the accuracy of a speculation and what they have learned from the process.)

Moving on:

- Have you assessed the children? Have you assessed them again?
- Are the majority of the class secure? Is this represented in their assessment?
- What will happen to those children who still have not consolidated the concept?
- Will they REMEMBER any of it? How are you going to re-visit and RE-ASSESS it so they don't forget?
- Which activities / types of questions are you going to feed into starters throughout the rest of the year?
- Link your current unit to your next unit if possible and explain the transferable knowledge (maths is a learning journey too)

Unit Design: Practice-Apply-Deepen (PAD)

Intelligent Practice - all tasks are chosen and sequenced carefully with purpose, offering appropriate variation (procedural and conceptual) in order to reveal the underlying mathematical structure, concept or process to pupils. Where appropriate, teachers use the **PAD** approach to micro-progression. This approach builds reasoning and problem-solving into lessons whilst ensuring basic skills are mastered first. Using the PAD approach, the learning is structured in 3 ways with children's depth of understanding increasing at each stage. This may be spaced across a unit of work or within an individual lesson. Children progress through the stages at their own pace, marking a task, checking any answers that weren't quite right and understanding why this was

the case before then moving on. Teachers should always consider whether a child needs to consolidate their understanding before they move on.

Practice: This stage requires explicit teaching of a calculation method / new knowledge and skills. Children have time and opportunities to rehearse and practice, consolidating and securing their understanding before moving on. This links to the fluency aspect of the White Rose Planning.

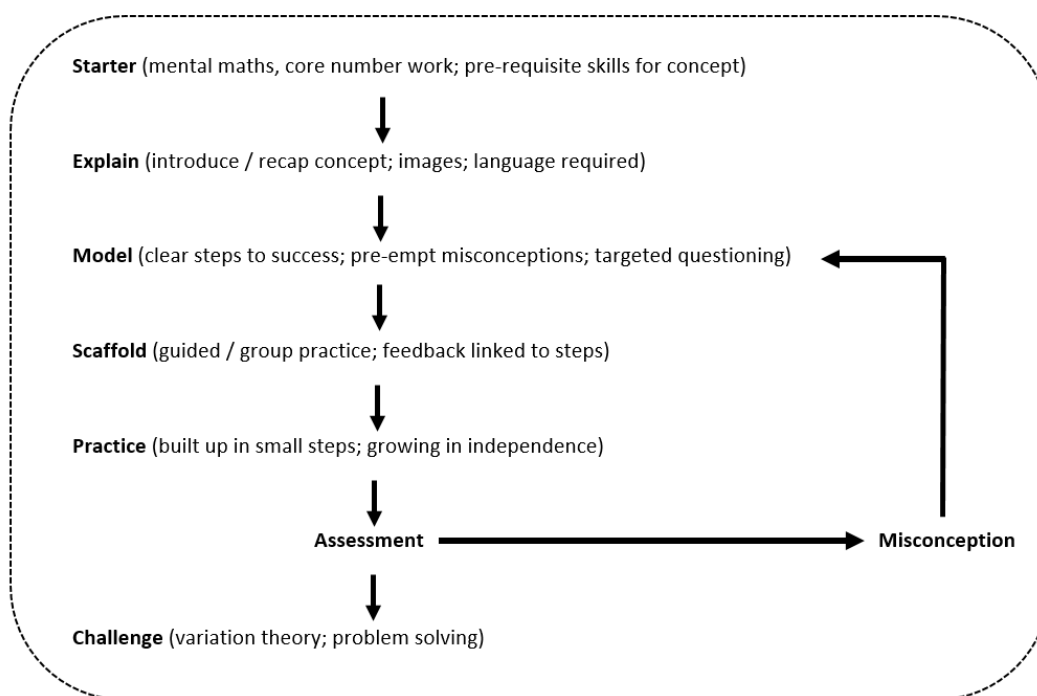
Apply: This stage builds upon the children's basic skills by exploring the new concept / WALT in a different way, e.g. applying their understanding to a puzzle or problem or asking them to spot differences and explain them. Using mathematical language is key. This links to the reasoning aspect of the White Rose planning.

Deepen: This stage often tackles a misconception or provides the children with a scenario to explore, particularly those that have multiple ways to approach the question. This section requires children to think more independently and to present their reasoning, examples, or approach clearly. This links to the problem solving aspect of the White Rose planning and involves aspects of the variation theory.

Teachers use the "[Deepening Understanding](#)" planning resource to supplement each stage of delivery.

Additionally, teachers use websites such as [NRICH](#) to find open-ended tasks that encourage lots of maths talk, reasoning and explanation to solve bigger and more complex problems. The children might be given a specific skill to focus on, e.g. finding proof or choosing ways of recording the various possibilities they have found. Teachers also use '[Check its](#)', '[Test its](#)' and '[Think its](#)' to extend, consolidate and challenge children's understanding. [NCETM Mastery](#) resources are used for questions, tasks and practical classroom activities which support teaching, learning and assessment. [Maths Frame](#) is an additional resource that supports learning in KS2.

Basic lesson design:



Every maths lesson starts by going through one of the following:

- Mental maths strategies
- Activities to increase arithmetical proficiency - being able to recall as many facts as possible (tables, number bonds and doubles) quickly and accurately, which children can then apply to calculations and to enable children to make links across the maths curriculum
- Revisit learning covered during previous topics or units of work, or even from previous year groups. White Rose "Flashback 4" tasks are used, as well as "Do Now" tasks focused on arithmetic.
- Pre-requisite skills or knowledge required to access the main concept being explored in the lesson

Reception & KS1 Additional Practice - Mastering Number Work Group

The school are taking part in the [Mastery Number Work Group](#). This involves teaching sessions for all children of 10 to 15 minutes in Reception, Year 1 and Year 2. The abacus-like rekenrek is used to help children develop confidence and fluency with number. The aim over time is that children will leave KS1 with fluency in calculation and a confidence and flexibility with number. There is an expectation that teachers will contribute to an online community to share practice and engage in critical reflection.

EYFS

Teachers and practitioners support children in developing their understanding of mathematics in a broad range of contexts in which they can explore, enjoy, learn, practise and talk about their developing understanding. This area of development includes seeking patterns, making connections, recognising relationships, working with numbers and numerical patterns, shapes and measures. Children use their knowledge and skills in these areas to solve problems, generate new questions and make connections across other areas of learning and development.

Children in the EYFS learn by playing and exploring, being active and thinking creatively which takes place both inside and outside of the classroom. We recognise that children learn through their own experiences and by following their interests, as well as planned sessions and activities. By providing the children with both continuous and enhanced mathematical provision and resources in the learning environment, we ensure that they have all the tools necessary to explore these opportunities in full. Mathematical understanding can be developed through a range of strategies, therefore we teach using a blended approach of structured teaching and child initiated learning. Whole class inputs and small group activities are timetabled and planned using resources such as White Rose and Mastering Number. There is balance between whole-class work, group teaching and individual practice.

Calculation Policy

We use the White Rose Calculation policy ([addition and subtraction](#) & [multiplication and division](#)) as it ties in with medium and day-to-day planning. Planning is structured around the concrete – pictorial –abstract approach, providing opportunities throughout for using mathematical vocabulary, developing mathematical thinking and using multiple representations. This is reflected in the school's calculation policy. Children learn through active, practical enquiry and experiment using concrete materials, represent their mathematical ideas through pictures and images and follow a clear progression toward recording abstractly.

Additional notes for Calculation Methods

- Regular number practice is essential in creating 'automaticity' and 'arithmetical proficiency' - being able to recall as many facts as possible quickly and accurately. This is crucial as it frees up the working memory to concentrate more on the underlying concepts being taught.
- Children who make persistent mistakes should return to the method that they can use accurately until they ready to move on.
- Teachers will discuss errors and diagnose problems then work through questions that caused difficulties step-by-step – not by simply re-teaching the method.
- Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.
- All new written methods should be presented alongside the previous method and children should be encouraged to explain 'what's the same' and 'what is different'.
- Teachers will use meta-language to talk through new written methods e.g. 'if you know this, then you know this...'
- Children should be encouraged to use the correct language and explain how they have answered a question (e.g. refer to the actual value of digits).

Multiplication Tables

The formal times tables will be taught in the following year groups:

- **Year 2** – 1, 2, 5 and 10 times tables
- **Year 3** – 3, 4, 6 and 8 times tables with revision of year 2 included
- **Year 4** – 7, 9, 11 and 12 times tables with revision of years 2 and 3 included
- **Years 5 and 6** – continue with practice and revision of all times tables

In Years 3 and 4, we adopt a research informed approach to teaching times tables based on Mastery and Shanghai models and developed by the Boolean Maths Hub.

Our aim is for all children to have a proficient and automatic recall of multiplication facts. This is important as it 'frees up' space for children to focus their brain activity on the application of the multiplication facts in different contexts, not the facts themselves.

- Multiplication facts are learnt and stored, rather than being 'calculated' or answered by 'skip counting' (we don't want the children to think!)
- For children to be able to automatically recall all multiplication facts in less than 3 seconds (particularly the 1 to 9 times tables as these are the building blocks they need in Y5 and Y6 to do any written algorithm)

Brief outline of approach:

- The learning of times tables is broken down into manageable chunks (teaching & learning a times table at a time). This is scheduled very carefully across the year – nothing is left to chance!
- There is a big emphasis on the importance of the commutative law and the relationship with division facts (if children learn 3×7 they do not need to learn 7×3 – this is made explicit, to make learning feel more manageable).
- Rote learning in which children learn the number facts AND a sound pattern (teachers and children learn each fact one way round, always stating the larger number first. E.g., 3×7 becomes 'Seven threes are twenty one'. This phrase is always used and repeated by the children after the teacher when going through answers).
- Little and often: a two-minute times table quiz, at least once a day.
- Booklets with questions for a quiz every day to support each times table - 40 questions in each quiz. The children have two minutes to complete the test (an average of 3 seconds per question)
- It is the teacher's job to know who is 'stuck' and find the barrier for children who aren't progressing and problem solve past the barrier

Marking and feedback: 'meaningful, manageable and motivating'

During and after every lesson, teachers should **assess** children's levels of understanding and mathematical fluency, deciding on their readiness to progress to the next stage of their learning.

Teachers are encouraged to teach 'with a pen in hand' as it allows them to identify mistakes in real time and provide immediate feedback. When appropriate, for example with closed tasks or exercises where the answer is either right or wrong, children may mark their own work as it allows them to identify their mistakes. Teachers should use daily assessment, including looking in books, to inform the design and content of the next lesson, considering: the key discussion points (misconceptions), the best ways to model effective, efficient strategies, and the activities and tasks chosen to either move children forward in their learning or re-visit and consolidate key concepts. There is no expectation of a written comment but it should be clear in a child's book that a teacher is regularly assessing their level of understanding and adapting their practice accordingly.




Identifying Errors

When teachers look at children's books, they are expected to distinguish between errors that reflect a **misunderstanding**, and mistakes that are simple **slips**. Slips are identified in blue and children should be given

adequate time to self-correct. Blue boxes indicate where a child should attempt to self-correct. Conceptual misunderstandings will need to be addressed individually, in small groups or during whole class discussion (when a misconception is evident in a large number of books) as close as possible to the teaching moment. Teachers may provide hints or questions in written marking which lead pupils to underlying principles but will, most likely, need to provide extra guidance, modelling and scaffolded support in the next lesson. Children should be given opportunities to demonstrate their understanding after this has happened before moving on.

The most important activity for teachers is the teaching itself. Thus, marking and evidence-recording strategies should be efficient, so that they do not steal time that would be better spent on lesson planning and preparation. There is no expectation for written feedback if it is clear in a child's book that a misconception has been addressed in the next lesson. If the teacher wishes to celebrate a child's success, they may tick in blue or highlight in green that section of work. Written praise should be genuine, sparing and related to 'personal bests', encouraging a growth mind-set.

Marking Codes:

-  Green for great! You did this so well
-  Instant feedback — try to improve this by the end of the lesson.
-  Blue for review. Please correct this in red pen or add some more detail.

Presentation:

The short date should be the top right-hand side and underlined. There should be a neatly underlined learning objective or title for every piece of work unless children are carrying on with a task from a previous lesson. When appropriate, especially when learning new calculation strategies, children should have steps to success underneath the WALT (or displayed clearly on the learning wall). The learning should be broken down into small, sizeable chunks to help guide children to complete the task. This helps children when they are stuck as they can use the steps to help them articulate exactly where they are getting confused. It can be useful for a teacher too as they can identify and tell the child where they have gone wrong. Teachers use the traffic lights as a quick way to mark against the WALT and also for children to indicate their understanding.

Children should take care to ensure their work is clear to ensure they can identify their own mistakes or the teacher can. There should be no scribbling – mistakes are fine because you can learn from them – a clear line can be put through the work to enable the teacher to see the initial mistake. Children should always use a pencil and allow appropriate spacing between numbers; they should use rulers when drawing lines and there should be no graffiti.

Prompt codes should be used if a child has received significant amount of support during the lesson:

S	A member of staff has helped me complete this work.
GW	I completed this work with a partner or as part of a group

Impact:

Assessment:

Assessment is an ongoing process in the classroom which forms the basis of future action. Every lesson should include a form of formative assessment, based upon practical, written and oral work completed by the children. Teachers must make sure they know how much the child has understood during a lesson so they can plan and adapt the next lesson. A child's book should provide evidence of how they have progressed, demonstrating aims outlined in medium term planning.

Automaticity, overlearning and regular retrieval tasks - children need to be given regular opportunities to practice their recall of core maths facts (bonds, times tables, arithmetic and key facts like shapes or

conversions) - this can take place at the start of lessons or as a 'do now' at various points in the day. Consolidation and overlearning of core content should take place at frequent intervals.

Spaced practice – it is important for children to revisit aspects of learning that they have been taught earlier in the year. Research suggests that we forget 40 per cent of information the day after teaching, and 90 per cent within the first month – so gaining full marks on an assessment immediately after teaching is no guarantee that learning will be retained in the longer term. This can be done at the start of lessons: a short 15-minute session to revisit and practise a specific element of the maths curriculum, particularly if it is a key building block required to access other concepts. It can also be done cumulatively: every time new learning is assessed, add a small number of questions that provide children with an opportunity to revisit prior learning.

A form of summative assessment should take place at the end of every unit and be used to compare attainment with the teacher's assessment. White Rose standardised tests are completed at the end of each term and are analysed in order to support ongoing teacher judgement about a child's overall attainment in mathematics and to identify gaps in knowledge and understanding to assist with future planning. When possible, each child should be involved in the review of his/her progress and be able to contribute to discussions about different aspects of his/her work.

Assessing mastery

At Southville, we assess whether pupil has a deep understanding of a mathematical concept, idea or technique if he or she can:

- make decisions on what to do and how to do it, choosing the most efficient option for them
- describe it in his or her own words
- represent it in a variety of ways (e.g. using concrete materials, pictures and symbols – the CPA approach)
- explain it to someone else or write an explanation for them clearly and systematically
- make up his or her own examples (and non-examples) of it
- see connections between it and other facts or ideas
- recognise it in new situations and contexts (varied tasks and problem solving tasks)
- challenges him/herself, looking for further opportunities to develop understanding
- does not just accept what others say, they question and test it.

This requires appropriate tasks for children to apply and problem solve using the knowledge they have accrued.

Home Learning:

Appropriate homework activities are set for each year group which may be games to play, facts to learn, or paper based questions to answer and return. There are additional homework activities available on the school website, such as Times Tables Rock Stars.