Maths
handbook

Westwood Primary School
Grove Primary School
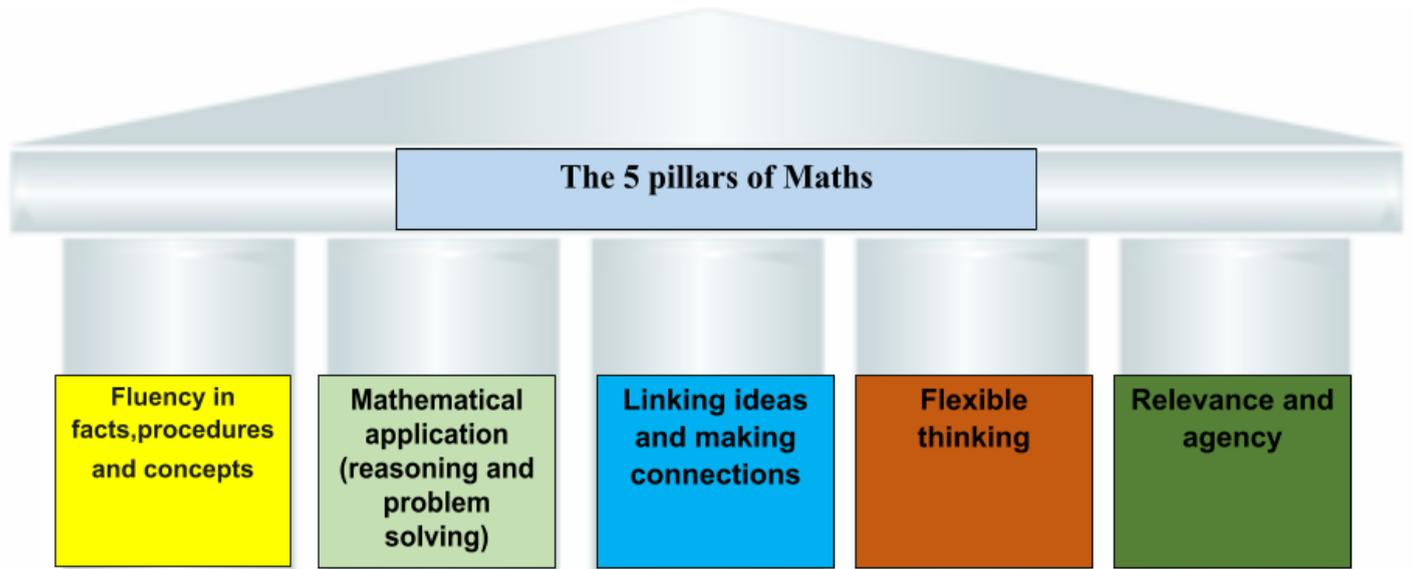
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Key Principles - Our 5 key pillars

Within our maths curriculum, we aim for each of our maths sessions to support the children with the following five principles of their learning.

The 5 pillars of Maths

| Fluency in facts, procedures and concepts | Mathematical application (reasoning and problem solving) | Linking ideas and making connections | Flexible thinking | Relevance and agency |

All underpinned by concrete, pictorial and abstract opportunities to work.

National Curriculum

The national curriculum (2014) for maths states:

The principal focus of mathematics teaching in key stage 1 is to ensure that pupils develop **confidence and mental fluency** with whole numbers, counting and place value. This should involve working with numerals, words and the four operations, including with **practical resources** [for example, concrete objects and measuring tools]. At this stage, pupils should develop their ability to recognise, describe, draw, compare and sort different shapes and use the related vocabulary. Teaching should also involve using a range of measures to describe and compare different quantities such as length, mass, capacity/volume, time and money. By the end of year 2, pupils should know the number bonds to 20 and be precise in using and understanding place value. **An emphasis on practice at this early stage will aid fluency.** Pupils should read and spell mathematical vocabulary, at a level consistent with their increasing word reading and spelling knowledge at key stage 1.

The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils become **increasingly fluent with whole numbers and the four operations, including number facts and the concept of place value.** This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers. At this stage, pupils should develop their ability to **solve a range of problems**, including with simple fractions and decimal place value. Teaching should also ensure that pupils draw with increasing accuracy and **develop mathematical reasoning** so they can analyse shapes and their properties, and confidently describe the relationships between them. It should ensure that they can use measuring instruments with accuracy and make connections between measure and number. **By the end of year 4, pupils should have memorised their multiplication tables** up to and including the 12 multiplication table and show precision and fluency in their work. Pupils should read and spell mathematical vocabulary correctly and confidently, using their growing word reading knowledge and their knowledge of spelling.

The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils **extend their understanding** of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio. At this stage, pupils should **develop their ability to solve a wider range of problems**, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems. Teaching in geometry and measures should consolidate and extend knowledge developed in number. Teaching should also ensure that pupils classify shapes with increasingly complex geometric properties and that they learn the vocabulary they need to describe them. By the end of year 6, **pupils should be fluent in written methods for all four operations,** including long multiplication and division, and in working with fractions, decimals and percentages. **Pupils should read, spell and pronounce mathematical vocabulary correctly.**

Our Curriculum Offer

At Westwood and Grove Primary, we want our children to be aspirational, be the best they can be, be supportive of others and be proud of who they are!

Our curriculum provides children with opportunities to achieve academically, as well as developing a person and a citizen.We aim for all children to be prepared for their next stage in learning, for all children to succeed and for some this may be to succeed against the odd.

In maths:
- Children acquire and practice key skills including; arithmetic, times tables etc.
- Have opportunities to develop fluency, problem solving and reasoning skills.

We also strongly believe children learn best when there is a shift from short term memory to long term memory. For this reason, our maths curriculum includes opportunities to ensure depth of learning

When possible and appropriate curriculum links are developed, maths will be explored and applied across the whole curriculum and children will be able to apply knowledge and skills across the curriculum.

The National Curriculum for Mathematics (2014) aims 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.
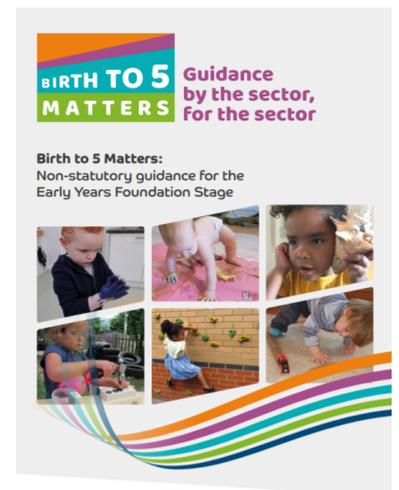
We aspire for children to leave Westwood and Grove Primary with a skill set that enables them to reason and problem solve in a technologically evolving world, ensuring they are confident to tackle any mathematical challenges they may face. As such, our whole school environment enables children to use a range of resources and encourages independent reasoning and problem solving. All children (from Nursery to Year 6) are encouraged to use concrete and pictorial representations to show, prove and explain their abstract thoughts and mathematical working. This also develops a conceptual understanding that enables children to transfer their mathematical skills into real life contexts.
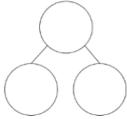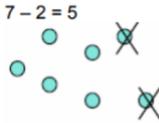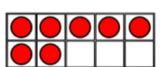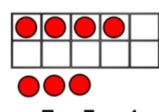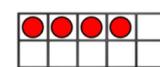
Maths Calculation Policy

At our schools, our children are able to reason mathematically, solve problems and develop fluency in their understanding of number through a number rich environment. Children are enabled to progress stage by stage at a pace appropriate to them, building upon models and representations they recognise from previous teaching, allowing for deeper conceptual understanding and fluency.

Foundations of Maths

Song	Move objects	Match, sort and organise, pattern	Counting 1:1 correspondence	Representing number	Combining number	Combining numbers within 5	Combing numbers within 10	Combing numbers within 20	Provision	Language
Song										
Song	Move objects									
Song	Move objects	Match, sort and organise, pattern								
Song	Move objects	Match, sort and organise, pattern	Counting 1:1 correspondence							
Song	Move objects	Match, sort and organise, pattern	Counting 1:1 correspondence	Representing number						
Song	Move objects	Match, sort and organise, pattern	Counting 1:1 correspondence	Representing number	Combining number					
Song	Move objects	Match, sort and organise, pattern	Counting 1:1 correspondence	Representing number	Combining number	Combining numbers within 5				
Song	Move objects	Match, sort and organise, pattern	Counting 1:1 correspondence	Representing number	Combining number	Combining numbers within 5	Combing numbers within 10			
Song	Move objects	Match, sort and organise, pattern	Counting 1:1 correspondence	Representing number	Combining number	Combining numbers within 5	Combing numbers within 10	Combing numbers within 20		

Subitising spans across the upper rows.

EYFS staff use Development Matters and Birth to 5 Matters to support planning and development of maths. All teachers are provided with a log in enabling them to access this progression of early mathematics.

BiRTH TO 5 MATTERS — Guidance by the sector, for the sector

Birth to 5 Matters:
Non-statutory guidance for the Early Years Foundation Stage

From the Early Years Coalition
www.birthto5matters.org.uk

Continuous teaching	**Addition**	**Subtraction**

	Addition and subtraction are connected. *Both express the relationship between 2 or more parts and the whole.*	Whole	
		Part / Part / Part	

| Secure numbers facts to 10 and 20 | **Stage 1:**
 Combining two sets (aggregation)
 Putting together - two or more amounts or numbers are put together to make a total. Count one set, then the other set, Combine the sets and count again.

 7 + 5 = 12

 First   Then   Now

 $4 + 3 = 7$
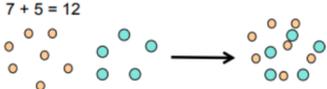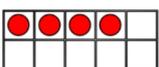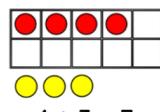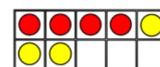
 Counting along the bead string, count out the 2 sets, then draw them together. Count again, starting at 1.

  | **Stage 1:**
 There are two concepts linked to subtraction:
 Subtract - where it is natural to count back to 'take away'
 Find the difference – where the understanding of the vocabulary leads to using addition to count on [complementary addition]. Children should be taught to find the difference, using subtraction methods. This should be part of practitioners' vocabulary when teaching subtraction.

 Taking away (subtraction method)
 When one quantity is taken away from another to calculate what is left.

 7 – 2 = 5

 First   Then   Now

 $7 - 3 = 4$ |

| | *Combining two sets (augmentation)*
 This stage is essential in starting children to calculate rather than counting. When one quantity is increased by some amount. Count on from the total of the first set, e.g. put 3 in your head and count on 2. Always start with the largest number.

 Counters:
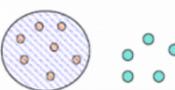
 Start with 7, then count on 8, 9, 10, 11, 12
 Bead strings:

 Make a set of 7 and a set of 5. Then count on from 7.

 Children need to be secure with aggregation and augmentation before moving onto using a stage one number line

 The Number Line
 Number line Teaching Points:
 ● Always work with numbers reading from left to right (smallest to largest), whatever the operation of the calculation.
 ● Numbers ('landmarks') are written below the line.
 ● Size of the 'jumps' are written above the 'jumps'.

 Children use a numbered line to count on in ones. Children use number lines and practical resources to support calculation and teachers *demonstrate* the use of the number line.
 7+ 4

  | *Finding the difference (comparison model)*
 Two quantities are compared to find the difference. *For example: 8 - 2 = 6*

 The Number Line
 Children use a numbered line to count on in ones. Children use number lines and practical resources to support calculation and teachers *demonstrate* the use of the number line.

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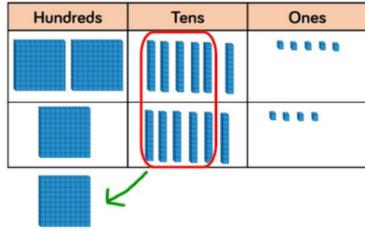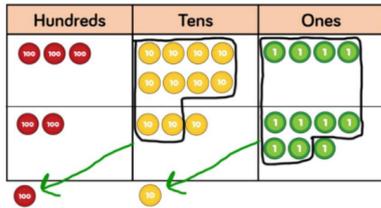|		

Inverse needs to be taught throughout	***It is crucial to know or be able to derive key number facts for totals of all numbers up to 10 (instant recall) before progressing further.***
	
	Stage 2:
	Children must be secure in partitioning a single digit number.
	
	Before moving on to a stage 2 number line where children jump on in 10s and 1s, children need to be completely secure in understanding of place value and use the appropriate vocabulary to recognise and explain 24 is '2 tens and 4 ones'.
	e.g. 12 + 23 = 10 + 2 + 20 + 3
	      = 30 + 5
	      = 35
	
	The steps in addition often bridge through a multiple of 10
	e.g. Children should be able to partition the 7 to relate adding the 2 and then the 5.
	8 + 7 = 15
	
	    8 10 15
	
	Jumping in 10s and 1s
	
	23 + 12 = 23 + 10 + 2
	         = 33 + 2
	         = 35
	
	     +10 +2
	  23 33 35
	
	Model this on a bead bar and practise on 100 bead strings, showing the 'collection' of 10s and then the ones. i.e "2 tens and 1 ten makes 3 tens, which is 30. Then 3 and 2 makes 5 ones. Altogether we can see 3 tens and 5 ones, which is 35." Check by counting in tens and ones along the bead bar. Express this as: "20 add 10 equals 30"
		Stage 2:
		Children must be secure in partitioning a single digit number.
		
		Use known number facts and place value to subtract (partition second number only)
		
		Example: 22 – 5 = 22 – 2
		             = 20 - 3
		
		    -3 -2
		
		  17 20 22
		
		Example: 80 – 30
		
		37 – 12 = 37 – 10 – 2
		         = 27 – 2
		         = 25
		
		    -2 -10
		
		  25 27 37

	AND as: "2 tens add 1 tens equals 3 tens or 30"
	
	Partition into tens and ones
	Partition both numbers and recombine.
	Count on by partitioning the second number only e.g.
	
	        36 + 53 = 53 + 30 + 6
	               = 83 + 6
	               = 89
	
	    +30 +6
	  53 83 89	

Ensure commas and decimal places are always used. *Ensure that columns are labelled and all digits are placed in the right column (digits of the same value line up).*	**Stage 3:** Children should become confident in adding first before exchanging whilst adding. Children should be confident in adding using base 10/place value counters in place value charts before recording pictorially. Children should become confident with recording column method alongside pictorial representations. When children are confident, children to solve calculations using column method. *For example: 38 + 23 = 61* | Tens	Ones | 38 + 23 61 1	**Stage 3:** Children should become confident in subtracting first before exchanging whilst subtracting. Children should be confident in subtracting using base 10/place value counters in place value charts before recording pictorially. Children should become confident with recording column method alongside pictorial representations. When children are confident, children to solve calculations using column method. *For example: 65 - 28 = 37* | Tens	Ones | ⁵65¹ – 28 37

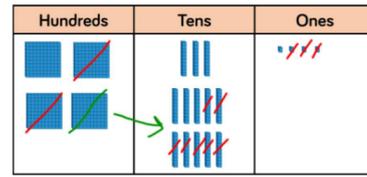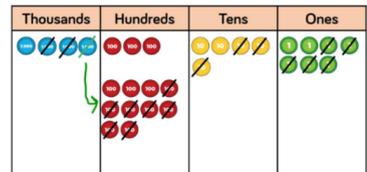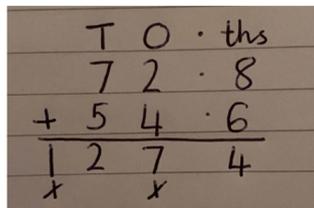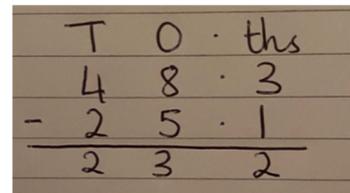|		
Ensure exchanging for addition is at the bottom	265 + 164 = 429 $\begin{array}{r} 265 \\ + 164 \\ \hline 429 \\ \hline 1 \end{array}$ 384 + 237 = 621 $\begin{array}{r} 384 \\ + 237 \\ \hline 621 \\ \hline 1\ 1 \end{array}$	435 - 273 = 262 $\begin{array}{r} ^3\!\not4^1\!35 \\ - 273 \\ \hline 262 \end{array}$ 4357 - 2735 = 1622 $\begin{array}{r} ^3\!\not4^1\!357 \\ - 2735 \\ \hline 1622 \end{array}$

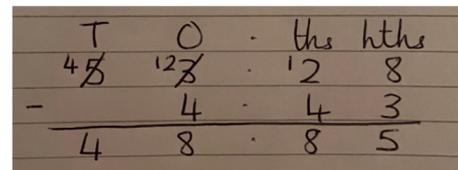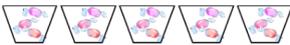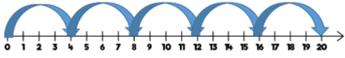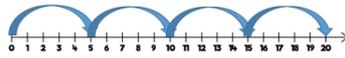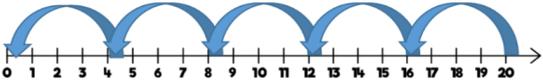|		
	Extend to decimals (same number of decimals places) and adding several numbers (with different numbers of digits). Extend to numbers with any number of digits and decimals with 1, 2 and/or 3 decimal places.	Extend to decimals (same number of decimals places) and subtracting several numbers (with different numbers of digits). Extend to numbers with any number of digits and decimals with 1, 2 and/or 3 decimal places.
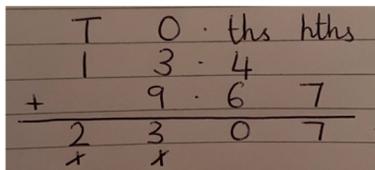
Multiplication	Division
Multiplication and division are connected. *Both express the relationship between a number of equal parts and the whole.*		Part	Part	Part	Part | |---|---|---|---| Whole (spanning)

	Multiplication	Division
The concept of inverse should be taught throughout multiplication and division. *The environment and language used should represent this concretely, pictorially and visually.*	**Stage 1 - Arrays** Multiplication is related to doubling and counting groups of the same size. Children need to be fluid in doubling numbers as a foundation to their understanding of multiplication. *3 + 3 = 6* Counting using a variety of practical resources: Counting in 2s e.g. counting socks, shoes, animal's legs. Counting in 5s e.g. counting fingers, fingers in gloves, toes. Counting in 10s e.g. fingers, toes. Pictures/marks – Teachers use pictures and marks to pictorially represent problems. Consolidation of one to one correspondence, aggregation and augmentation. *There are 3 sweets in one bag.* *How many sweets are there in 5 bags?* **Stage 2 - Arrays and repeated addition** *Looking at rows* *3 + 3* *2 groups of 3*	**Stage 1 - Sharing** Sharing requires secure counting skills and develops the importance of one-to-one correspondence. *8 sweets are shared between 2 people.* *How many do they have each?* Children to become confident in sharing by participating in practical activities involving sharing, distributing cards when playing a game, putting objects onto plates, into cups, hoops etc. **Grouping** Children working practically to group a total number of objects into smaller groups. Children to develop this skill pictorially. *Sorting objects into 2s / 3s/ 4s etc. How many pairs of socks are there?* *There are 12 bulbs. Plant 3 in each pot. How many pots are there?* *Jo has 12 Lego wheels. How many cars can she make?* **Stage 2 - Repeated subtraction** Children to use bead strings and number lines to recognise division calculations as repeated subtraction.

|	Multiplication	Division
	●●●● ●●●● *4 x 2 = 8 or 4 + 4 = 8 (4 times by 2 = 2 lots of 4)* ● ● ● ● ● ● *2 x 4 or 2 + 2 +2 + 2 (2 times by 4 = 4 lots of 2)* ● ● Children need to understand the inverse, supported by the use of arrays. If the calculation is 7 x 5 for example, children should understand that this means 7 + 7 + 7 + 7 + 7. However, children with secure knowledge of inverse and arrays can use the commutative to count 7 lots of 5. Children use number lines to support understanding of repeated addition / jumping in equal groups: $4 \times 5 = 20$ $5 \times 4 = 20$ Bead strings can be used to demonstrate repeated addition: *5 x 3 = 15* *3 x 5 = 15*	*There are 3 groups of 5 in 15.* *15 ÷ 3 = 3* *5 + 5 + 5 = 15* *There are 5 groups of 4 in 20.* *20 ÷ 4 = 5* *4 + 4 + 4 + 4+ 4 = 20* $$20 \div 4 = 5$$ Children to answer questions involving remainders using number lines and bead strings, recognising 'left over' beads as remainders. *For example: 13÷ 4 = 3 r1* *Sharing - 13 shared between 4, how many left over?* *Grouping – How many 4's make 13, how many left over?* $13 \div 4 = 3\ r1$

Number lines can also be used to support children's understanding of the relationship between different times tables e.g. 2 and 4:
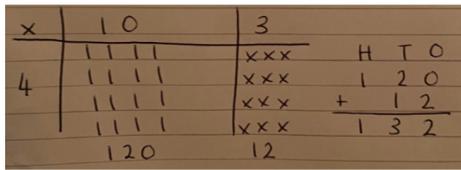

0 1 2 3 4 5 6 7 8
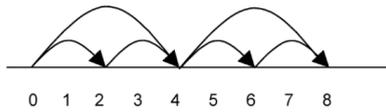
Stage 3 - Grid method
To introduce grid method, link children's knowledge of arrays and partitioning. Children to become confident in using the grid method with concrete resources and pictorially.
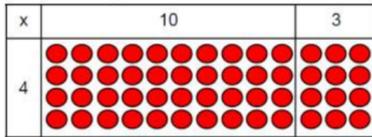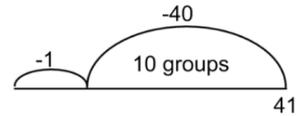

There are 4 rows of 10 and 4 rows of 3. 40 + 12 = 52

Stage 3 - Partitioning when dividing on number lines
Children can partition numbers and use mental number facts to calculate efficiently on number lines.
For example:
41 ÷ 4
40 ÷ 4 = 10
*There is 1 left over*
41 ÷ 4 = 40 r1

Stage 4 - Sharing Base 10/place value counters into groups (including remainders)
On place value charts, children divide the space into the amount of groups they are dividing by. Children to partition numbers and share equally into groups - e.g. 2 digit numbers will be partitioned into tens and ones. The tens will be shared evenly into X groups, then the ones will be shared evenly into X groups.

66 ÷ 3 = 22

The next step would be to use the grid method (as above) but using abstract numbers rather than concrete resources or concrete representations.
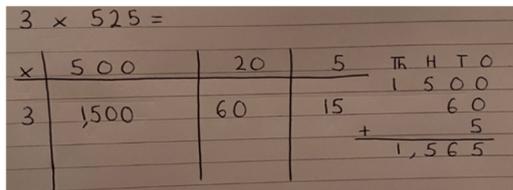
Stage 4: Concrete/pictorial representations in place value charts

Children to represent numbers using base 10/place value counters in place value charts. *For example: 3 groups of 24 or 3 x 24.* When counting the totals in each place value column, children exchange to the next place value column. *For example: exchanging 10 ones for 1 ten.* Once children are confident, children can represent base 10/counters pictorially.

343 ÷ 4 = 114r1
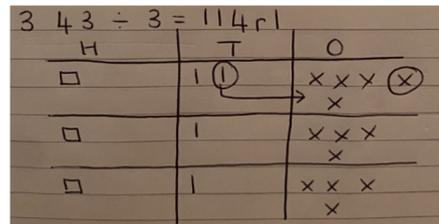
Stage 5: Short division
Children to be shown short division alongside pictorial representations in place value charts. Children to be confident in calculating with exchanges and with remainders.
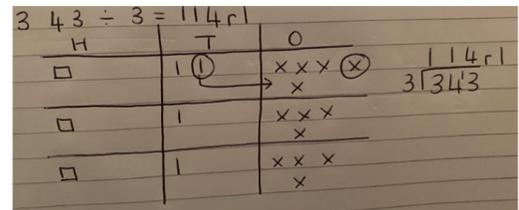
Once children become confident in showing their working out with short division alongside pictorial representations, children can solve calculations using short division only. If needed, children to refer back to concrete/pictorial representations.

Stage 5: Short Column Multiplication

Children to be shown short column multiplication alongside pictorial calculations shown in place value charts. *(4 x 3 = 12 - exchange the 10. 2 tens x 3 = 6 tens + 1 ten = 7 tens. 24 x 3 = 72)*

$$\begin{array}{r} 1 \\ 24 \\ \times\ \ 3 \\ \hline 72 \end{array}$$

The recording is reduced further, with exchanging digits recorded above the place value column. Exchanged digits should be crossed out once they have been added.

$$\begin{array}{r} 5 \\ 38 \\ \times\ \ 7 \\ \hline 266 \end{array}$$

Children who are already secure with multiplication for TO × O and TO × TO should have little difficulty in using the same method for HTO × TO or applying decimals.

$$\begin{array}{r} 286 \\ \times\ 29 \\ \hline 2574 \\ 5720 \\ \hline 8294 \end{array}$$

(9 x 286 = 2574)
(20 x 286 = 5720)

$$4\overline{)489^12}\quad 1223$$
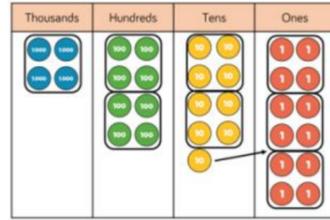
Children taught key vocabulary.

$$\text{divisor } 5\overline{)847}\text{ dividend}\quad\overset{\text{quotient}}{}$$

Stage 6: Long division

Alongside the pictorial representation children need to develop the written long division method.

12
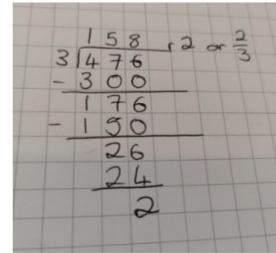
Planning flow diagram

The planning process

Our teachers use the long term plans which are then supported by a range of medium term units from sources such as White Rose, Herts4 Learning and Inspire. Our highly skilled teachers use these resources to plan differentiated lessons that meet the developmental needs of each child allowing them to progress to their next stage of learning. Westwood and Grove Primary works closely to share skill sets and subject knowledge to ensure lessons are always of the highest quality.

Long term planning

The long term plans are supported by medium term plans which are available electronically in the staff pen drive held on Google Drive.

Year 1 and 2:

Grove and Westwood Primary School
Maths LTP - Year 1 & 2

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Place Value Year 1 - Numbers to 20 Year 2 - Numbers to 200					Addition and Subtraction						
Spring	Multiplication and Division				Shape		Fractions			Place Value Year 1 - Numbers to 50 Year 2 - Numbers to 100		Money
Summer	Time		Length and height	Position and direction	Measure			Problem solving		Consolidation		

Year 3:

Grove and Westwood Primary School
Maths LTP - Year 3

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Place Value			Addition and Subtraction				Multiplication and Division				
Spring	Multiplication and Division			Length and perimeter			Fractions					Mass and capacity
Summer	Mass and capacity		Money		Time		Shape		Statistics			Consolidation

Year 4:

Grove and Westwood Primary School.
Maths LTP - Year 4

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Place Value				Addition and Subtraction			Multiplication and Division				
Spring	Multiplication and Division	Length and Perimeter		Area	Fractions				Decimals			
Summer	Decimals	Money		Time		Shape		Position and direction		Statistics	Consolidation	

Year 5:

Grove and Westwood Primary School
Maths LTP - Year 5

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Place Value			Addition and Subtraction / Multiplication and Division					Fractions			
Spring	Decimals and percentages			Multiplication and Division			Fractions		Perimeter and volume		Statistics	
Summer	Shape			Position and direction		Decimals			Negative units	Converting units		Volume

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Year 6:

Grove and Westwood Primary School
Maths LTP - Year 6

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Place Value		Addition and Subtraction / Multiplication and Division					Converting units	Fractions			
Spring	Decimals		Fractions, decimals and percentages		Ratio		Algebra		Area, perimeter and volume		Statistics	
Summer	Shape			Position and direction	Problem solving and Investigations							

Useful Websites

NRICH - https://nrich.mathss.org/

Maths for the more able - https://www.egfl.org.uk/sites/default/files/mathss%20puzzles%20all.pdf

Mathematical Etudes - https://www.m-a.org.uk/resources/downloads/2D-Collin-Foster-Mathematical-Etudes.pdf

Testbase - https://www.testbase.co.uk/

Times Tables Rockstars - https://ttrockstars.com/

Mathsbot - https://mathssbot.com/

Solvemoji - https://www.solvemoji.com/

Maths beginnings http://www.foster77.co.uk/mathsematicalbeginnings/index.htm

Tes Maths resources - https://www.tes.com/teaching-resources/hub/primary/mathsematics

Virtual dice - https://www.curriculumbits.com/prodimages/details/mathss/mat0005.html

Non negotiables

- 5 sessions per week.
- Teachers should use the long term plan to inform their teaching sequence.
- Clear differentiation in lessons.
- Children must have access to manipulatives in every classroom which they can access independently.
- **All** children must have opportunities to complete **reasoning and problem solving** activities in all lessons
- TA is responsible for marking 6 children's work each session (preferably the group they have been working with) and using marking codes within session for any children they are giving verbal feedback to.
- Children to use pencil in maths apart from when they respond to feedback in green pen. If they have made errors, they must correct work in green.
- Fluency session at the beginning of every lesson (10 minutes).
- Children should use the methods for the four operations set out in the calculation policy.
- School presentation policy must be followed - Margins to be used in KS2 (4 squares)
- Children must write one number in each box
- Date to be written roman numerals in Year 4, 5 and 6
- A new page must be started for a new day's work.

Student Voice

Do you enjoy the subject; why? Because we learn new things like dividing and sharing. Maths is fun and also it makes us happy. I like it because it tests our brains. I love numbers in maths because they are all different and fun. I enjoy mats because it will help me get a job like a till worker
What did you learn this week in maths; and do you know how to improve? We get pink highlighters in our books and the teachers help us get better I learnt about fractions to improve you have to focus on
What did you find challenging? Our super challenges in the envelopes, they make us think
How does what you have learned today build on what you already know? We answer questions at the start of the lesson which are from our other lessons
What jobs do you think you can have with maths? police , eye testers woman banker, member of Parliament
What will maths be like next year? It will get harder but I'm excited about this We will be confident and be risk taking rabbits
How well do pupils behave in your lessons? Really good behaviour because we have fun learning and we listen to what we are taught. We don't give up and we keep trying.
How do you get help in maths? We put our hand up and our teacher will come. We can look at the maths wall to help us. We can look on the board and the maths resource area with cubes and support.
Have you been on any trips with maths? No but we would love to