Rationale for Teaching and Learning in Mathematics

Our mathematics curriculum has been developed with our children at the centre. We have used the most up to date research and guidance in order to successfully implement strong mathematical procedures that allow our children to make at least good progress. This is in line with our intent for mathematics.

Mathematics Intent:

At Westglade, we believe that all children should be able to access mathematics with confidence. Our main aim is to progress pupils to a secure understanding of the knowledge and skills within the mathematics curriculum. Our curriculum will give pupils a good understanding of the expected age content and, in Upper Key Stage 2, prepare them for secondary education.
We share the aims of the national curriculum for mathematics 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.

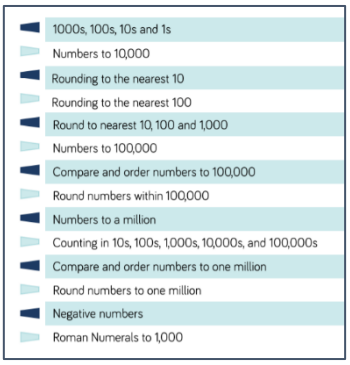
Whilst we teach mathematics thorough distinct domains, we recognise that it is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. Our mathematics curriculum makes rich connections across ideas to develop fluency, reasoning and competence in solving increasingly sophisticated problems. We also aim to allow pupils to apply their mathematical knowledge to science and other subjects.

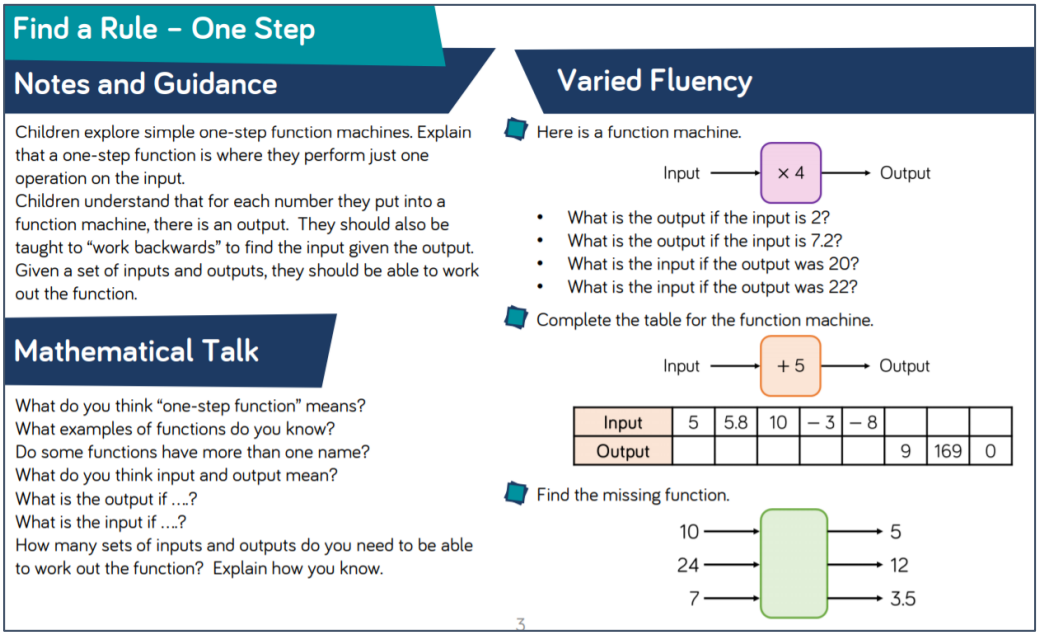
The expectation is that the majority of our pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress will always be based on the security of pupils' understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly will be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material will consolidate their understanding, including through additional practice, before moving on.

Our mathematics curriculum has been developed over a number of years and extensive work using latest pedagogical theories. However, our children remain at the heart of all of our provision and we continually review the outcomes of pupils as the main means of evaluating our processes and making any necessary adaptations.

Ensuring progression in learning

Our teaching of Mathematics is done within the principles of the mastery approach. At Westglade, we define mastery as pupil acquiring a deep, long-term, secure and adaptable understanding of the subject. We achieve this by allowing pupils to focusing on 'the next small thing'. In Key Stages 1 and 2, our teaching and learning is informed by White Rose Small Steps Progression (exemplified to the right). We do not use White Rose as a scheme. We do not believe that a scheme would be able to meet the needs of our pupils more so than the professional judgement of our teachers. White Rose provides the small step progression sequence which our teaching sequences follow. We then use their guidance as a tool to provide a clear exemplification of the curriculum expectations. Teachers use this to inform their teaching input and pupils application activities. For this reason, White Rose materials will be used but not exclusively as teachers will draw on a range of other high quality resources.





Find a Rule – One Step

Notes and Guidance

Children explore simple one-step function machines. Explain that a one-step function is where they perform just one operation on the input.
Children understand that for each number they put into a function machine, there is an output. They should also be taught to "work backwards" to find the input given the output. Given a set of inputs and outputs, they should be able to work out the function.

Mathematical Talk

What do you think "one-step function" means?
What examples of functions do you know?
Do some functions have more than one name?
What do you think input and output mean?
What is the output if ….?
What is the input if ….?
How many sets of inputs and outputs do you need to be able to work out the function? Explain how you know.

Varied Fluency

Here is a function machine.

Input → × 4 → Output

- What is the output if the input is 2?
- What is the output if the input is 7.2?
- What is the input if the output was 20?
- What is the input if the output was 22?

Complete the table for the function machine.

Input → + 5 → Output

Input	5	5.8	10	– 3	– 8			
Output						9	169	0

Find the missing function.

10 → 5
24 → 12
7 → 3.5

3

(Example of White Rose Guidance)

Small step progression is at the heart of our teaching and learning. We know that our children learn best when their cognitive load is reduced and they are able to focus. Teachers use the White Rose small steps to outline the teaching sequence for each content domain. They use their professional judgement and assessment for learning strategies to determine how long a small step is focused on (for example, half a lesson, multiple lessons... etc.) As demonstrated below.

Progression through the lesson - *Fluency, Problem Solving and Reasoning* *Which small step(s) is the lesson focus? How will the small step(s) be achieved? How is the learning broken down? How will pupils be supported and challenged? Key Questions and Vocabulary?*
Lesson Focus: 1. Find a rule – one step & 2. Find a rule – two step Think it out… Which set of numbers would give the correct answer. (Starting to explore a function machine) Use the T.I.O. to introduce the idea of a 'function' – numbers will be impacted by the function to give you an outcome. Explore some one-step function machines together. Task: Complete function machines by putting provided inputs through. Progressing to finding the missing function and then working backwards. Support: multiplication squares etc. to support calculation. *Challenge: Progression in task. Show children a two-step function machine. *How is this different?* Discuss how we can sometimes perform two or more operations to an input. Model examples. Task: Complete function machines by putting provided inputs through. Progressing to finding the missing function and then working backwards. Support: multiplication squares etc. to support calculation. *Challenge: Progression in task.
Lesson Focus: 3. Forming expressions & 4. Substitution Think it out… Teddy has two function machines… Work through some examples of function machines on wbs. TA to have small group of children identified from yesterday from all three classes to do the same activity but guided more as needed. As a whole class again, explain that we can use expressions to explain what outputs are. Use the two function machines to show how 'y' is being effected and changed. Then look at Rosie grew 3cm. Explore what we know and don't know (she +3cm / her original height). If we don't know her original height – how could we represent it? (h) So to show what happened 'h' + 3. and work through some examples. Introduce expressions eg. 4y instead of y x 4. Task: Form expressions for given examples. Support: Use pictures and/or cubes to show expressions. *Challenge: Simplify expressions Show children a completed expression. *What if the value of 'x' was 5? What if it was 3?* Together, explore substituting values into expressions. Task: Substitute the value of x = into the previous expressions (children to choose a substitution and write… If x = ___ then, a) b) c) etc. with the solved equations. Support: Aids for calculation as needed. *Challenge: What mistakes have Whitney and Amir made?

The full teaching sequence is always planned for in advance to the delivery to allow for adaptation based on assessment for learning. If pupils master a small step quicker than expected, the next one is ready to go. If the majority of pupil require longer on a small step, the teaching sequence is adapted to allow for this. It is for this reason that planning may not always reflect the long-term sequence. Teachers are responsible for managing their curriculum times and if more time is needed on a block that it should be given. We acknowledge that this has repercussions on ensuring that there is enough breadth to our curriculum therefore we have purpose built in consolidation weeks to allow for additional time where needed. If a teacher is worried about coverage they will discuss this with the maths lead and a plan will be put in place.

Ensuring that pupils are both challenged and supported

Whilst we generally expect the majority of pupils to move through smalls steps at the same pace, we recognise that some learners require additional support to help them to achieve objectives. For the majority of pupils, we adapt by support. Support can be, but is not limited to: the use of manipulatives, pictorial representations, the deployment of an adult. This support is intended to help keep pupils working at the expectations of their year group. Further to this, we recognise and understand that pupils with Special Educational Needs may require further support and/or an alternative curriculum. Our planning proforma allows for teachers to detail this. Pupils with SEN may be working through an alternative year groups small steps. When possible, this will match the content domain of the majority of the pupils. Where this is not possible if the content is specific to a year group (for example, Algebra in Year 6), these pupils will work on the closest relevant domain. If they have an Individual Education Plan, they may be working on targets from this.

Further to this, we recognise that some pupils may grasp concepts quicker than others. In accordance with mastery principles, the most current research and guidance, we do not accelerate pupils through the curriculum or move them to the year above. We believe opportunities to deepen their understanding is more beneficial than simply racing them through the curriculum. To achieve this, we have developed a 'Star Challenge' system. This is facilitates two levels of challenge:

- A 'Star Challenge' is our universal challenge. This is targeted at *most* pupils *most* of the time. We believe all children, regardless of ability, should have opportunity to deepen their learning.
- A 'Two Star Challenge' is targeted specifically at children who are identified as greater depth. These are designed to challenge these pupils to reach that standard. Two Star challenges are for *some* pupils, *some* times.

The level of challenge will be indicated by either a * or ** next to the activity (these may be drawn in by the children or printed on a task).

Reviewing Key Skills and Knowledge

Whilst we teach within the principles of mastery, in that we teach content domains in blocks, we recognise the need for pupils to have opportunities to regularly review and consolidate their learning. All maths lessons start with a 'Flashback'. This is approximately 10 minutes to revisit previous learning from this year group or previous years. Based on internal monitoring and assessments, we have broken flashbacks into three strands: number, non-number and vocabulary.

Assessment of Mathematics

An assessment for learning approach is used throughout mathematics teaching. Class teachers regularly assess during maths lessons in order to adjust the pitch and challenge as needed. At the end of each lesson, the pupil's achievement within the lesson focus is assessed using the 'Pink and Green' marking system. If a teacher assesses that there is enough evidence to show that a pupil has a good enough understanding of the objective, the small step number (next to the short date) is highlighted in pink. If the teacher assess that more practise is needed, it will be green. We have built in to our math lessons strong opportunities for self-assessment. Children mark using a green pen to get immediate feedback. Flashbacks are usually self-assessed. We do not expect written marking unless the class teacher feels it is appropriate. This is indicated by a green triangle.

In order to assess children's knowledge of each content domain, we use End of Block assessment. These come at the end of each content domains teaching to provide a snapshot of pupils understanding. Teacher's use these to inform their intervention planning. This is our process to identify potential slow progress before formal summative assessments.

Each term, we use formal summative assessments to support teacher attainment judgements. These are NfER papers in Years 1, 3, 4 and 5 and previous SATs papers in Years 2 and 6. Children sit an arithmetic paper and then either one or two reasoning papers. These inform formal judgements on pupils attainment.

Mathematics interventions

Class teachers use a variety of strategies to help close identified gaps in children's knowledge and skills. Children identified as potential slow movers based on End of Block assessments will form part of an intervention group using Maths NoProblem materials. We use Maths NoProblem as it complements our mathematics quality first teaching. These are delivered by Teaching Assistants with the class teacher overseeing. Intervention paperwork is monitored by a Level 3 TA and fed back to the Senior Leadership Team. We believe that TAs are fundamental in supporting pupils who have not grasped content securely. They have the knowledge and skills from the original teaching input to know how best to pitch the intervention. The intervention is designed to last no more than 20 minutes a session. Once the intervention is complete, the children will resit the end of block assessment as an impact measure.