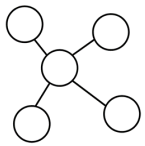
SUBJECT ON A PAGE

Mathematics

"Mathematics knows no race or boundaries, for mathematics the world is one country and a language we all can speak" - David Hilbert

Retrieval practice can and should take place **beyond the maths lesson.** A separate number sense session must be **timetabled 10 – 15 mins 3x a week.**

Purpose and Sequence

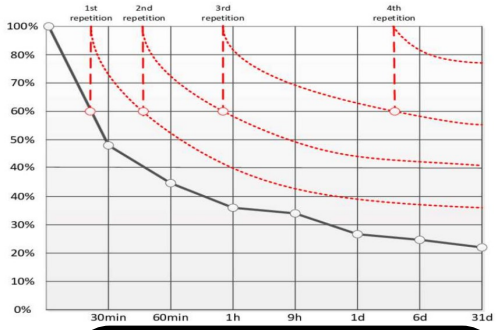


Each Maths lesson **must follow the sequence set out within The Good Shepherd Maths Intent document.** This is largely taken from the same sequence of learning set out by White Rose, however there are some changes to **suit our context**. Each small step contains **core knowledge** that the children need to know and remember. The White Rose SoL 3.0 documents set out the knowledge and prior learning in each step, potential misconceptions, key questions and STEM sentences which can all support with planning. **Make sure pupils are aware of their learning and how this fits into their prior knowledge.**

Today we are learning how to calculate the area of rectangles and squares. Before, you have done this by counting the squares in the shape [model this] but today we will be using our knowledge of times tables and multiplication from our previous lessons to help us do this more efficiently!

Retrieval and Recap

Each lesson must begin with a retrieval activity to **recap prior learning** but also to **make explicit links to the new learning.** For example, if the lesson is about learning how to calculate the area of rectangles, a retrieval activity on the properties of rectangles and times tables and mental addition would fit into this sequence. **Retrieval can take many forms** and should be varied in order to engage the children. Children should be told **that retrieval is a learning technique, not an assessment technique.** Retrieval will **strengthen their memory**. Some examples of retrieval in maths below:



Flashback 4 — four questions. Q1 recap from last lesson; Q2 recap from earlier in the week; Q3 recap from a few weeks ago or a previous concept; and Q4 recaps learning from a previous term/year. The principles of Flashback 4 are based on the 'Forgetting Curve' (Ebbinghaus, 1913).

Tough 10/Fluent 5 —5 or 10 arithmetic questions based on the key facts for each year group. Children should be encouraged to think about efficient **methods** and whether a **written or mental method** is the most appropriate solution. **This will need to be modelled.**

The Frayer Model— Explore key maths vocabulary using the Frayer Model. This explores definitions, facts/ properties, examples and non-examples.

Vocabulary and Narrative

The Maths Intent document outlines the **key vocabulary** for each component of learning. All staff must **use, directly teach and model this vocabulary. All children are expected to use this vocabulary in their verbal and written explanations.** When planning from the Maths Intent, it is **important to think about connections between each block or small step as this forms a 'narrative' for children's Maths journey** which will help them to remember more. Making these **connections explicit** to the children will be vital and **linking them to the context of a real life problem will aid this too.** There are a range of Maths picture books which can be use to support contextualising the Maths children will encounter (see separate document).

Times Tables — Children from Y2—Y6 should be **practising their times tables daily**. Teachers should plan in time each term for the children to access TTRS at school. A 1 minute times table quiz should be carried out once a week and children need to be encouraged to beat their score. A times tables practise sheet should be **sent home every day** and these can be downloaded from TTRS.

Deliberate Practice: Modelling and Questioning

Every technique used in Maths lessons should be **purposely planned** for—nothing is left to chance. **Direct instruction** should **form a part of all our Maths teaching and learning.** Maths teaching is more effective when the teacher explicitly explains material in small, carefully thought out steps, giving children lots of opportunity to practise specific knowledge and skills before going onto the next small step. **From Rosenshine's Ten 'Principles of Instruction', there are four key ones which should feature regularly in our Maths lessons:**

1. Present new information in small steps with pupil practice after each step.

Avoiding practising 'the whole thing' at once when it comes to something new in Maths. Break the concept down to its core elements.

Adding Fractions: decide if they're in the correct form to add, find a common denominator, then convert both fractions, then add the numerators, then simplify!

Instead of doing it all at once, practice each sub skill a bit at a time until they are easy! Some skills will be picked up really quickly and others will take more time as well as require scaffolds.

After each sub skill is taught, there could be opportunity for the children to practise independently so that you can assess whether they are ready to move on.

Once complete, the children will be ready to put it all together and direct instruction can begin!

2. Ask a large number of questions to check for understanding.

Can you convince me?

Develops generalisations and reasoning e.g. 'Convince me that subtraction is the opposite of addition'

Are you sure?/How do you know?

Builds children's metacognition + checks if they have gained a deep understanding.

Is there another way?

Encourages multiple ways to find a solution.

Is this always, sometimes or never true?

Help develop generalisations and apply children's number sense.

What do you notice?

Builds procedural variation—spotting similarities and differences/spotting patterns.

I think I understand what you're saying, do you mean...?

Build on their reasoning, making it sharper or more concise so that the group or whole class can develop their understanding and the pupil giving the explanation can internalise their understanding further.

3. Provide Models: Worked Examples & 'I Do, We Do, You Do'.

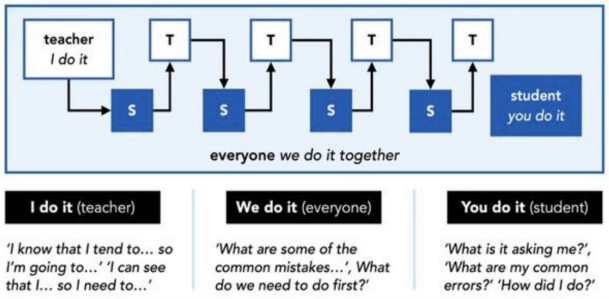
Worked example: A step-by-step demonstration of how to solve a problem. We must **narrate the whole thought process behind solving a calculation/problem.** The teacher does not stop and ask questions or check for understanding. Pupils watch and listen **in silence.**

After a worked example ('I do'), a second example should be modelled, but this time with the involvement of the children ('we do'). This should be a **very similar example to the previous one and both should remain visible for the next part.**

Once confident, children should practise similar examples to the models on their mini-whiteboards, using the worked examples to support them with the methods ('you do').

During the 'you do', teachers/TAs conduct **active observations** (Lemov, technique 9) around the room. This is to **support/scaffold**, **give feedback** and pick up on any **misconceptions** which should be addressed with the whole class.

The Art of Modelling... It's all in the Handover: Tom Sherrington (2020)



High Expectations: Scaffolding

The final core **'Principles of Instruction'** is to **provide scaffolds for difficult tasks**. We know that memory recall and cognitive load is an issue for our lower ability pupils and these are often barriers for them accessing large elements of the Maths Intent for their year group. We must consider how we can carefully scaffold a task to support these learners. This will also help to build a classroom where **'High Challenge, Low Threat'** is the norm. **Using the techniques of direct instruction is an essential starting point to support with scaffolding.** These are some other suggested strategies to support with scaffolding, but the list is not exhaustive:

Use of TA: During direct instruction, TAs can observe the class, looking out for children who are unsure and intervening where appropriate. TAs should also be involved in the planning process, considering which resources might be useful to support children accessing the lesson and should support in preparing these before the lesson begins.

STEM Sentences: PSR STEM Sentences should be used to support children's verbal and written reasoning. Each year group has their own sentence STEMs to introduce and teach, but children can use them all. The White Rose SoL contain new sentence STEMs for each small step to provide children with frames for talking mathematically.

Use manipulatives (CPA Approach): Mental representations help pupils embed conceptual understanding, increasing the chances that they will be able to apply these ideas into other contexts. Numicon, base 10, place value counters, bar models, part-whole models, tens frames etc should all be used to support children's understanding. Children should know that they are able to get these resources whenever they need them.

Same Day Intervention/Pre-Teach Intervention: If a child needs more time to practice a concept outside of the lesson, they should be pulled in the afternoon to go through the work again (this should last no more than 15 minutes). It might be that some children would benefit from some pre-teaching of prerequisite knowledge/skills before a lesson and so time should be planned for a pre-teach intervention. Remember, keep up, not catch up!

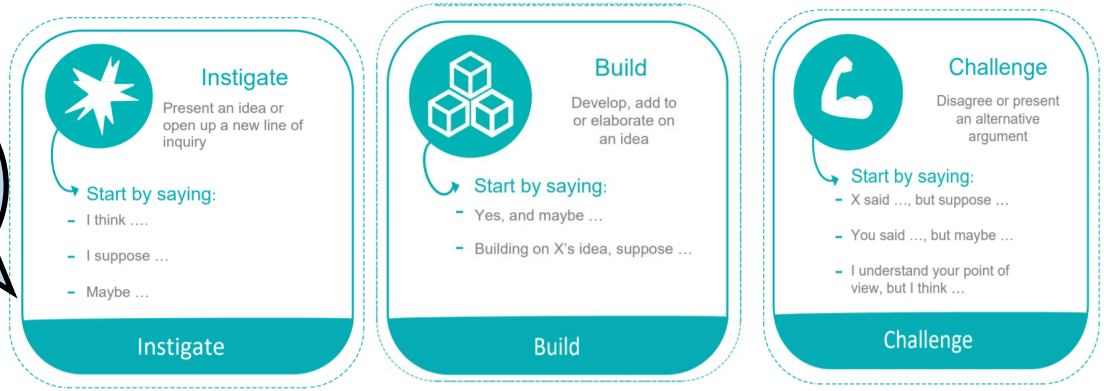
Number Facts: Think carefully about what the core knowledge of the lesson is. If it is to use long multiplication, but some children do not know their times tables, then providing a multiplication square would be an effective scaffold to support this lesson. Likewise, a child may be confident knowing how to calculate the perimeter of a rectangle, but they struggle with mental addition. The barrier to learning here is the number bonds, but the lesson is about how to find the perimeter. So, give the children the number bonds they need to access the learning!

Feedback and Review

☑☆☆☆
☐☆☆
☐☆

Feedback in Maths lessons should be **immediate** so that children can act upon it and you as the teacher can **redirect the lesson** if children require more practice in a particular area. All feedback should **inform future planning and interventions**—if a large proportion of the class cannot do something, then more time is needed on it. **The whole class feedback book should be used by all staff.** TAs should use this in the afternoon sessions to inform their same day interventions. During **active observations of children's independent work**, teachers and TAs could make notes on specific children who need support or specific areas that need addressing as a whole class. Evidence of **adult intervention to provide scaffolds should be evident through the green pen**. Use the **visualiser** to show good examples to the whole class or to address **misconceptions**.

Talk Tactics *Maths*



Oracy

Establishing a **culture of oracy and 'maths talk'** in our classrooms is essential to ensure our children develop a strong conceptual understanding. Using **STEM Sentences** provides children will a **scaffold** to support their oracy in Maths. Maths lessons are often about 'generalising' or 'proving' and framing a discussion around the uncertainty of Maths can be very powerful. Questions such as 'Always, Sometimes or Never True' are a great starting point. Teachers and TAs should always **model vague language** and questioning to support this e.g. ***'Can anyone think of another possibility?'***