St. Mark's Catholic Primary School

Calculations Policy

St. Mark's Calculation Policy

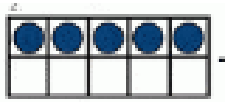
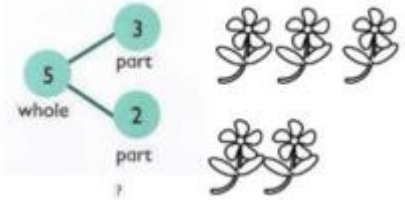
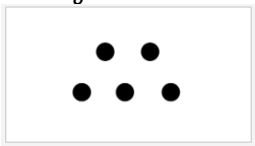
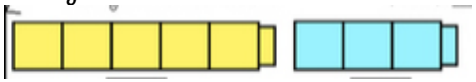
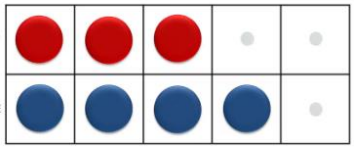
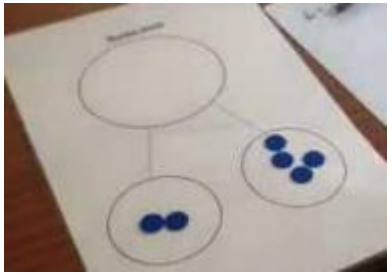
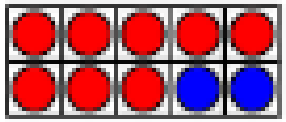
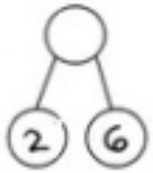
The following Calculation Policy has been largely adapted from the Master the Curriculum Resources which works in line with White Rose Maths. Additional material has been taken from the Number Sense Fluency programme and Times Tables programme as well as the use of Fluent in Five Arithmetic from Third Space Learning. The policy aims to meet the requirements of the National Curriculum 2014 for the teaching and learning of mathematics, in accordance with an increased emphasis on fluency and mastery of concepts. It is designed to provide pupils with a clear and smooth progression of learning through KS1 and KS2 and ensure that the teaching of calculation methods remains consistent across the 4 operations of addition, subtraction, multiplication and division. The consistent use of the concrete, pictorial and abstract approach helps children develop mastery across all the operations in an efficient and reliable way. This policy shows how these methods develop children's confidence in their understanding of both written and mental methods. The school calculation policy builds progressively from the content and methods established in EYFS, with a recognition that concrete and pictorial representations of problems continue to play a valuable role throughout all key stages.

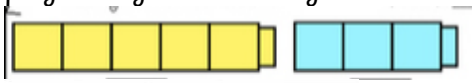
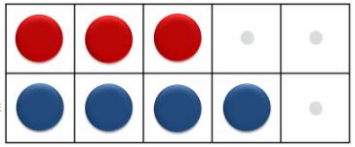
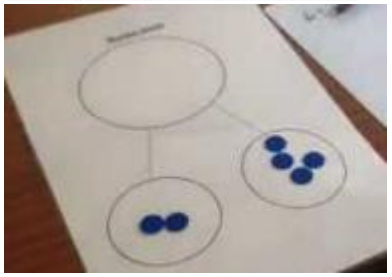
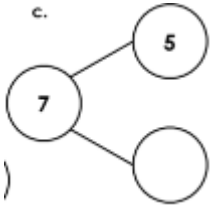
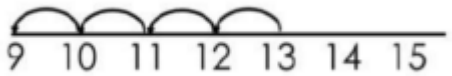
Context for calculation:

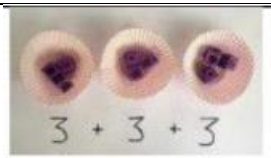
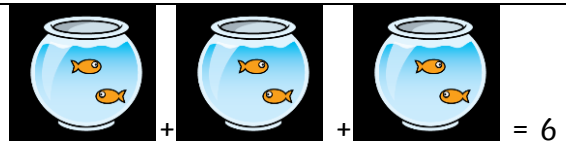
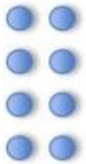
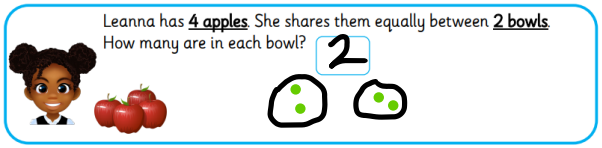
It is important that children are given real-life contexts and problems to use and apply their calculation methods. As a result, children will develop a more secure understanding of the purpose of calculations and learn to choose their operations with accuracy. This is a priority in an increasingly-challenging curriculum, with its focus on mastery.

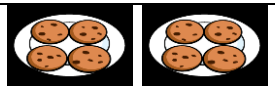
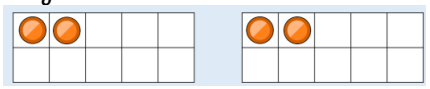
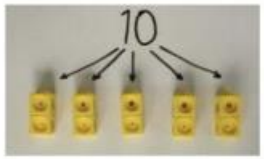
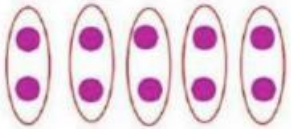
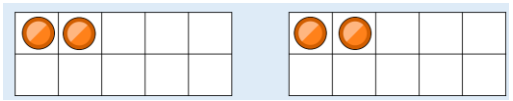
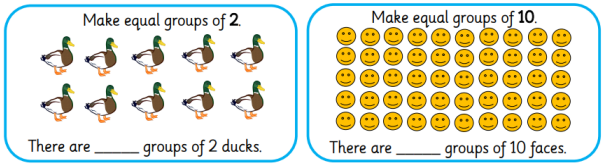
Choosing a calculation method:

Children must be taught and encouraged to use a simple process in deciding what approach to take to a calculation, ensuring that they select the most appropriate method for the problem, whether mental or written. Children need to be comfortable with a wide variety of strategies and representations in order to demonstrate this. The aim is that the children will have efficient methods that they are comfortable with and will apply with independence and accuracy.

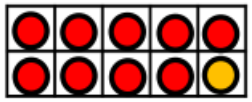
	Year 1		
	Concrete	Pictorial	Abstract
Number bonds:	Children will learn number bonds to numbers within 10 by using egg boxes and tens frames. 	Using images to show the number bonds.  **Number Sense:** Stage 2 – Make and break numbers to 10 looks at different arrangement of numbers to make numbers 2 – 10. This is taught through visual animations. 	Systematic teaching: 0+5 = 5 1+4 = 5 2+3 = 5 3+2 = 5 4+1 = 5 5+0= 5
Addition	Children will learn to add by using cubes, tens frames and the Part- whole model.  5 + 3 = 8  4 + 3 = 7  4 + 2 = 6 Counting forward on a number line. 	Using images to represent the concrete objects.  8 + 2 = 10  2 + 6 = 8	3 + 4 = 7 6 + 2 = 8 5 + 1 = 6

		 Number Sense – Stage 3 animations uses pictorial representations to support the children's early addition within 10.	
Subtraction	Children will learn to subtract by using cubes, tens frames and the Part- whole model. Other physical objects can also be used to show how these objects can be physically taken away.    Counting back on a number line. 	Using images to represent the concrete objects and crossing off the objects being taken away. 4 – 2 = 2   Part- whole model 7 – 5 = 2 Counting backwards on a number line. 	9 – 1 = 8 8 – 3 = 5 3 – 2 = 1
Multiplication: Chn will learn to count in 2's 5's and 10's.	**Repeated addition:** Children will use different objects to add equal groups.	Children will see pictorial representation of repeated additions such 3 bowls with 2 fish in each.	Children will write repeated addition to describe pictures and objects.

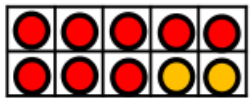
They will solve one step problems by calculating the answer using concrete objects, pictorial representations and arrays.	  **Arrays:** Chn will use cube and counters to create arrays. 	 = 6  = 12 Children will begin to draw simple arrays to answer calculations. They will begin to see the commutative law.  4 × 2 = 8 2 × 4 = 8  2 × 4 = 8 4 × 2 = 8	 2 + 2 + 2 = 6 Children will use arrays to write multiplication sentences and reinforce repeated addition.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15
Division	**Sharing:** Children will begin to divide by sharing objects between people. 9 objects shared between 3 people = 3  8 cookies shared between 2 plates = 4	Children will use pictorial representations to share quantities. They will begin to draw dots or shapes to represent the calculation.  8 ÷ 2 = 4 : : : :	4 ÷ 2 = 2 8 ÷ 2 = 4

	 Children will share into equal groups using tens frames.  4 ÷ 2 = 2 **Grouping:** Children will divide quantities into equal groups. They will use cubes, counters and objects to support their understanding.   	They will use tens frames templates to draw the calculations onto.  4 ÷ 2 = 2 Children will use pictures to make equal groups. 	4 ÷ 2 = 2 8 ÷ 2 = 4

	Year 2		
	Concrete	Pictorial	Abstract
Number bonds:	Children will consolidate their knowledge of number bonds to numbers within 10 by using cubes, tens frames and the part-whole model.	Using images to show the number bonds as well as drawing images to show the number bonds.	Answer questions related to number bonds



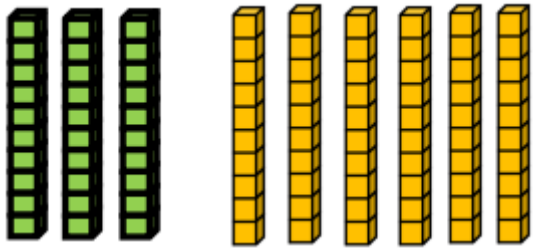
9 + 1 = 10

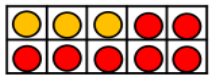


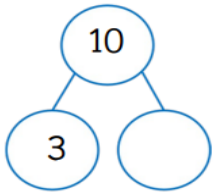
8 + 2 = 10

Number bonds to 100

Children will use base 10 equipment and other objects to support their finding of number bonds to 100.

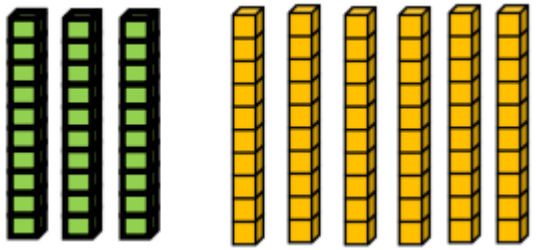






Number bonds to 100

Children will use pictorial representations of base 10 equipment to support them finding number bonds to 100.

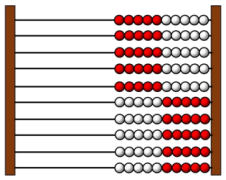


Children will use pictorial representations to find number bonds to 100.

100 = 100 – 0 ___ = 100 – ___

90 = 100 – 10 ___ = ___ – ___

80 = 100 – ___ ___ = ___ – ___



10 = ___ + 2

___ + 4 = 10

1 + ___ = 10

10 = ___ + 0

10 = 5 + ___

___ + 10 = 10

10 = ___ + 2

___ + 8 = 10

Number bonds to 100

Children will use their knowledge of the number bond to 10 to support their understanding of number bonds to 100.

7 + 3 = 10

70 + 30 = 100

0 + 100 = 100

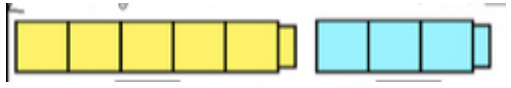
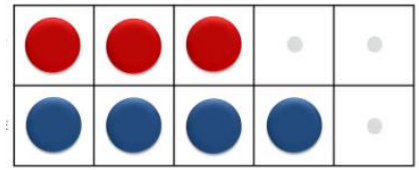
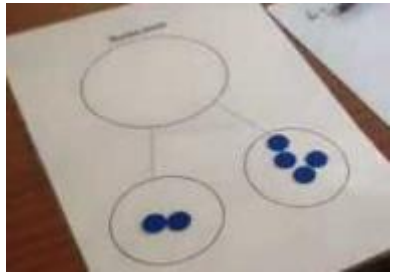
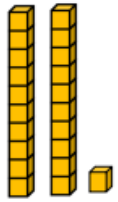
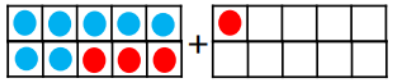
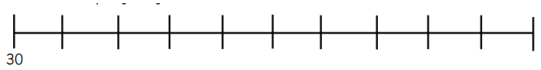
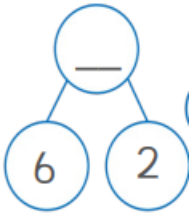
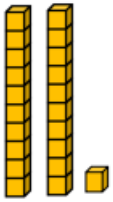
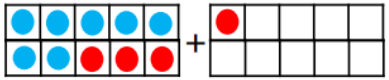
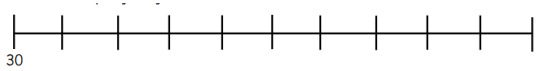
___ + ___ = 100

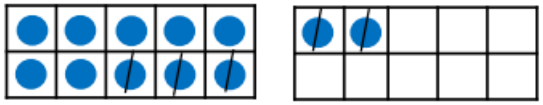
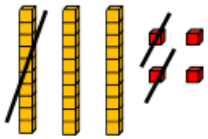
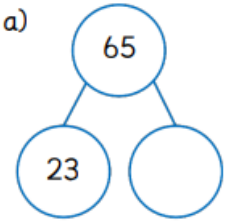
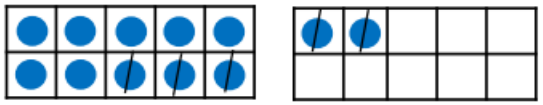
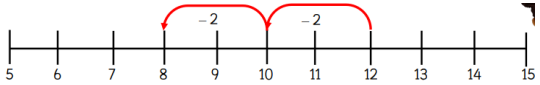
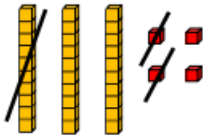
___ + ___ = 100

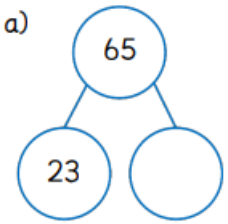
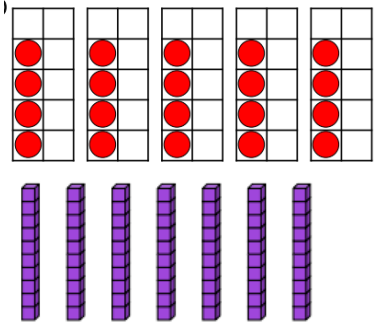
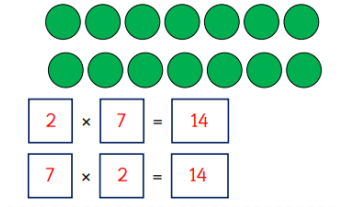
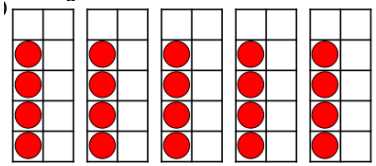
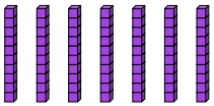
___ + ___ = 100

___ + ___ = 100

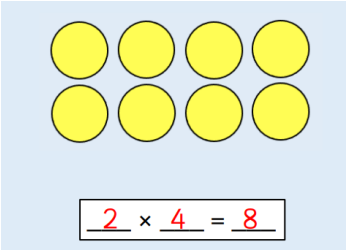
___ + ___ = 100

Addition	Children will learn to add by using cubes, tens frames and the Part- whole model, consolidating the skills that they have learnt in Year 1.    Children will begin to use base 10 equipment when adding tens and ones.  20 + 1 = 21 Adding by making 10: Children will use 10s frames.  7 + 4 = 11  30 Using a number line to count on	Using images to represent the concrete objects.  6 + 2 = 8  2 + 3 = 5 Children will use base images of tens and ones to add.  20 + 1 = 21 Adding by making 10: Children will use pictorial representations of tens frames to draw the counters onto.  7 + 4 = 11  30	Children will begin to add mentally by counting on. 13 + 1 = ___ 21 + 1 = ___

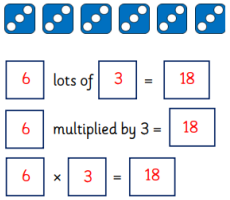
		Number sense Stages 5 and 6 – Uses pictorial animations to support this.	
Subtraction	Children will learn to subtract by using tens frames and the Part- whole model.  12 – 5 = 7 Children will place the counters onto the tens frames and then remove the amount required. 34 – 12 = 22  a)  65 – 23 = _____ Children will place objects into the part whole model and will practically subtract some to find the answer.	Children to use or draw pictorial representation and number lines to work out subtraction calculations. Number sense Stages 5 and 6 – Uses pictorial animations to support the skills in subtraction.  12- 5 = 7 Crossing ten.  12 – 4 = 8 Subtracting 2-digit numbers. 34 – 12 = 22 	Children will begin to subtract mentally by count back. a) 16 – 6 = ___ b) 11 – 1 = ___ c) 14 – ___ = 10 d) 17 – ___ = 10 19 – __ = 18 89 – 1 = __

		a)  65 – 23 = _____	
Multiplication	**Making Equal groups:** Children will use objects to make equal groups. They will use equipment such as tens frames and base ten.  Making arrays: Children will us counters to make arrays.  2 × 7 = 14 7 × 2 = 14 **Two times tables:**	**Making Equal groups:** Children will draw or use images such as tens frames and base ten.  There are 5 equal groups with 4 in each group.  **Add equal groups:**  5 + 5 + 5 + 5 + 5 = 25	Children will write and answer number sentences such as: a) 5 × 2 = 10 b) 16 = 8 × 2 c) 2 × 3 = 6 d) 2 × 4 = 8 e) 14 = 7 × 2 f) 22 = 11 × 2 g) 2 × 0 = 0 h) 2 × 1 = 2 i) 18 = 2 × 9 j) 12 × 2 = 24

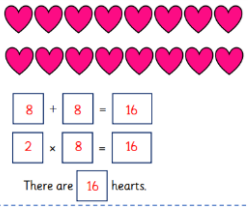
Children will use cube/ counters to add two more practically and then write the sum.



Count on practically using a number line.

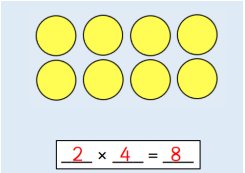


Making arrays:



Two times tables:

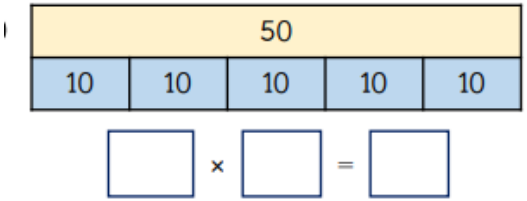
Children will draw cubes/ counters to draw it the calculations.

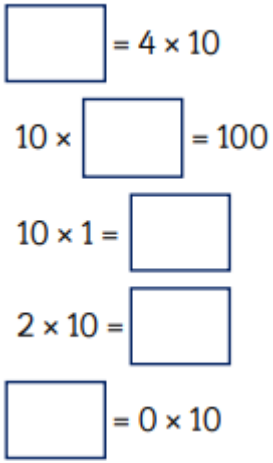


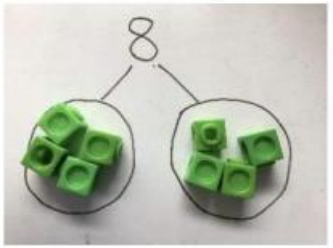
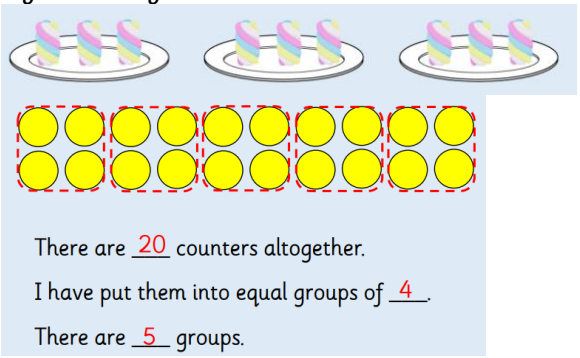
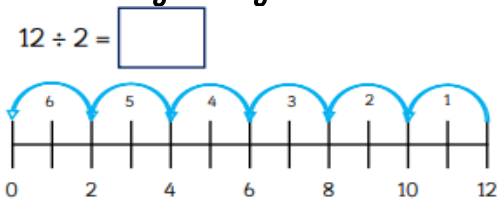
Drawing and counting on a number line.

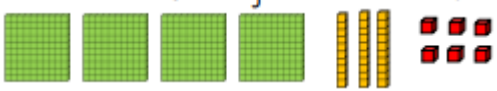
10 Times tables:

Children will begin to use the bar model to multiply by 10.

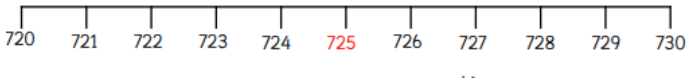




Division	**Making equal groups/ sharing:** Children will share objects practically between groups onto plates or using the part- whole model. 	**Making equal groups/ sharing** Children will use pictorial representations by drawing to divide.  There are 20 counters altogether. I have put them into equal groups of 4. There are 5 groups. **Divided by using a number line:** 12 ÷ 2 =  	

	Year 3		
	Concrete	Pictorial	Abstract
Addition	The children will develop an understanding of using a range of equipment to help them with their addition skills. Eventually, the children will become confident in choosing and using the resources independently. They will use: Base 10 equipment: 	The children will develop their addition skills by using pictorial representations to add quantities.  243 + 5 = 248	Children will learn efficient methods to add. Adding the 100s.

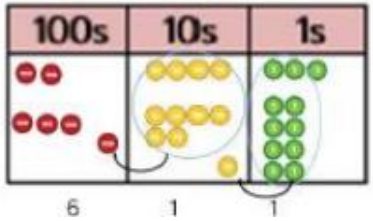
Number lines:

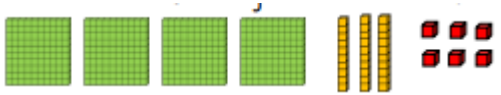


Place Value Charts and Counters:

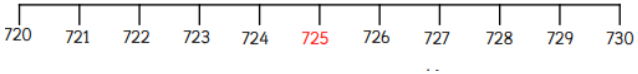
With exchanges:

Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred.





Base 10

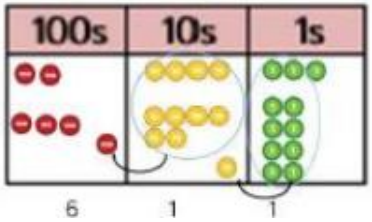


Number lines

Place value chart and counters.

With exchanges:

Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred.



221 + 500 = .

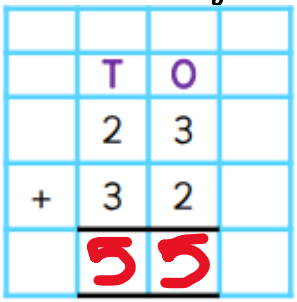
421 + 200 = .

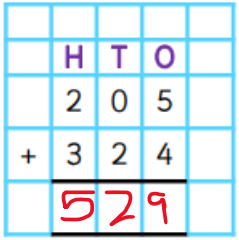
621 + 100 = .

Formal written methods:

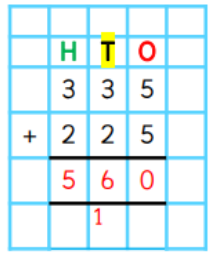
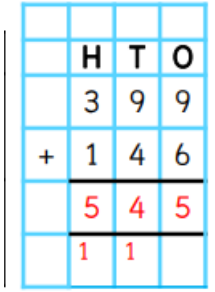
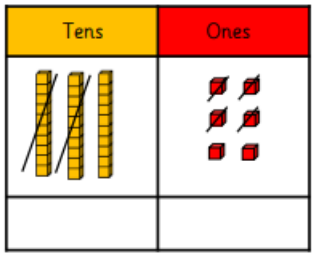
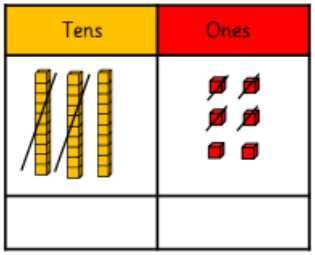
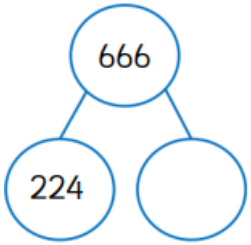
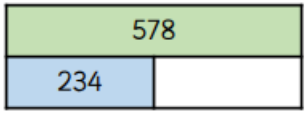
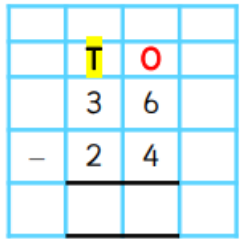
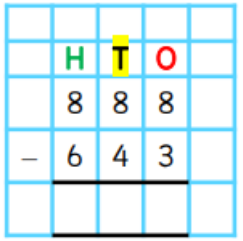
The children will begin to use the column method for addition. Children will be taught to start with the ones first, then the tens and then the hundreds.

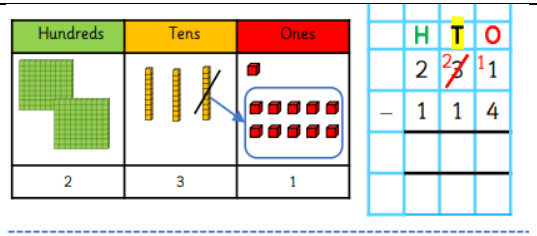
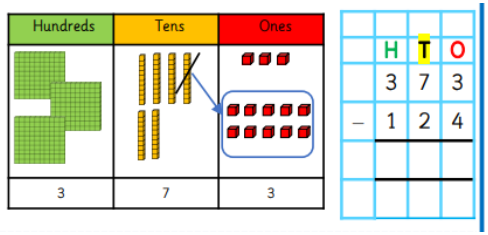
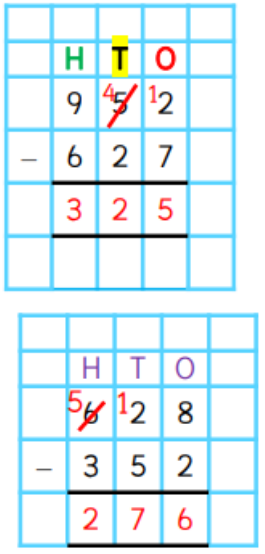
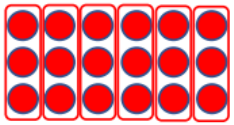
Without exchanges:

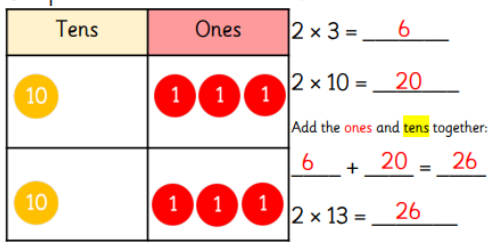


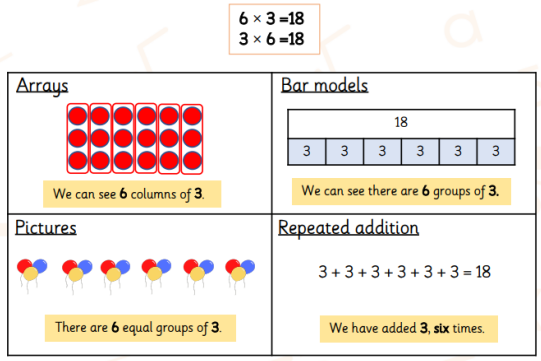


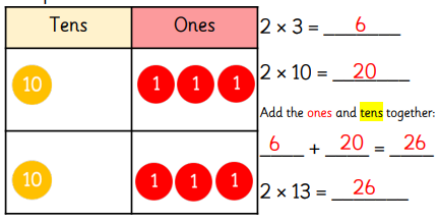
With exchanges:

			 
Subtraction	The children will use place value mats, base 10 and counters to subtract practically.   **With exchanges:** Children will use base 10 resources to physically exchange to solve subtractions.	The children will use images of or draw place value mats, base 10 and counters to subtract.     **With exchanges:**	**Formal written methods:** The children will begin to use column method for subtraction. **Without exchanging:**  

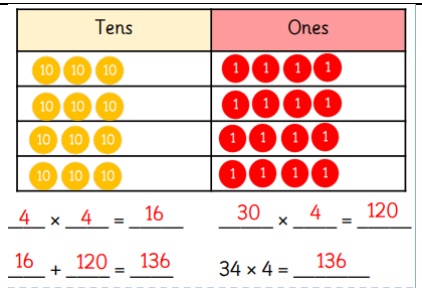
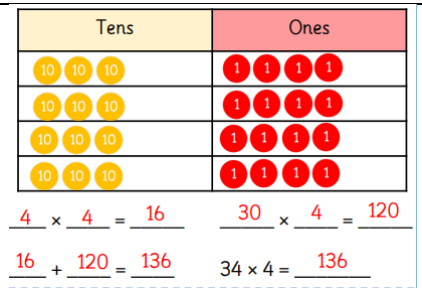
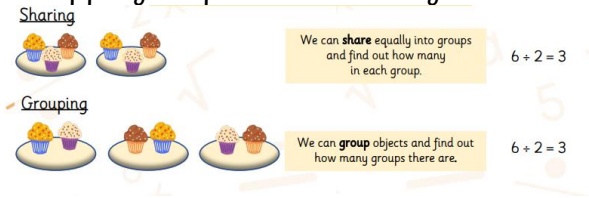
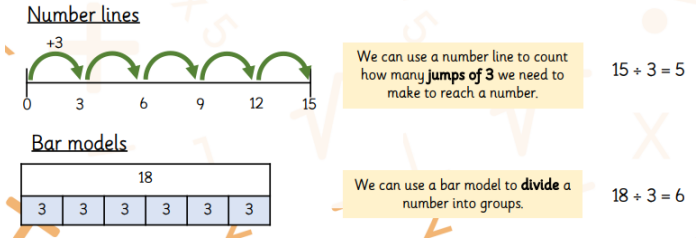
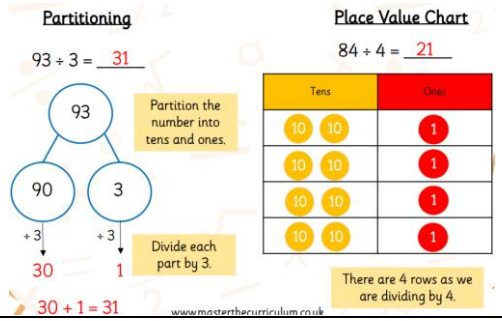
<table>
<tr>
<td></td>
<td> 
</td>
<td>Children will use pictorial representations of base 10 resources to exchange to solve subtractions.
 
</td>
<td>With exchanges
 
</td>
</tr>
<tr>
<td>Multiplication</td>
<td>The children will use previous method learnt.
Arrays
 
We can see 6 columns of 3.

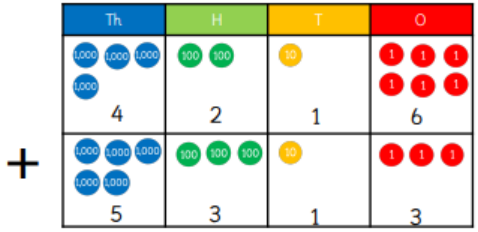
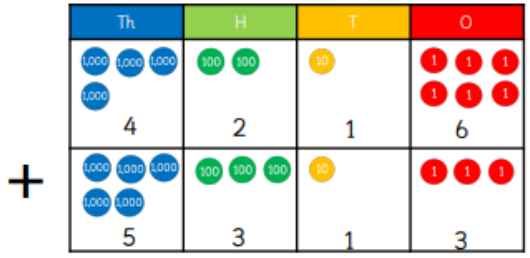
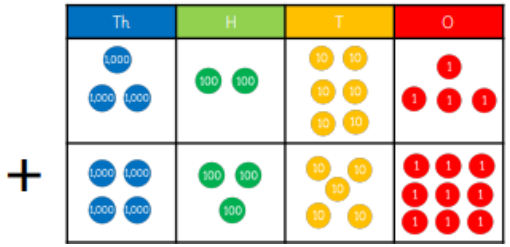
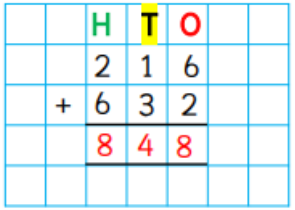
They will use place value charts.
 

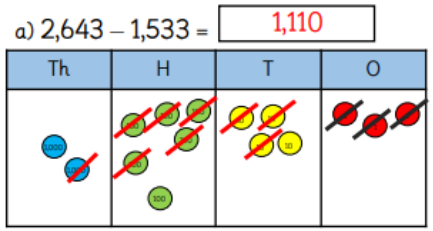
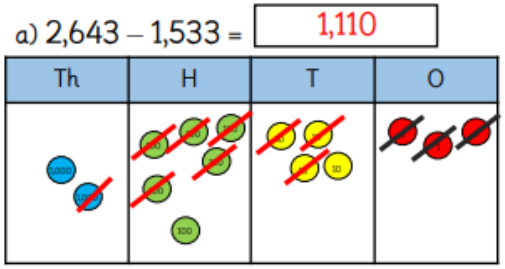
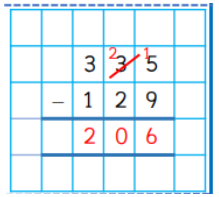
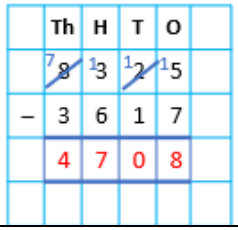
Without exchanges</td>
<td>The children will use previous methods learnt.
 

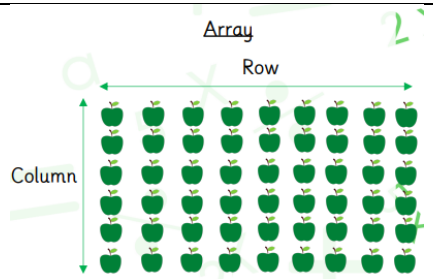
They will draw place value charts
 

Without exchanges</td>
<td>From Year 3, the children are given daily Times Tables Fluency lessons using the Number Sense Programme to develop their mental recall of multiplication facts. This will enable the children to recall multiplication facts with efficiency and accuracy.</td>
</tr>
</table>

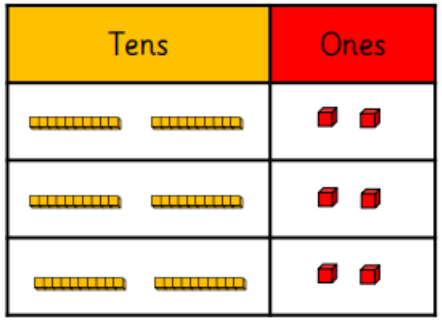
	 With exchanges.	 With exchanges.	a) 5 × 4 = 20 b) 2 × 8 = 16 c) 6 × 8 = 48 d) 11 × 2 = 22 e) 4 × 8 = 32 f) 2 × 9 = 18 g) 4 × 7 = 28 h) 8 × 10 = 80
Division	Children will share and group physical objects. Recapping on previous learning. 	Children will draw or use pictorial representations:  Dividing 2 digits by 1 digit. 	From Year 3, the children are given daily Times Tables Fluency lessons using the Number Sense Programme to develop their mental recall of division facts. 30 ÷ 3 = 21 ÷ 3 = 51 ÷ 3 =

	Year 4		
	Concrete	Pictorial	Abstract
Addition	The children will use place value charts and counters to solve addition sums. 	The children will use images or draw images to represent the concrete objects.  	The children have daily Fluent in Five lessons to embed and practise the mental and written methods that have been taught. The children will use the column method as a formal written methods to calculate addition sums. Starting with no exchanges.  Moving onto one exchange.  Then more than one exchange.

			
Subtraction	Children will use place value counters to subtract. The will remove the counters from the chart 	Children will use pictorial representations of place value counter and cross them out. 	The children have daily Fluent in Five lessons to embed and practise the skills/ methods that have been taught. The children will use the column method as a formal written methods to calculate addition sums. With one exchange.  With more than one exchange. 
Multiplication	Children will use arrays and base 10 or 10s and 1s counters and a place value grid to work practically to answer calculations.	Children will use pictorial representations of the base 10 or 10s and ones counters to find the answer to calculations.	The children have daily Fluent in Five lessons to embed and practise the skills/ methods that have been taught.



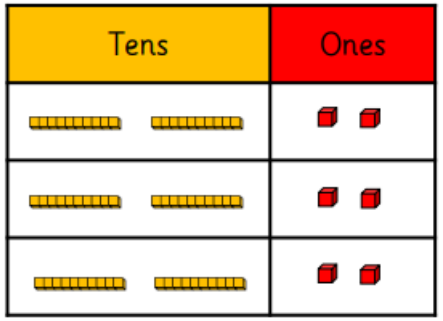
9 x 6 = 54



22 x 3 = 66

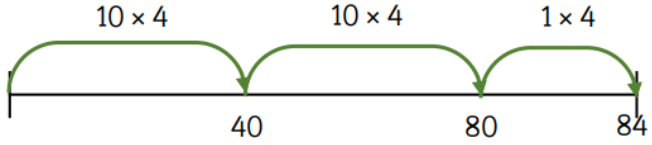
Exchanges

Children who are not yet secure with the above methods, may use some of the below method to support practically.



3 x 22 = 66

They will draw number lines to aid calculations.



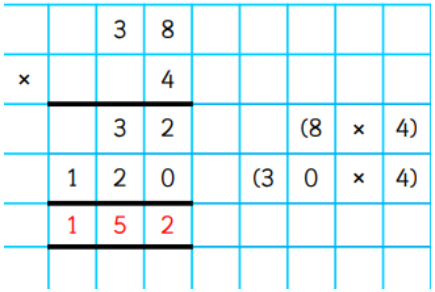
4 x 21 = 84

Pictorial representations.

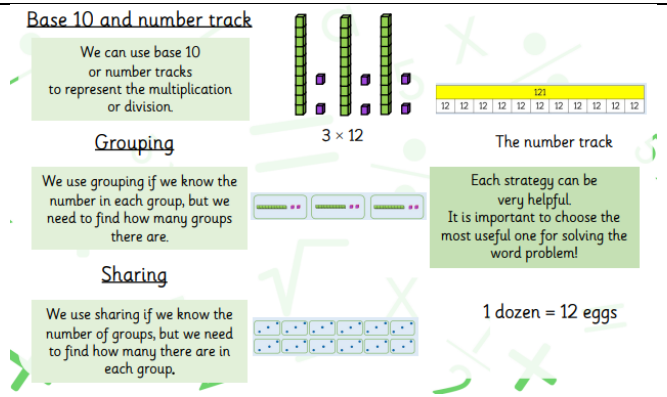
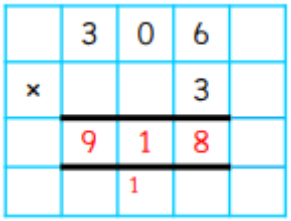
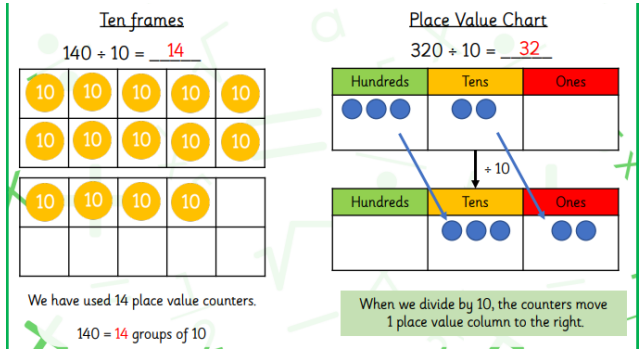
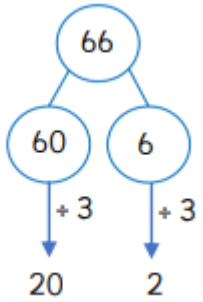
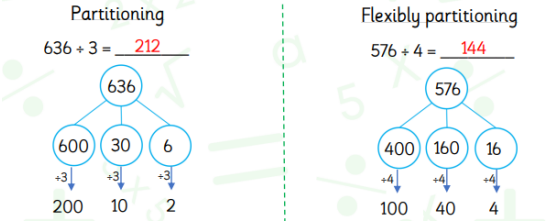
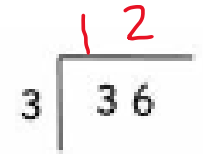
The children are given daily Times Tables Fluency using the Number Sense Programme to develop their mental recall of multiplication facts.
This will enable the children to recall multiplication facts to 12 x 12 with efficiency and accuracy:

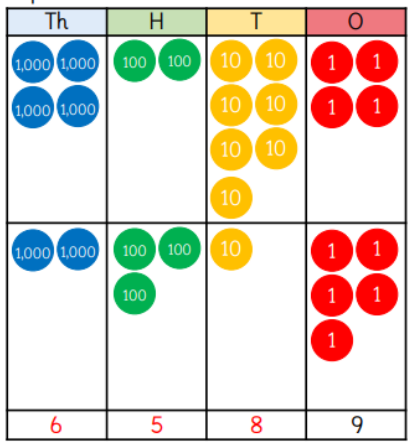
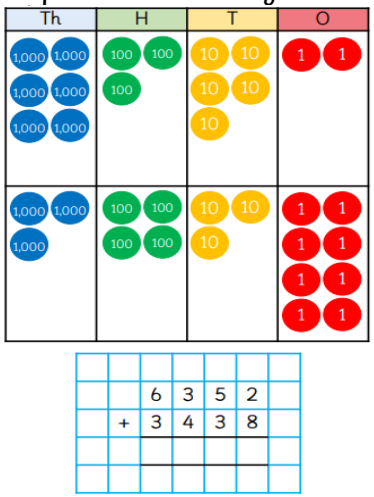
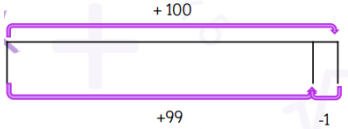
a) 5 × 4 = 20
b) 2 × 8 = 16
c) 6 × 8 = 48
d) 11 × 2 = 22
e) 4 × 8 = 32
f) 2 × 9 = 18
g) 4 × 7 = 28
h) 8 × 10 = 80

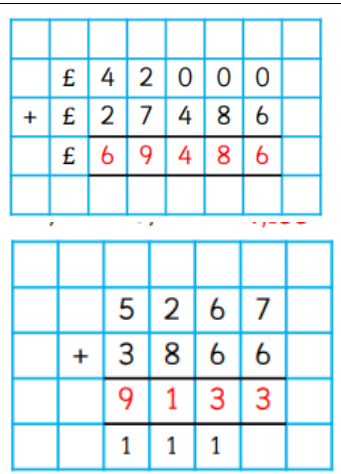
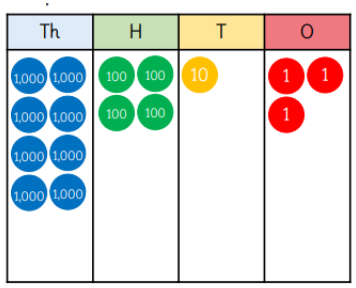
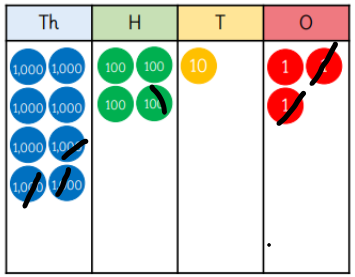
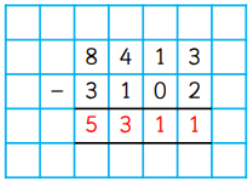
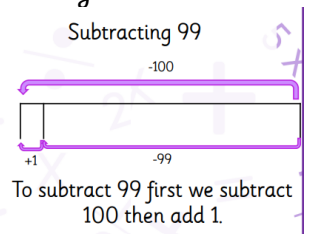
Year 4 – Children will use the expanded written method.

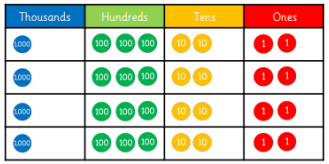
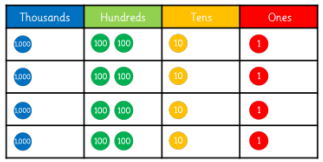


They will then move on to using the compact written method.

			
Division	Children will use place value counters where necessary to calculate division sums. 	Children will use pictorial representations or drawings to divide.   66 ÷ 3 = 22 	The children have daily Fluent in Five lessons to embed and practise the skills/ methods that have been taught. The children are given daily Times Tables Fluency using the Number Sense Programme to develop their mental recall of division facts. The children will begin to use formal written methods for division.  

	Year 5		
	Concrete	Pictorial	Abstract
Addition	Children will begin to move away from using concrete objects and will develop their abstract skills – written and mental methods. Children who still require concrete objects, will use place value counters to support them practically.  	Children will begin to move away from using pictorial representations and will develop their abstract skills – written and mental methods Children who still require pictorial support will use place value images.  	The children have daily Fluent in Five lessons to embed and practise the skills/ methods that have been taught. Children will be taught mental strategies such as 4 + 6 = 10 40 + 60 = 100 4,000 + 6,000 = 10,000 40,000 + 60,000 = 100,000 Adding 99  To add 99 first we add 100 then subtract 1. Children will use formal written methods for addition

			
Subtraction	Children will begin to move away from using concrete objects and will develop their abstract skills – written and mental methods. For children who still require the use of concrete objects, the children will use place value counters and will physically remove the counters to answer the question. 	Children will begin to move away from using pictorial representations and will develop their abstract skills – written and mental methods For children who still require pictorial resources they will use images of place value counters.  	The children have daily Fluent in Five lessons to embed and practise the skills/ methods that have been taught. Children will be taught mental strategies such as  Children will use column subtraction as a formal written method for subtraction.

			a) 7 3 5 6 – 5 0 2 5 2 3 3 1 b) 2 1 7 3 5 6 – 3 2 8 0 4 0 7 6 c) 6 1 2 1 7 3 5 6 – 2 7 9 4 4 5 6 2 d) 6 1 2 1 7 3 5 6 – 8 7 3 6 4 8 3
Multiplication	Children will begin to move away from using concrete objects and will develop their abstract skills – written and mental methods. Children who require concrete support will use a place value chart for multiplication.  1322 x 4 = 5288	Children will begin to move away from using pictorial representations and will develop their abstract skills – written and mental methods. Children who require pictorial support will use a place value chart for multiplication. Complete the multiplication. Use the place value chart to help you. × 1 2 1 1 4 4 8 4 4  	The children have daily Fluent in Five lessons to embed and practise the skills/ methods that have been taught Children will use informal written methods (grid method) for calculations when beginning to multiply a 2 digit number by a 2 digit number. × 20 4 30 600 120 1 20 4 × 20 6 10 200 60 5 100 30 Children will use written methods (Column method) for calculations. 4-digit number multiplied by a 1 digit number.

a)

		2	1	2	6
×					3
		6	3	7	8
				1	

b)

			5	1	3	2
×						6
		3	0	7	9	2
		3		1	1	

2-digit number multiplied by a 2-digit number.

a)

		2	4	
×		1	1	
		2	4	(24 × 1)
	2	4	0	(24 × 10)
	2	6	4	

b)

		3	4	
×		1	2	
		6	8	(34 × 2)
	3	4	0	(34 × 10)
	4_1	0	8	

You will need to exchange here.

3-digit number multiplied by a 2-digit number.

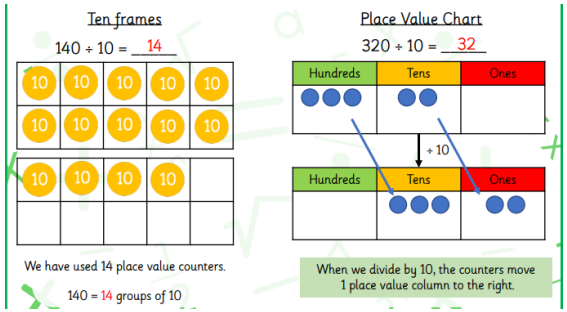
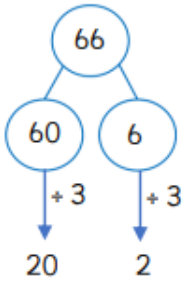
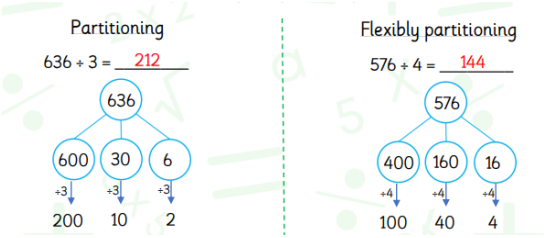
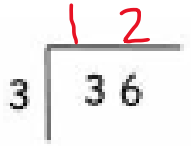
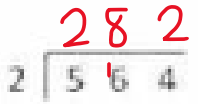
			5	2	
×			1	3	
		1	5	6	(52 × 3)
		5	2	0	(52 × 10)
		6	7	6	

4-digit number multiplied by a 2-digit number.

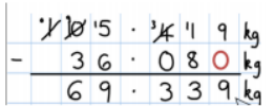
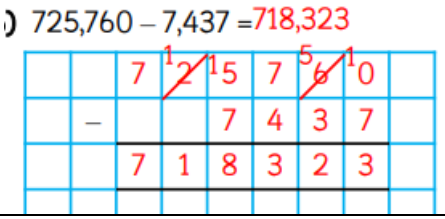
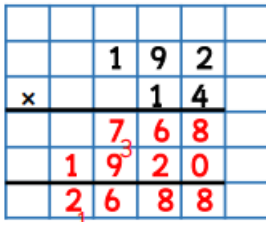
		Th	H	T	O	
		4	1	2	3	
×				2	6	
	2	4	7	3	8	(4,123 × 6)
	8	2	4^1	6^1	0	(4,123 × 20)
1	0	7_1	1	9	8	

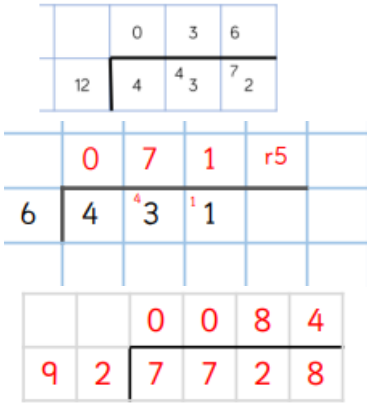
Column method:

	H	T	O
		2	2
×		3	1
		2	2
	6	6	0
	6	8	2

Division	Children will begin to move away from using concrete objects and will develop their abstract skills – written and mental methods Children will use place value counters where necessary to calculate division sums. 	Children will begin to move away from using pictorial representations and will develop their abstract skills – written and mental methods. For children who need to use pictorial representations or drawings to divide.   66 ÷ 3 = 22 	The children have daily Fluent in Five lessons to embed and practise the skills/ methods that have been taught. The children will use formal written methods for division with increasing confidence.   

	Year 6		
	<u>Concrete</u>	<u>Pictorial</u>	<u>Abstract</u>
Addition	Children will move away from using concrete objects and will develop their abstract skills – written and mental methods. Where necessary to clarify, children will use place value counters.	Children move away from using pictorial representations and will develop their abstract skills – written and mental methods. Where necessary, children will represent place value counters pictorially.	The children have daily Fluent in Five lessons to embed and practise the skills/ methods that have been taught. 54,183 + 17,614 = 71,797 

Subtraction	Children will move away from using concrete objects and will develop their abstract skills – written and mental methods. Where necessary to clarify, children will use place value counters.	Children move away from using pictorial representations and will develop their abstract skills – written and mental methods. Where necessary, children will represent place value counters pictorially.	The children have daily Fluent in Five lessons to embed and practise the skills/ methods that have been taught. Children will use formal written methods for efficiency.  
Multiplication	Children will move away from using concrete objects and will develop their abstract skills. They will use written and mental methods, so that they are using efficient methods for calculations.	Children will move away from using pictorial representations and will develop their abstract skills. They will use written and mental methods, so that they are using efficient methods for calculations.	The children have daily Fluent in Five lessons to embed and practise the skills/ methods that have been taught. Children will use formal written methods for efficiency.  

Division	Children will move away from using concrete objects and will develop their abstract skills. They will use written and mental methods, so that they are using efficient methods for calculations.	Children will move away from using pictorial representations and will develop their abstract skills. They will use written and mental methods, so that they are using efficient methods for calculations.	The children have daily Fluent in Five lessons to embed and practise the skills/ methods that have been taught. Children will record multiplication factors to support. Short division:  Long division: