Mathematics Curriculum Policy

Approved by Governors:	Date: May 2024	
Signature of Governor:	Name:	Signature:

Westglade Primary School
Grow, discover & blossom

Teaching and Learning 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.

Implementation in Key Stages One and Two

Teaching and learning

As a school, our practise is driven by the principles of Mastery. We teach through a model where all pupils (with some exceptions) are working on the same objective and move through the curriculum at broadly the same pace. This is supported by the White Rose small steps progression. Within the lesson, pupils who show they are finding the objective a challenge will be given support to help them to achieve it. This **may** be through an additional resource (numberline, timestables grid…), consolidating a concrete/pictorial representation or adult deployment. Those who present as being able to grasp concepts more quickly will be provided further challenge through the 'Star Challenge' system. A 'One Star Challenge' is used to encourage pupils to think deeper about a concept. These are for *most* pupils, *most* of the time. A 'Two Star Challenge' is aimed to allow Greater Depth pupils to demonstrate a more advanced understanding. These will be for *some* pupils, *some* times. Star challenges **may** be an open-ended question or a low-threshold/high ceiling investigation. The underlying principle is so that all pupils are able to work within their year group objective being challenged or supported as needed.

Fluency, Problem Solving and Reasoning

The national curriculum aims for pupils to "be able to move fluently between representations of mathematical ideas". To achieve this, we aim for pupils to gain a conceptual understanding of the area they are learning so that they have a secure, flexible knowledge. Pupils experience addition, subtraction, multiplication and division through concrete, pictorial and abstract representations, which are exemplified through the calculation policy. Formal written methods are taught when pupils demonstrate a secure conceptual understanding of the 'why' and 'how' the calculation works. All pupils have opportunity to develop their fluency, problem solving and reasoning skills. This may be part of one lesson or as stand alone sessions dependent on teacher judgement.

White Rose

As a school, we follow the White Rose schemes of learning. These provide clear long term overviews for each year group that ensure coverage of the national curriculum objectives. Each objective is exemplified through a range of fluency, problem solving and reasoning activities. Teachers use these to support their planning to ensure pitch and challenge. White Rose provide 'small steps progression' outlines for each area of the maths curriculum that teachers follow when planning.

Arithmetic and Key Skills/Knowledge

All maths lessons start with a Key Skills and Knowledge session ("Flashback") of approximately 10 minutes. These are to ensure that key number skills are revisited and consolidated. During the beginning of the year, previous year group objectives are consolidated, then as new number skills have been taught these are planned for as well. This work is largely self or peer marked.

Working Walls

Working walls are used as a scaffold for pupils' learning. They are kept up to date to reflect the current teaching.

Times tables Rockstars

Times tables rockstars is used throughout KS2 and from the Spring term in Year 2 (after the teaching of multiplication and division). The intention is to increase pupils' fluency in multiplication and division facts. Pupils sit 4 sessions a week, these are kept separate to maths books.

Implementation in the Early Years

Pupils in the Early Years work towards the early learning goals (Number and Numerical Pattern). This is achieved through direct teaching sessions in groups, continuous provision and enhancements within the maths area. In Foundation 1, teaching follows the 'Maths Mastery' scheme of work. This has been closely designed to reflect the principles and practises of White Rose and was chosen for this reason. In Foundation Stage 2, children follow the White Rose Framework in line with KS1 and KS2. In both settings, pupils receive a direct teaching input for approximately 15-20 minutes. This is done either through the whole class input or small group sessions.

Assessment

Small Step Progression

At the beginning of each new domain, pupils will insert the small step progression that they will follow into their workbooks. The small steps will be informed by White Rose but class teachers apply their professional judgement in the progression of skills. Each small step is numbered and will be used to help pupils track their progress. Each lesson will start by reviewing the small step progression and discussing with pupils the new learning within the context of what has already been taught. Pupils will write the corresponding small step number next to the date in their mathematics book to indicate the focus of the lesson. Teachers will then highlight this number in 'pink' to show if the pupil has demonstrated a sufficient level of understanding or 'green' if the pupil needs additional practise/support/help.

Summative Assessments

Termly assessments in mathematics are carried out during designated assessment weeks. In these weeks, pupils sit NfER assessment papers in arithmetic, problem solving and reasoning. Teachers also used end of block assessments to provide a snapshot of a pupils understanding of a single area of mathematics. These assessments are used to identify any pupils who are not making expected progress and require intervention.

Methods of Calculation

The national curriculum aims for pupils to "be able to move fluently between representations of mathematical ideas". To achieve this, calculation is taught so that pupils gain a conceptual understanding of the area of calculation so that they have a secure, flexible knowledge. Pupils experience addition, subtraction, multiplication and division through concrete, pictorial and abstract representations. Formal written methods are taught when pupils demonstrate a secure conceptual understanding of the 'why' and 'how' the calculation works.

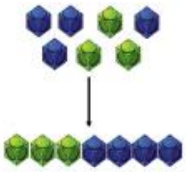
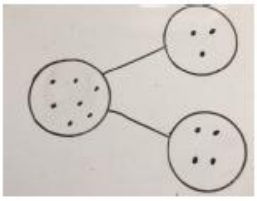
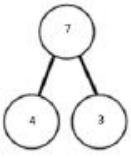
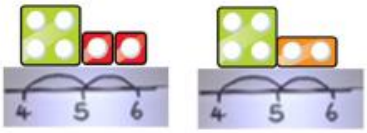
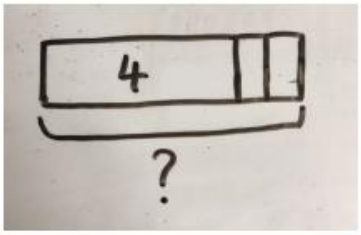
	EYFS/Year 1	Year 2	Year 3	Year 4	Year 5	Year 6

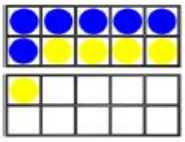
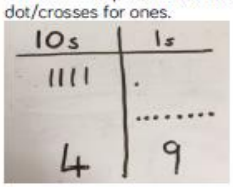
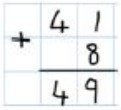
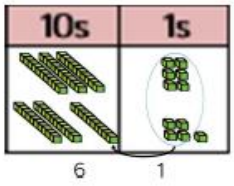
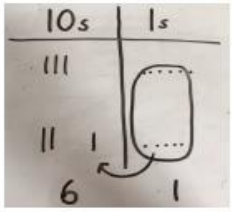
Addition	Combining two parts to make a whole: part whole model. Starting at the bigger number and counting on- using cubes. Regrouping to make 10 using ten frame.	Adding three single digits. Use of base 10 to combine two numbers. Introduction of column method (up to 2 digits).	Column method- regrouping. Using place value counters (up to 3 digits).	Column method- regrouping. (up to 4 digits)	Column method- regrouping. Use of place value counters to show adding decimals.	Column method- regrouping. Abstract methods.
Subtraction	Taking away ones Counting back Find the difference Part whole model Make 10 using the ten frame	Counting back Find the difference Part whole model Make 10 Use of base 10 Introduction of column method (up to 2 digits).	Column method with regrouping. (up to 3 digits using place value counters)	Column method with regrouping. (up to 4 digits)	Column method with regrouping. Abstract for whole numbers. Start with place value counters for decimals- with the same amount of decimal places.	Column method with regrouping. Abstract methods. Place value counters for decimals- with different amounts of decimal places.
Multiplication	Recognising and making equal groups. Doubling Counting in multiples Use cubes, Numicon and other objects in the classroom	Arrays- showing commutative multiplication	Arrays 2d × 1d using base 10 Introduction of column multiplication	Column multiplication- introduced with place value counters. (2 and 3 digit multiplied by 1 digit)	Column multiplication Abstract only but might need a repeat of year 4 first(up to 4 digit numbers multiplied by 1 or 2 digits)	Column multiplication Abstract methods (multi-digit up to 4 digits by a 2 digit number)
Division	Sharing objects into groups Division as grouping e.g. I have 12 sweets and put them in groups of 3, how many groups? Use cubes and draw round 3 cubes at a time.	Division as grouping Division within arrays- linking to multiplication Repeated subtraction	Division with a remainder-using lollipop sticks, times tables facts and repeated subtraction. 2d divided by 1d using base 10 or place value counters	Division with a remainder Short division (up to 3 digits by 1 digit- concrete and pictorial)	Short division (up to 4 digits by a 1 digit number including remainders)	Short division Long division with place value counters (up to 4 digits by a 2 digit number) Pupils should exchange into the tenths and hundredths column too

Below are examples of how each calculation ***may*** be exemplified in different representations and the agreed formal written method that is taught.

Addition

Key Language: sum, total, parts and wholes, plus, add, altogether, more, 'is equal to' 'is the same as'.

Concrete	Pictorial	Abstract
Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars). 	Children to represent the cubes using dots or crosses. They could put each part on a part whole model too. 	4 + 3 = 7 Four is a part, 3 is a part and the whole is seven. 
Counting on using number lines using cubes or Numicon.  	A bar model which encourages the children to count on, rather than count all. 	The abstract number line: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? 4 + 2 

Regrouping to make 10; using ten frames and counters/cubes or using Numicon. 6 + 5 	Children to draw the ten frame and counters/cubes. 	Children to develop an understanding of equality e.g. 6 + □ = 11 6 + 5 = 5 + □ 6 + 5 = □ + 4
TO + O using base 10. Continue to develop understanding of partitioning and place value. 41 + 8 	Children to represent the base 10 e.g. lines for tens and dot/crosses for ones. 	41 + 8  1 + 8 = 9 40 + 9 = 49 
TO + TO using base 10. Continue to develop understanding of partitioning and place value. 36 + 25 	Chidlren to represent the base 10 in a place value chart. 	Looking for ways to make 10. 36 + 25 = 1 5 30 + 20 = 50 5 + 5 = 10 50 + 10 + 1 = 61 Formal method: 36 +25 61

789 + 642 becomes

Formal written method:

A formal method of setting out an addition in ordered columns with each column representing a decimal place value and ordered from right to left in increasing powers of 10. With addition, more than two numbers can be added together using column addition.

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  7 8 9
+ 6 4 2
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1 4 3 1
  1 1
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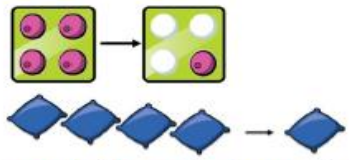
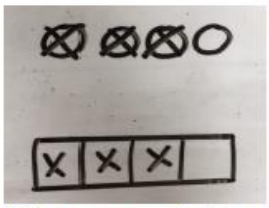
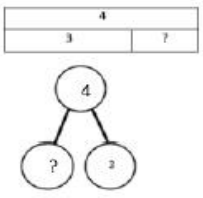
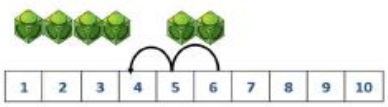
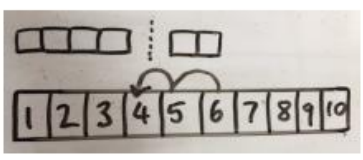
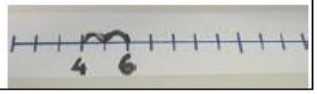
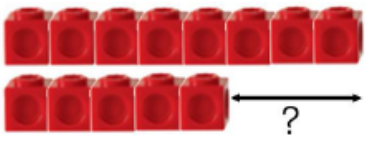
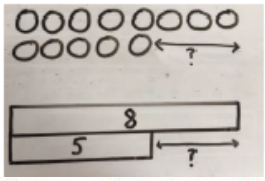
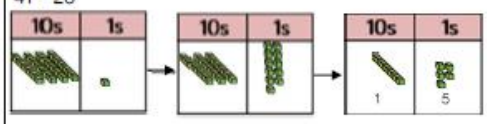
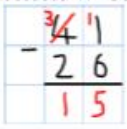
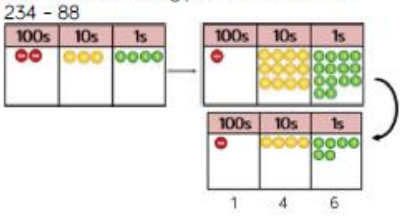
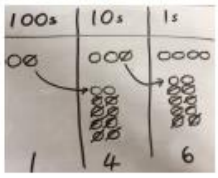
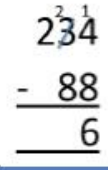
Answer: 1431

Subtraction

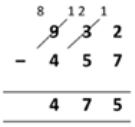
Key language: take away, less than, the difference, subtract, minus, fewer, decrease.

Concrete	Pictorial	Abstract
Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items such as beanbags could be used). 4 − 3 = 1 	Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used. 	4- 3 = □ = 4 − 3 
Counting back (using number lines or number tracks) children start with 6 and count back 2. 6 − 2 = 4 	Children to represent what they see pictorially e.g. 	Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line  

Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used). Calculate the difference between 8 and 5. 	Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate. 	Find the difference between 8 and 5. 8 – 5, the difference is ☐ Children to explore why 9 - 6 = 8 - 5 = 7 - 4 have the same difference.
Column method using base 10 and having to exchange. 41 – 26 	Represent the base 10 pictorially, remembering to show the exchange. 	Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because 41 = 30 + 11. 
Column method using place value counters. 234 – 88 	Represent the place value counters pictorially; remembering to show what has been exchanged. 	Formal colum method. Children must understand what has happened when they have crossed out digits. 

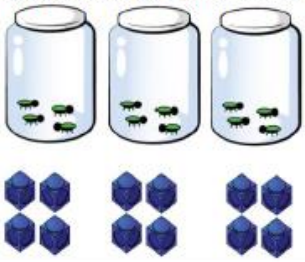
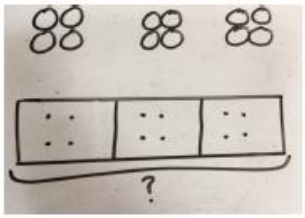
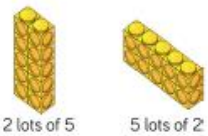
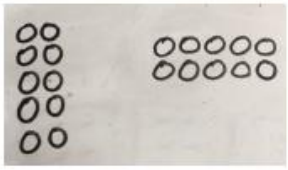
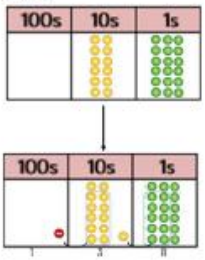
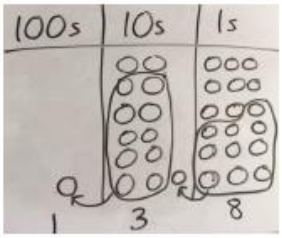
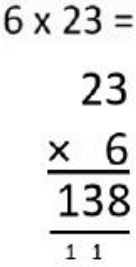
Formal written method:
A formal method of setting out a subtraction in ordered columns with each column representing a decimal place value and ordered from right to left in increasing powers of 10.

932 – 457 becomes



Answer: 475

Multiplication
Key language: double, times, multiplied by, the product of, groups of, lots of, equal groups.

Concrete	Pictorial	Abstract
Repeated grouping/repeated addition 3 × 4 4 + 4 + 4 There are 3 equal groups, with 4 in each group. 	Children to represent the practical resources in a picture and use a bar model. 	3 × 4 = 12 4 + 4 + 4 = 12
Use arrays to illustrate commutativity counters and other objects can also be used. 2 × 5 = 5 × 2 	Children to represent the arrays pictorially. 	Children to be able to use an array to write a range of calculations e.g. 10 = 2 × 5 5 × 2 = 10 2 + 2 + 2 + 2 + 2 = 10 10 = 5 + 5
Formal column method with place value counters. 6 x 23 	Children to represent the counters/base 10, pictorially e.g. the image below. 	Formal written method 

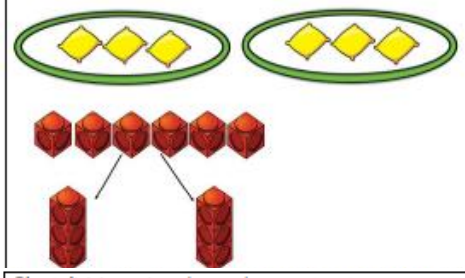
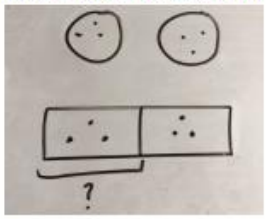
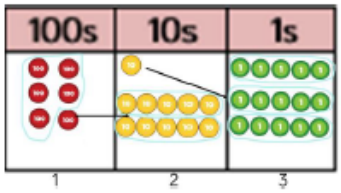
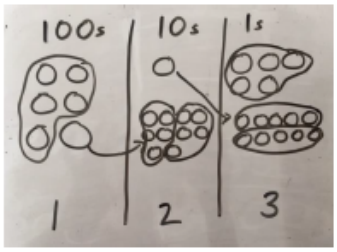
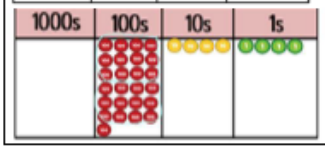
Formal written method:
Short multiplication; essentially, simple multiplication by a one digit number, with the working set out in columns.

342 x 7 becomes

$$\begin{array}{r} 3\ 4\ 2 \\ \times\quad\ 7 \\ \hline 2\ 3\ 9\ 4 \\ \ \ 2\ 1 \end{array}$$

Long multiplication; a columnar algorithm for performing multiplication by more than a single digit, again best illustrated by an example:

Division
Key language: share, group, divide, divided by, half.

Concrete	Pictorial	Abstract
Sharing using a range of objects. 6 ÷ 2 	Represent the sharing pictorially. 	6 ÷ 2 = 3 3 | 3 Children should also be encouraged to use their 2 times tables facts.
Short division using place value counters to group. 615 ÷ 5  1. Make 615 with place value counters. 2. How many groups of 5 hundreds can you make with 6 hundred counters? 3. Exchange 1 hundred for 10 tens. 4. How many groups of 5 tens can you make with 11 ten counters? 5. Exchange 1 ten for 10 ones. 6. How many groups of 5 ones can you make with 15 ones?	Represent the place value counters pictorially. 	Children to the calculation using the short division scaffold. $5\overline{)615}^{\,123}$ (1, 1)
Long division using place value counters 2544 ÷ 12  We can't group 2 thousands into groups of 12 so will exchange them.  We can group 24 hundreds into groups of 12 which leaves with 1 hundred. $12\overline{)2544}^{\,02}$, 24, 1		

Formal written method:

Short division; a compact written method of division.
Long multiplication; a columnar algorithm for division by more than a single digit.

496 ÷ 11 becomes

$$\begin{array}{r} 4\ 5\ \text{r}1 \\ 11\overline{)496}^{\,5} \end{array}$$

432 ÷ 15 becomes

$$\begin{array}{r} 2\ 8\cdot 8 \\ 15\overline{)432\cdot 0} \\ 30 \\ \hline 132 \\ 120 \\ \hline 120 \\ 120 \\ \hline 0 \end{array}$$