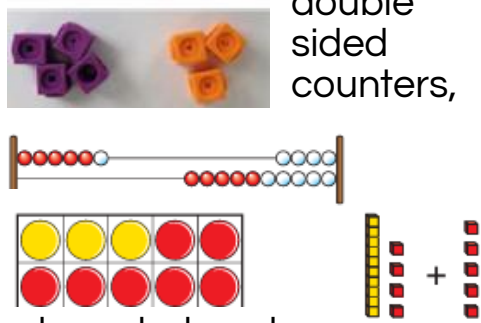
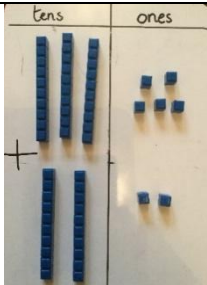
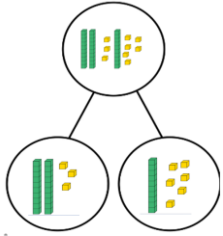
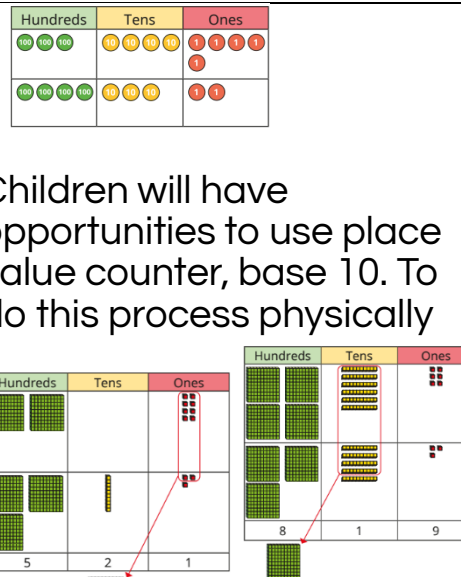
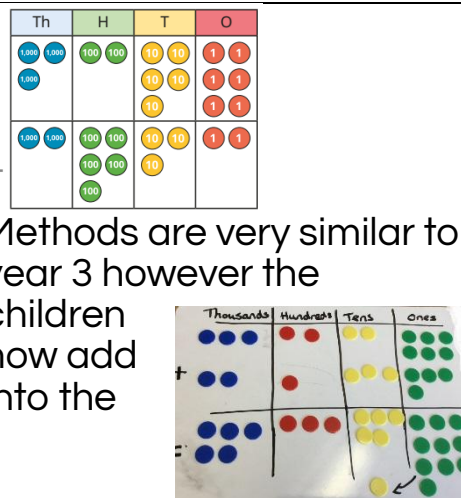
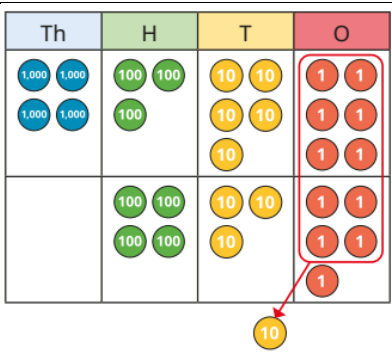
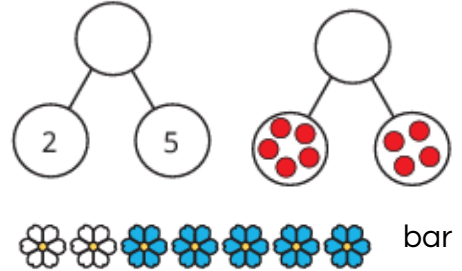
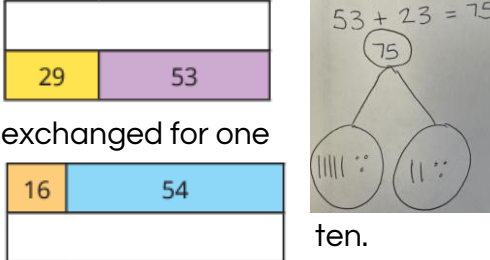
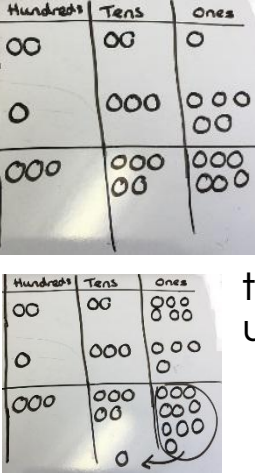
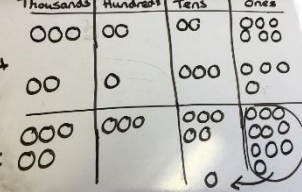
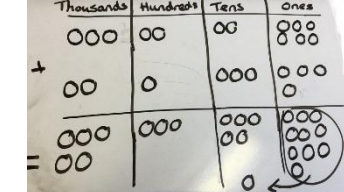


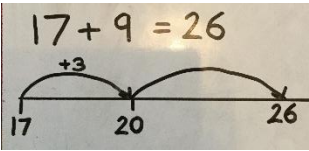
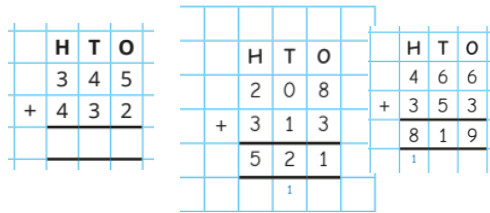
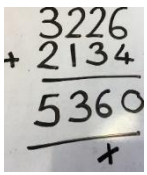
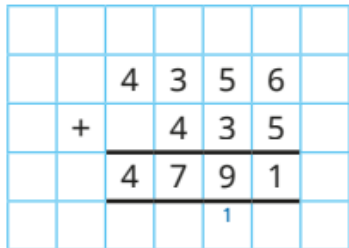
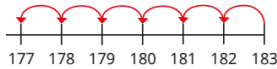
Watling Primary School Calculation Policy

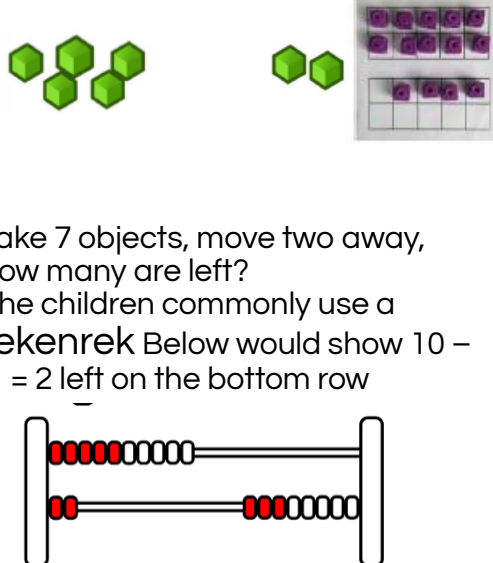
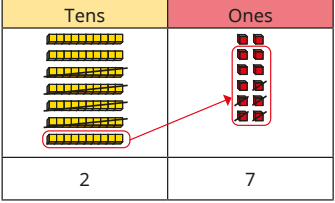
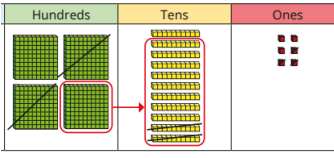
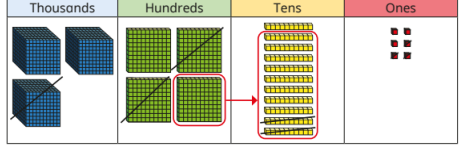
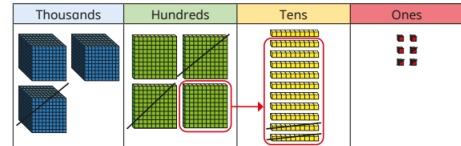
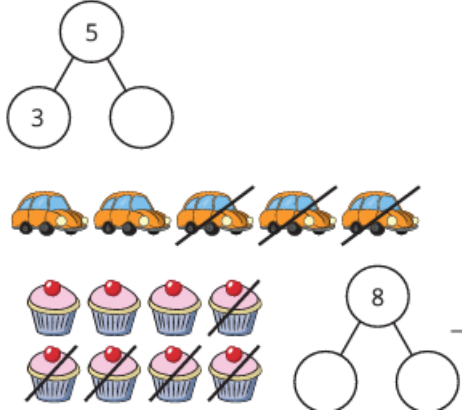
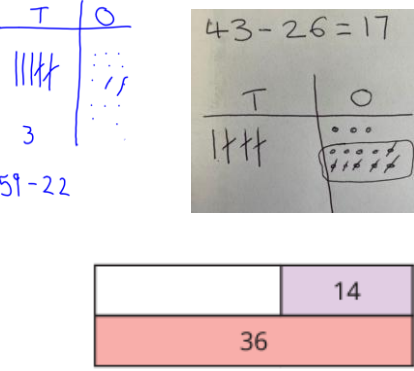
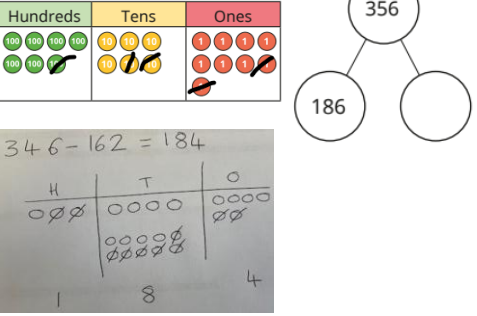
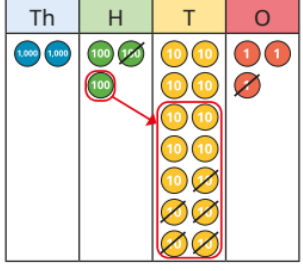
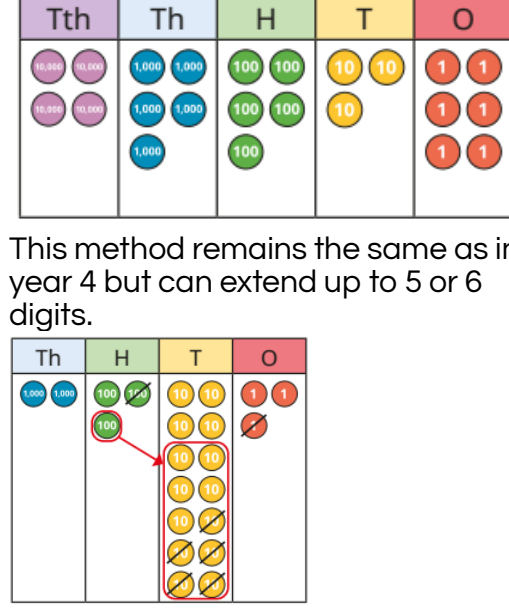
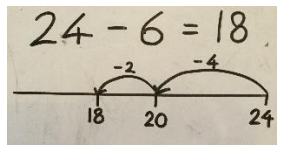
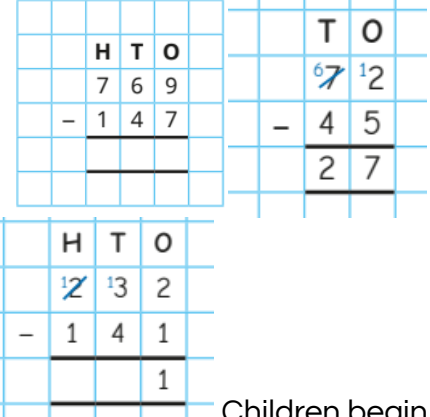
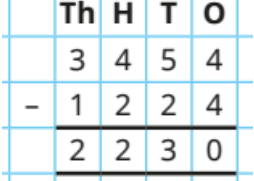
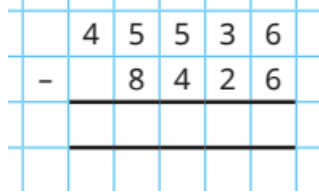


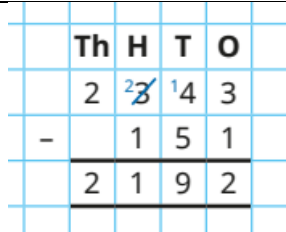
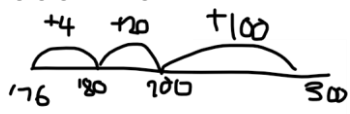
At Watling Primary School, we want our children to become confident and fluent mathematicians. We follow the teaching for mastery approach (supported through the use of White Rose Maths and Mastering Number in Early Years and KS1) and devise sequences of lessons which sees pupils moving from the use of concrete resources, to pictorial images, before moving on to the abstract.

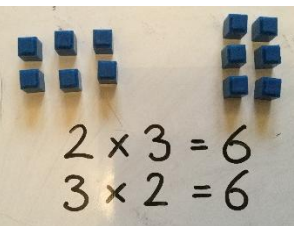
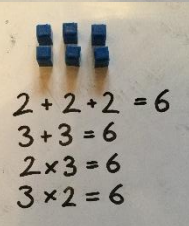
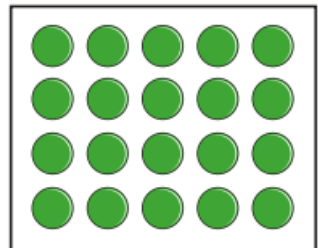
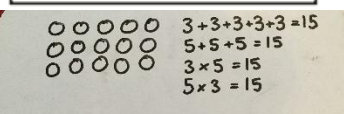
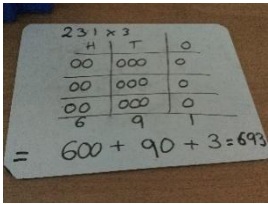
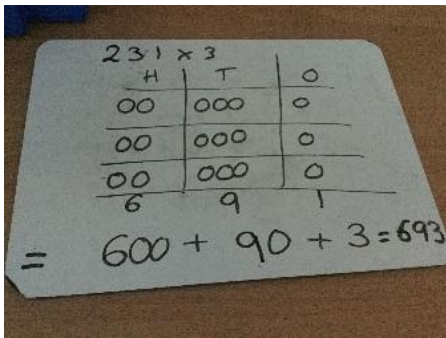
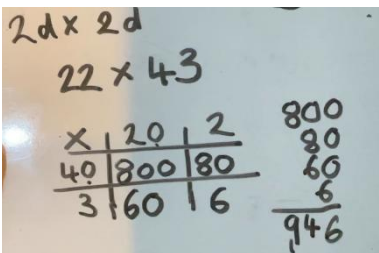
We believe that the use of concrete resources and manipulatives at every stage of learning is paramount to the children becoming keen and successful mathematicians. We encourage the use of concrete resources within lessons to scaffold learning across all year groups, enabling the children to gain a good grasp and deeper learning of key mathematical concepts. This leads to greater fluency overall within mathematics as they are able to reason and explain more clearly, due to having a better overall understanding of key concepts.

Addition	Year 1	Year 2	Year 3	Year 4	Year 5 & 6
Concrete	Use part, part whole model. Use cubes to add two numbers together as a group or in a bar. Cubes, double sided counters, rekenrek, bead string 	Adding 2 two-digit numbers together using base 10 and a place value grid.  Children are also exposed to a part whole model. 	Children will have opportunities to use place value counter, base 10. To do this process physically  Children then begin to physically carry across a 10 if their number goes over 10.	Methods are very similar to year 3 however the children now add into the thousand's column as well. Children also physically exchange and carry over one ten / ten ones. 	 This method remains the same as in year 4 but can extend up to 5 or 6 digits.
Pictorial	Part-Whole modal, modals. 	Children can draw any shapes to represent the numbers. As the year progresses, they begin to see how the ten ones can be exchanged for one ten.  $\square + \square = 20$ $20 - \square = \square$ $\square + \square = 20$ $20 - \square = \square$	221+135  We carry the 10 underneath.	Children can draw pictorially the calculation and add the extra place value counter to carry into the next column. 	This method remains the same as in year 4 but can extend up to 5 or 6 digits. 

Abstract	$8 = 5 + 3$ $5 + 3 = 8$ $8 = ? + 3$ $5 + ? = 8$ Showing the children that the equals sign can go in any order.	Children begin to add 3 digits together, $6 + 8 + 1 =$ They begin to solve missing number problems Using their number bonds $24 + = 30$ They also begin to add across 10 $75 + 6 =$ Towards end of the year able children begin to put this method into a column 	 Children begin with 3-digit numbers in a formal written layout with NO carry and then begin to carry the 10 underneath. It is important to still recognize the value of each column.	 We cross out the ten-carry underneath so that we know we have added it  onto the final total (often a misconception this gets missed). Children also do multiply carries.	 The children consolidate this method and become fluent in adding up to 6 digits.
Key Info and vocabulary	Children learn their Number bonds to 10 Number sentence Fact families First there were 3 sheep. Then 2 more sheep came along. How many altogether $5 = 2 + 3$ In year 1 children only use addition with numbers to 20.	Children learn their Addition and subtraction number bonds to 20 and related 10s facts to 100. Using known facts. If $3 + 5 = 8$, what is $30 + 50$? How do you know? It may help to set it out with T, O (tens and ones) at the top of each column. Always start the calculation from the units in case we need to exchange (for example ten ones for one ten). Key vocabulary: tens, ones, represents, exchange, partition.	In Year 3 the children begin to build on their MENTAL calculations too. Adding 1s, 10s to a number and using strategies to do this in their head by number bonds and crossing against the 10. Eg: $361 - 6$ 	Children continue their mental methods of addition, bridging over the 10. Adding ones, tens, hundreds, thousands mentally.	The method remains the same for addition and children should be fluent and confident in this formal written method. The children continue to work on mental strategies for addition and solving problems.

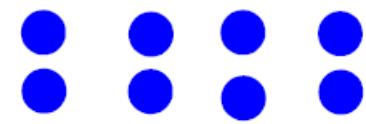
Subtraction	Year 1	Year 2	Year 3	Year 4	Year 5 & 6
Concrete	 Take 7 objects, move two away, how many are left? The children commonly use a rekenrek. Below would show $10 - 2 = 2$ left on the bottom row	For this calculation we start with  46. When there is no exchanging needed, we can take away the base ten to solve the problem. So, $46 - 23 = 23$ When we cannot take away simply by removing base ten (e.g. when we start with 6 ones but need to subtract 7 ones) then we need to exchange.	Physically the children take the base 10 away. Children begin to physically exchange one 10 for 10 ones or in the example below 1 hundred for 10 10s $416 - 23 =$ 	Children begin with no exchange and using place value counters to physically represent the calculation and then take them away,  Using Base 10 and Place Value counters children exchange (go to the bank) 1 ten for 10 ones. $3416 - 1223$ 	This method remains the same as in year 4 but can extend up to 5 or 6 digits. 
Pictorial		For this calculation we need to exchange 1 ten for 10 ones before completing the calculation of $63 - 25 = 38$ 	Children also draw the place value counters too. 	 Children draw the place value counters and then cross them out.	 This method remains the same as in year 4 but can extend up to 5 or 6 digits.
Abstract	$7 - 4 = 3$ $16 - 9 = 7$ Hannah has 12 sweets, and her sister has 5. How many more does Hannah have than her  $9 - 3 = \underline{\quad}$ Max uses a number line to work out $20 - 7$  sister.?	Dan has 21 sweets. He gives 7 sweets to Ben. How many sweets does Dan have left? Finding the difference Some children begin Column Subtraction: without exchanging and then exchanging 1 ten for ten ones 	 Children begin with no exchange and then build up to one exchange and multiple exchanges in different columns.	 Children begin with no exchange and then build up to one exchange and multiple exchanges in different columns. A progressional step from Year 3 is now the children work with an additional place value column.	 This method remains the same as in year 4 but can extend up to 5 or 6 digits.

					
Key Info	How many left? First, Then, Now? Finding the difference, for example How many more sweets does Kim have than Mo? How many fewer sweets does Mo have than Kim?	In year 2 children work towards being able to see how the ten is exchanged for 10 ones some children begin to use formal written methods When children move onto column subtraction, they need to start by setting out the numbers in the correct columns, neatly lining them up to prevent errors. They need to understand the place value of each digit in a number. It may help to set it out with T, O (tens and ones) at the top of each column. Always start the calculation from the units in case we need to exchange (for example one ten for ten ones). Key vocabulary: difference, subtract, count back, tens, ones, represents, exchange	This is an important stage in calculation and is important not to rush through each stage. Children are exposed to this method a lot with physically exchanging (going to the bank) for 10 ones. In addition to this, children also learn their number bonds to 100 eg: $87 + ? = 100$	Children continue to consolidate this written method of exchange. Children also work on their efficient subtraction for subtraction such as counting on. For example: $300 - 176 =$ 	In Year 5 and 6 there is no new method that is taught. The place value of the digits increases up to 6 digits. Children develop their fluency in these methods, using them to problem solve and building confidence in subtraction to solve calculations mentally.

Multiplication	Year 1	Year 2	Year 3	Year 4	Year 5 & 6																						
Concrete	Equal Groups  There are 4 groups of 2 Repeated Addition $5 + 5 + 5 = 15$ 	  Children apply their knowledge of counting in 2s, 5s and 10s when solving problems. adding equal groups together They arrange objects in arrays and find related number facts.  $2 \times 3 = 6$ $3 \times 2 = 6$  $2 + 2 + 2 = 6$ $3 + 3 = 6$ $2 \times 3 = 6$ $3 \times 2 = 6$	<table><tr><th>Tens</th><th>Ones</th></tr><tr><td>10 10</td><td>1</td></tr><tr><td>10 10</td><td>1</td></tr><tr><td>10 10</td><td>1</td></tr><tr><td>10 10</td><td>1</td></tr></table> In year three they multiply a 2-digit number by a 1-digit number. 21 x4 Building on their knowledge of repeated addition 21 + 21 +21 +21 They use place value counters to manipulate the numbers	Tens	Ones	10 10	1	10 10	1	10 10	1	10 10	1	<table><tr><th>Hundreds</th><th>Tens</th><th>Ones</th></tr><tr><td>100 100</td><td>10</td><td>1 1 1</td></tr><tr><td>100 100</td><td>10</td><td>1 1 1</td></tr><tr><td>100 100</td><td>10</td><td>1 1 1</td></tr></table> This is progressive from Year 3 as children now multiply a 3 digit by a 1 digit 213x3	Hundreds	Tens	Ones	100 100	10	1 1 1	100 100	10	1 1 1	100 100	10	1 1 1	Manipulatives may still be used with the corresponding long multiplication modelled alongside.
Tens	Ones																										
10 10	1																										
10 10	1																										
10 10	1																										
10 10	1																										
Hundreds	Tens	Ones																									
100 100	10	1 1 1																									
100 100	10	1 1 1																									
100 100	10	1 1 1																									
Pictorial	 $10 + 10 + 10 = 30$ A baker has made 3 trays of 10 bread rolls. 	  Children begin to draw their own arrays and use the multiplication symbol in a commutative way. 4 groups of 3 $3 + 3 + 3 + 3 = 12$ 	Children begin to draw their own place value chart to solve 2 digit multiplied by 1 digit <table><tr><th>Tens</th><th>Ones</th></tr><tr><td>10 10 10 10</td><td>1 1 1 1 1</td></tr><tr><td>10 10 10 10</td><td>1 1 1 1 1</td></tr><tr><td>10 10 10 10</td><td>1 1 1 1 1</td></tr></table> 4 tens $\times$ 3 = _____ tens 5 ones $\times$ 3 = _____ ones _____ + _____ = _____ 45 $\times$ 3 = _____ 	Tens	Ones	10 10 10 10	1 1 1 1 1	10 10 10 10	1 1 1 1 1	10 10 10 10	1 1 1 1 1	 Children keep the same method from year 3 pictorially but progressed onto 3 digit multiply by a one digit.	 In Year 5 children are introduced to multiplying by a 2 digit number for the first time. They can use the Grid Method which they are familiar with to pictorial represent the numbers														
Tens	Ones																										
10 10 10 10	1 1 1 1 1																										
10 10 10 10	1 1 1 1 1																										
10 10 10 10	1 1 1 1 1																										

Abstract

Arrays 2 + 2+ 2 + 2= 8
2x4= 8



The answer to a multiplication question is 18
What could the multiplication be?

□ × □

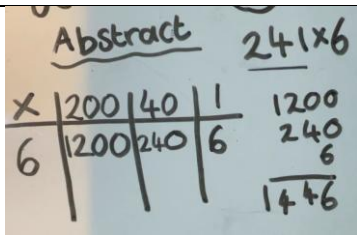
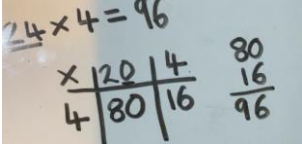
How many possible questions can you find?

5 + 5 + 5 = 15
3 + 3 + 3 + 3 + 3 = 15
5 x 3 = 15
3 x 5 = 15

35x7
Children are introduced to the new

x	30	5
7	210	35

method of partitioning to multiply. Grid Method. They partition the number and then multiply and add the two calculations together.



Children build on what they did from year 3 with a 3 digit multiplied by a 1 digit.

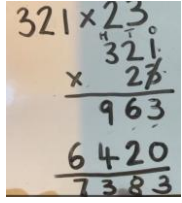
They are then exposed to the formal column method which if they are confident and ready to move onto, they are welcome to use. At this stage when children are building number fluency children choose a method, they feel confident with.

	Th	H	T	O
		2	3	4
x				6
	1	2	0	4
		2	2	

In Year 5 children can choose to continue the grid method as learnt in year 4 but encouraged to use a more efficient way using the column method. This is because of the numerous calculations they are doing and the carries.
In Year 5 and 6 the children multiply up to a 4 digit number and 2 digit number.

		3	1	2	
x			2	3	
		9	3	6	
+					

(312 x 3)
(312 x 20)



This method is consolidated over two years in year 5 and 6 due to the heavy number of calculations.
Many misconceptions arise such as times table errors, adding two numbers together, place value holder.

Key Info

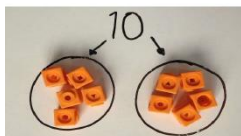
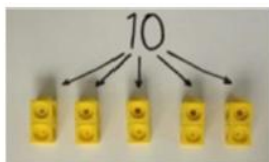
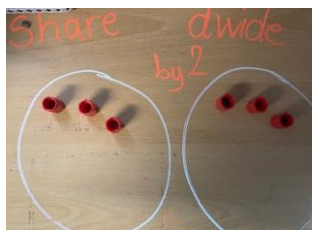
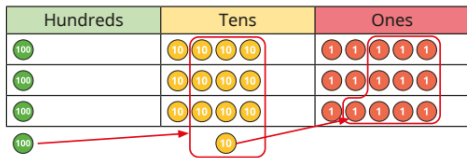
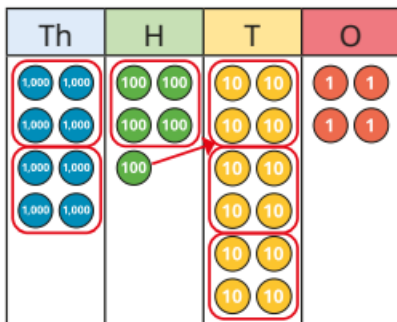
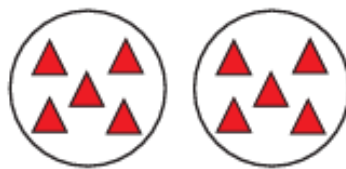
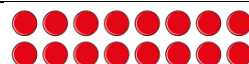
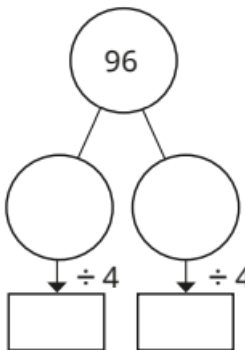
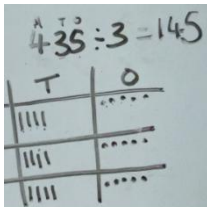
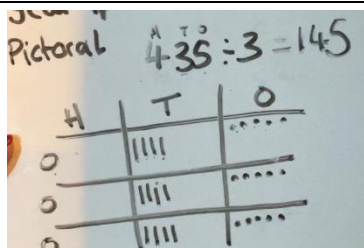
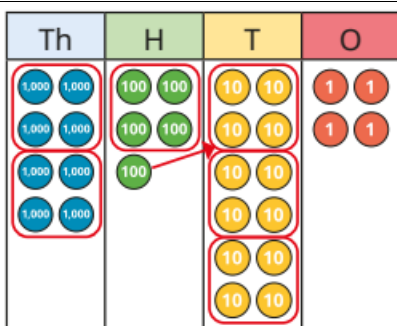
The children begin to count in 2s 5s and 10s
Equal groups
Repeated addition
Doubling numbers
In Year 1 the children handle multiplication with numbers up to 5.
4 groups of 3.

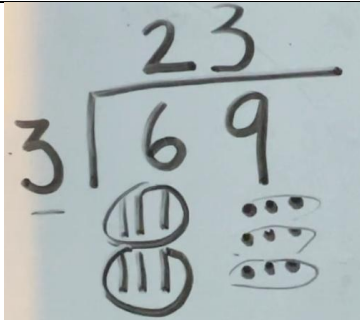
The children continue to count in 2s 5s and 10s and learn these as times tables. They begin to learn their 3s
All children will confidently begin to use the multiplication symbol.
A lot of what happens in Year 2 is consolidation from Year 1. However, in Year 2 the children handle multiplication with numbers up to 10 and also use a more array style model.

In Year 3 a large block of multiplication learning is about learning counting patterns of 2s 3s 4s and 8s. They use these patterns to multiply, divide and solve problems.

In Year 4 a large block of multiplication learning is about learning counting patterns of 6s 9s 7s and 12s. They use these patterns to multiply, divide and solve problems. They must be fluent in all times tables by the end of year 4.

By this point children should be fluent in their times tables knowledge. They also multiply by 10 100 1000 using a place value grid.

Division	Year 1	Year 2	Year 3	Year 4	Year 5 & 6																
Concrete	I have 10 cubes I can share them equally into two groups  I have 10 cubes I can Group them into 5 groups of 2 	Take 15 counters.  Put them into groups of 3 Complete the sentences. There are 15 counters. The counters are in groups of ____ There are ____ groups. Grouping Kay has 12 cherries.  She shares them equally between 3 plates. Show how Kay shares the cherries. How many cherries are on each plate? Sharing Children will use hoops and cubes to be able to physically share and group items such as  multilink. This shows how the children would do $6 \div 2 = 3$	Children begin to flexible partition. 42 divide 3. Represent 4 tens and divide them into three rows. <table><tr><th>Tens</th><th>Ones</th></tr><tr><td>10</td><td></td></tr><tr><td>10</td><td></td></tr><tr><td>10</td><td></td></tr></table>  <table><tr><th>Tens</th><th>Ones</th></tr><tr><td>10</td><td>1 1 1 1</td></tr><tr><td>10</td><td>1 1 1 1</td></tr><tr><td>10</td><td>1 1 1 1</td></tr></table> Then exchange for 12 ones. Divide them into three rows. How many are in one row?	Tens	Ones	10		10		10		Tens	Ones	10	1 1 1 1	10	1 1 1 1	10	1 1 1 1	 $435 \div 3 = 145$ Children represent 435 with place value counters. With the remaining that is left to be shared are exchanged for 10 10s and 10 ones which can then be divided by 3. The answer is how many are in one row.	 Manipulatives may still be used with the corresponding long division modelled alongside.
Tens	Ones																				
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Tens	Ones																				
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Pictorial	 There are 10 triangles in 2 equal groups of 5. Share the muffins equally between the 2 plates. 	 ____ $\times 2 = 16$ $16 \div 2 = \underline{\quad}$ Children begin to use their knowledge of arrays from multiplication to divide  $14 \div 2$	$96 \div 4 = \underline{\quad}$  They then begin to flexibly partition from a part whole modal.  $435 \div 3 = 145$	 The same process is carried out pictorially.	 Pictorial may still be used with the corresponding long division modelled alongside.																

Abstract	There are 12 biscuits to be shared by 4 people. How many would they get each? <i>The division symbol is used but it is not an expectation for children to be using the division symbol</i>	Children use their counting with support of numberlines to calculate these mentally. 60 ÷ 10 = ____ 20 ÷ 5 45 ÷ 5 = ____	48 ÷ 3 52 ÷ 4 65 ÷ 5 72 ÷ 6 Using flexible partitioning in an abstract way. I know using my times table that 30 divide 3 = 10 18 divide 3 = 6 so 48 divide 3 = 16	 The bus stop method is introduced as grouping. Easily divisible numbers with NO exchange into another column. This is so the children are exposed to this method before year 5.	Short Division Children continue using the bus stop method but carry <table><tr><td></td><td>2</td><td>1</td><td>3</td><td>1</td></tr><tr><td>4</td><td>8</td><td>5</td><td>12</td><td>4</td></tr></table> Children use grouping to group 8000 divided by 4. How many 4's go into 8000 (2000) How many 4s go into 500 (100 with 1 left over/remainder) How many 4's go into 120 (30) How many 4's go into 4 (1)		2	1	3	1	4	8	5	12	4																																
	2	1	3	1																																											
4	8	5	12	4																																											
Key Infor	Children begin to learn the difference between grouping and sharing.	Children continue to group and share physically using objects. However, they also begin to discover that they can use their counting patterns and times tables to divide by counting on. "If I am solving 8 divide 2, I can see how many times I count in twos to get the 8, ... 2 4 6 8 that was 4 times."	Flexible partitioning is a difficult step and relies on a strong place value knowledge and good knowledge of their times tables. In year three children also begin to talk about remainders and what happens if there isn't an equal group.	Division in year four gets trickier! YouTube videos are available to show the process of exchange.	It is important that when using short division children still understand the value of each of the groups being made. Long Division This is introduced in year 6. 432 divide 12 Children create a FACT BOX first of the 12 times table. They can then use <table><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td>0</td><td>3</td><td>6</td><td></td></tr><tr><td></td><td>12</td><td>4</td><td>3</td><td>2</td><td></td></tr><tr><td></td><td></td><td>3</td><td>6</td><td>0</td><td></td></tr><tr><td></td><td></td><td></td><td>7</td><td>2</td><td></td></tr><tr><td></td><td></td><td></td><td>7</td><td>2</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td>0</td><td></td></tr></table> (12 × 30) (12 × 6) this when calculating.									0	3	6			12	4	3	2				3	6	0					7	2					7	2						0	
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