Routes through Calculations

May 2021

Children's chances of maths success are maximised if they develop a deep and lasting understanding of mathematical procedures and concepts. Through Teaching for Mastery, learning is structured with great care to build deep conceptual knowledge alongside developing procedural fluency. The focus is on the development of deep structural knowledge and the ability to make connections.

This Routes through Calculations document provides information on the number facts to be learnt in KS1, the multiplication facts to be learnt in Y2, Y3 and Y4, examples of concrete materials used to represent numbers, core representations and the year groups they are used in and how each calculation looks in each year group.

This policy is based on the following ideas:

- Children should develop a clear conceptual understanding of arithmetic processes.
- Children should have fluent recall of number facts, including addition facts within 10, single digit sums and times table facts.
- Children should develop a secure understanding of efficient written algorithms for arithmetic by Year 4.
- Related operations (e.g. addition and subtraction) should be introduced together, with explicit links between them.
- The role of place value in arithmetic processes should be modelled and made clear from the start of Y2.

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Routes through calculations

Fluency in number facts

+	0	1	2	3	4	5	6	7	8	9	10
0	0 + 0	0 + 1	0 + 2	0 + 3	0 + 4	0 + 5	0 + 6	0 + 7	0 + 8	0 + 9	0 + 10
1	1 + 0	1 + 1	1 + 2	1 + 3	1 + 4	1 + 5	1 + 6	1 + 7	1 + 8	1 + 9	1 + 10
2	2 + 0	2 + 1	2 + 2	2 + 3	2 + 4	2 + 5	2 + 6	2 + 7	2 + 8	2 + 9	2 + 10
3	3 + 0	3 + 1	3 + 2	3 + 3	3 + 4	3 + 5	3 + 6	3 + 7	3 + 8	3 + 9	3 + 10
4	4 + 0	4 + 1	4 + 2	4 + 3	4 + 4	4 + 5	4 + 6	4 + 7	4 + 8	4 + 9	4 + 10
5	5 + 0	5 + 1	5 + 2	5 + 3	5 + 4	5 + 5	5 + 6	5 + 7	5 + 8	5 + 9	5 + 10
6	6 + 0	6 + 1	6 + 2	6 + 3	6 + 4	6 + 5	6 + 6	6 + 7	6 + 8	6 + 9	6 + 10
7	7 + 0	7 + 1	7 + 2	7 + 3	7 + 4	7 + 5	7 + 6	7 + 7	7 + 8	7 + 9	7 + 10
8	8 + 0	8 + 1	8 + 2	8 + 3	8 + 4	8 + 5	8 + 6	8 + 7	8 + 8	8 + 9	8 + 10
9	9 + 0	9 + 1	9 + 2	9 + 3	9 + 4	9 + 5	9 + 6	9 + 7	9 + 8	9 + 9	9 + 10
10	10 + 0	10 + 1	10 + 2	10 + 3	10 + 4	10 + 5	10 + 6	10 + 7	10 + 8	10 + 9	10 + 10

Adding 1

Adding 2

Bonds to 10

Adding 0

Adding 10

Doubles

Bridging/ compensating

Near doubles

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Year 1 (Within 10)	Alongside
Adding 1 (e.g. 7 + 1 and 1 + 7)	
Doubles of numbers to 5 (e.g. 4 + 4)	
Adding 2 (e.g. 4 + 2 and 2 + 4)	Partitioning 2, 3, 4, 5, 6 and 10
Number bonds to 10 (e.g. 8 + 2 and 2 + 8)	
Adding 10 to a number (e.g. 5 + 10 and 10 + 5)	
Adding 0 to a number (e.g. 3 + 0 and 0 + 3)	
Near doubles (e.g. 3 + 4 and 4 + 3)	Partitioning 7, 8 and 9
The ones without a family! 5 + 3, 3 + 5, 6 + 3, 3 + 6	
Year 2 (Bridging 10)	
Doubles of numbers to 10 (e.g. 7 + 7)	
Near doubles (e.g. 5 + 6 and 6 +5)	Partitioning 11 – 20 into single digit addends
Bridging (e.g. 8 + 4 and 4 + 8)	
Compensating	

Multiplication and Division Facts

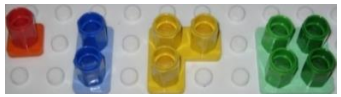
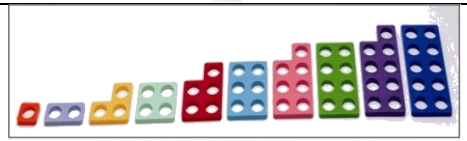
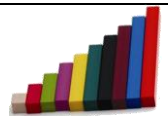
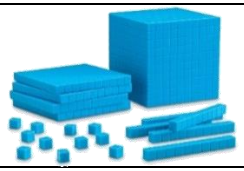
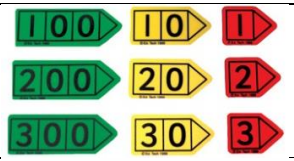
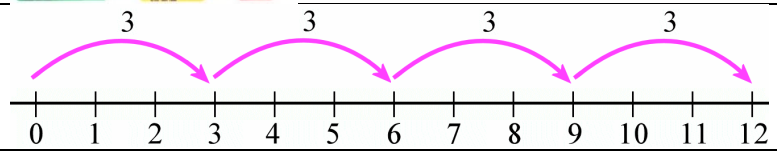
Year 2	recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables
Year 3	recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
Year 4	recall multiplication and division facts for multiplication tables up to 12 × 12

We learn the tables in this order:

x10	x5	x2	x4	x8	x3	x6	x9	x7	x11	x12
Year 2			Year 3			Year 4				

Representing Numbers with concrete materials

The following concrete materials are used to support the children's understanding of number.

Objects		Counters	
Pegs		Numicon Shapes	
Number Rods (Cuisenaire)		Straws	
Place Value Equipment		Place Value Counters	
Number Tracks		Place Value Cards	
Bead Strings		Number Lines	

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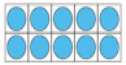
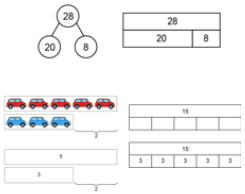
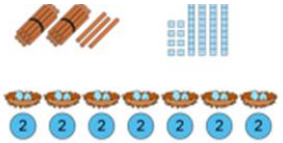
Core Representations are used to support children's understand (pictorial)							
Representation		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	Tens Frame	Number and place value, addition and subtraction and number fluency	Addition and subtraction	Number and place value and number fluency		Number and place value, number fluency and multiplication and division	Number and place value
	Number Line	Number and place value and number fluency	Number and place value and addition and subtraction	Number and place value and fractions			
	Gettegno Chart	Number and place value and number fluency			Multiplication and division	Number and place value and multiplication and division	Number and place value
	Partitioning diagrams including bar models	Addition and subtraction and number fluency	Number and place value and addition and subtraction	Number and place value, addition and subtraction and fractions	Number and place value, multiplication and division and fractions	Number and place value and fractions	Number and place value, addition and subtraction, multiplication and division and fractions
	Groups of units in addition to ones such as Diennes, PV counters		Number and place value, addition and subtraction and multiplication and division	Addition and subtraction and multiplication and division	Multiplication and division and fractions	Number and place value and multiplication and division	Number and place value

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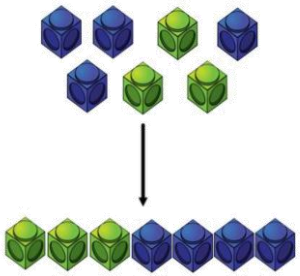
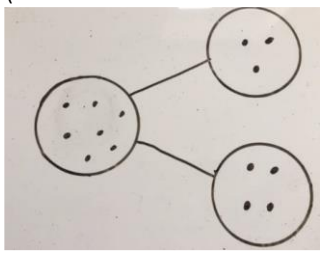
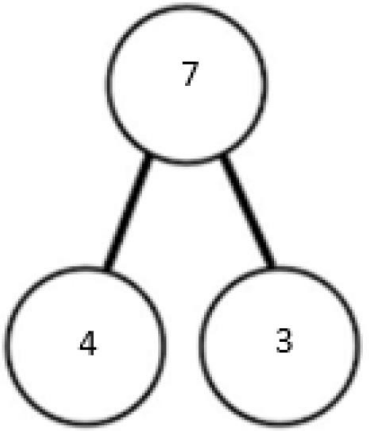
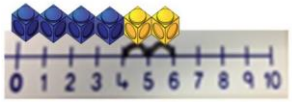
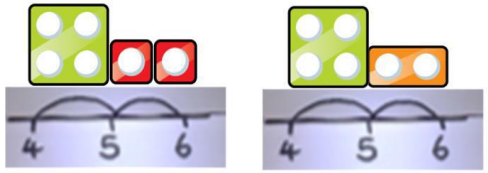
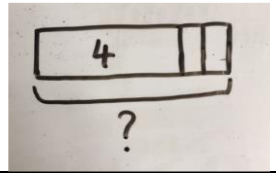
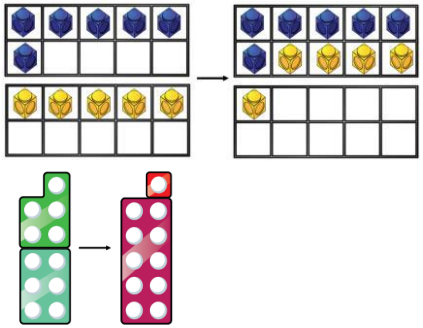
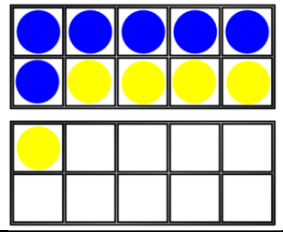
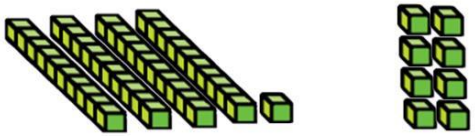
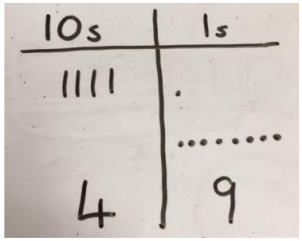
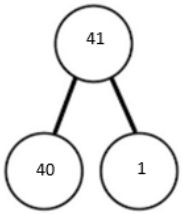
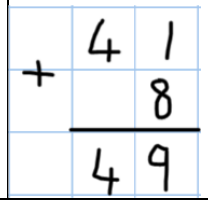
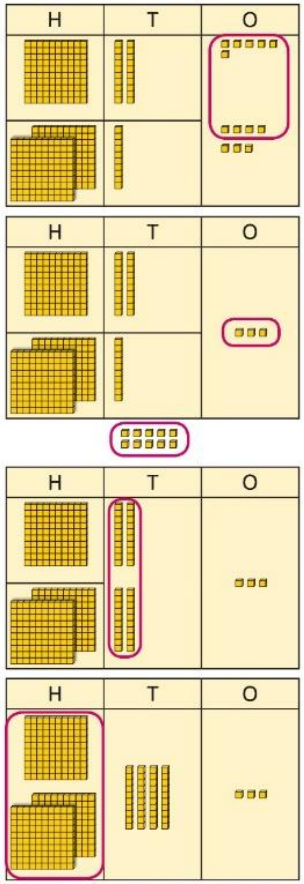
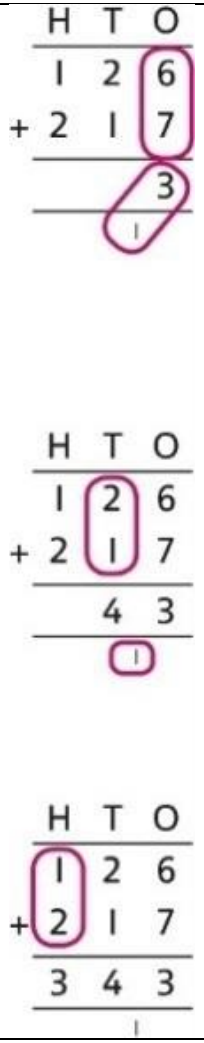
Overview

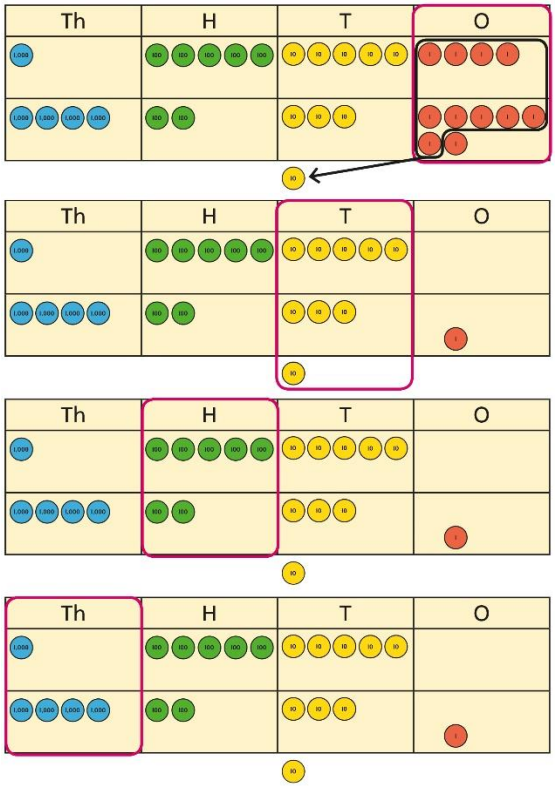
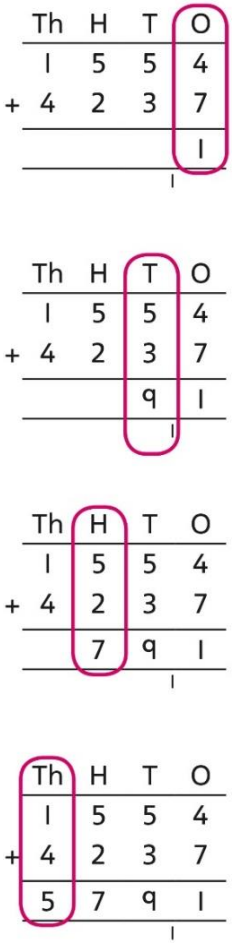
	Reception / Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Addition	Combining two parts to make a whole: part whole model. Starting at the bigger number and counting on- using cubes. Exchanging to make 10 using ten frame.	Adding three single digits. Column layout – no exchanging.	Column layout- exchanging. Using place value counters (up to 3 digits).	Column layout with exchanging. (up to 4 digits)	Column layout with exchanging. Add decimals with up to two decimal places	Column layout- exchanging. Abstract methods.
Subtraction	Taking away ones Counting back Find the difference Part whole model Make 10 using the ten frame	Counting back Find the difference Part whole model Make 10 Column layout - no exchanging	Column layout with exchanging (up to 3 digits using place value counters)	Column layout with exchanging. (up to 4 digits)	Column layout with exchanging. Subtract decimals with up to two decimal places	Column layout with exchanging. Abstract methods.
Multiplication	Recognising and making equal groups. Doubling Counting in multiples Use cubes, Numicon and other objects in the classroom	Arrays- showing commutative multiplication	Column Short multiplication (2 digit number multiplied by 1 digit)	Column short multiplication (2 and 3 digit multiplied by 1 digit)	Column long multiplication (up to 4 digit numbers multiplied by 1 or 2 digits)	Column Long multiplication (multi digit up to 4 digits by a 2-digit number)
Division	Sharing objects into groups Division as grouping e.g. I have 12 sweets and put them in groups of 3, how many groups? Use cubes and draw round 3 cubes at a time.	Division as grouping Division within arrays- linking to multiplication Repeated subtraction	Division with a remainder-using lollipop sticks, times tables facts and repeated subtraction. 2d divided by 1d using base 10 or place value counters	Short division (up to 3 digits by 1 digit- concrete and pictorial)	Short division (up to 4 digits by a 1 digit number including remainders)	Long division with place value counters (up to 4 digits by a 2 digit number) Children should exchange into the tenths and hundredths column too

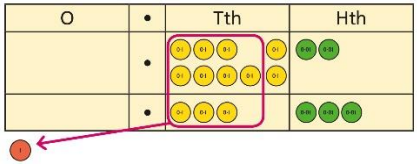
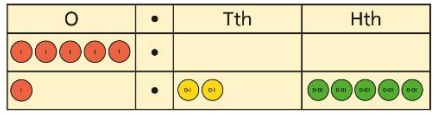
Addition	Concrete & Pictorial Representations	Written Recording
Reception Combining two parts to make a whole	 (use other resources too e.g. eggs, shells, teddy bears, cars).  Children to represent the cubes using dots or crosses. They could put each part on a part whole model too.	4 + 3 = 7 7 = 4 + 3 Four is a part, three is a part and the whole is seven. 

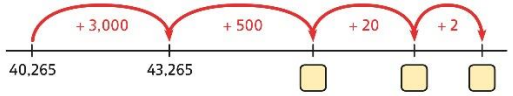
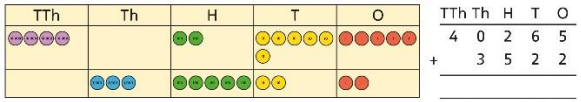
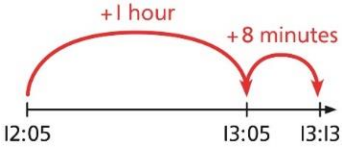
Addition	Concrete & Pictorial Representations	Written Recording
Year 1 Starting at the bigger number and counting on	Count on using cubes or Numicon.   A bar model which encourages the children to count on, rather than count all.  	**The abstract number line:** What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? 4 + 2 
Year 1 Exchanging to make 10	Exchange using ten frames and counters/cubes or using Numicon. 6 + 5  Children to draw the ten frame and counters/cubes. 	Children to develop an understanding of equality e.g. 6 + □ = 11 6 + 5 = 5 + □ 6 + 5 = □ + 4

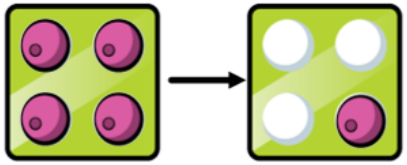
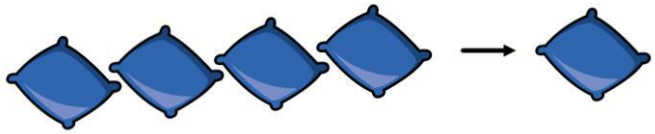
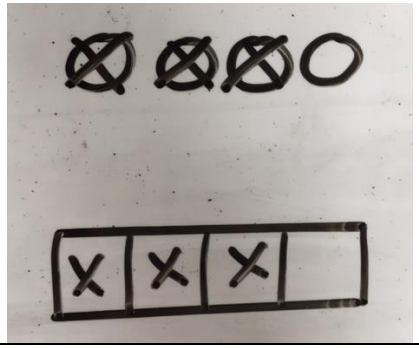
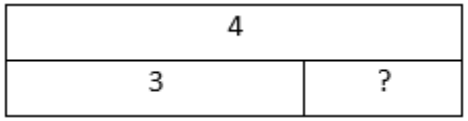
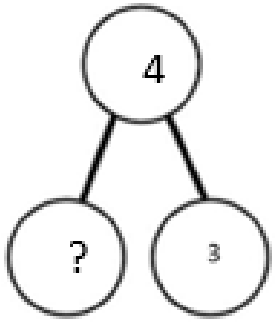
Addition	Concrete & Pictorial Representations	Written Recording
Year 2 Adding two or three single digits. Column layout – no exchanging.	**TO + O using base 10.** Continue to develop understanding of partitioning and place value.  41 + 8 Children to represent the base 10 e.g. lines for tens and dot/crosses for ones. 	**41 + 8**  1 + 8 = 9 40 + 9 = 49 

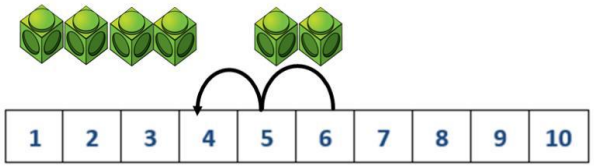
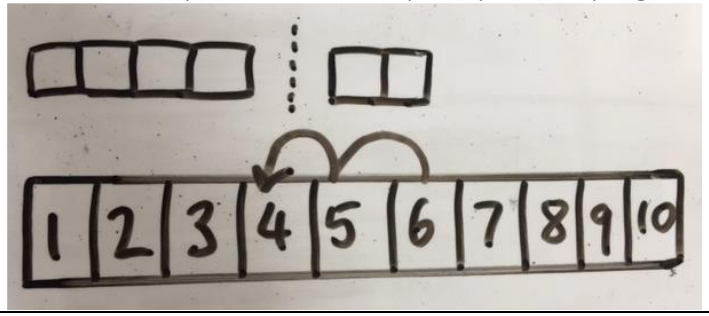
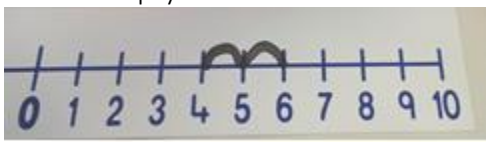
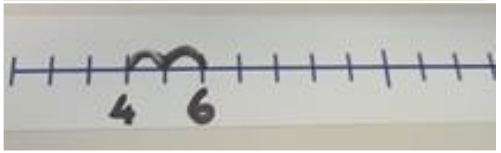
Addition	Concrete & Pictorial Representations	Written Recording
Year 3 Column layout- exchanging (up to 3 digits).	Place Value Equipment Model the stages of column addition using place value equipment on a place value grid. 	

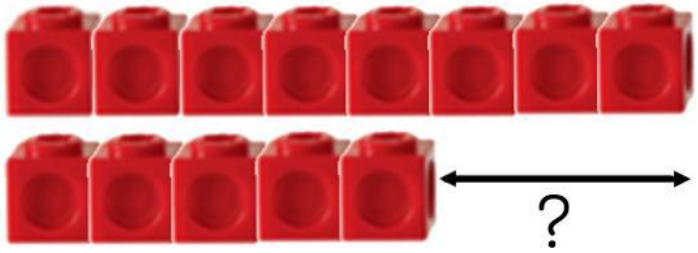
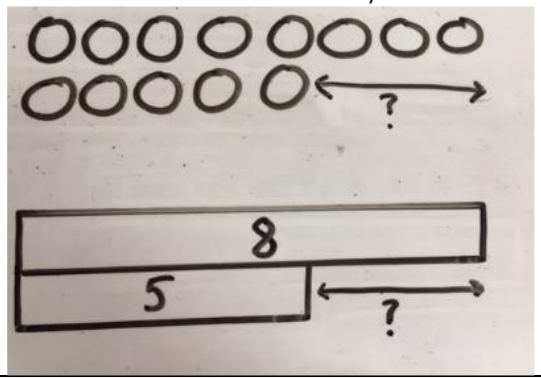
Addition	Concrete & Pictorial Representations	Written Recording
Year 4 Column layout-exchanging. (up to 4 digits)	**Place Value Counters** on Grids – Thousands, Hundreds, Tens and Units 	**Compact column addition** with larger numbers 

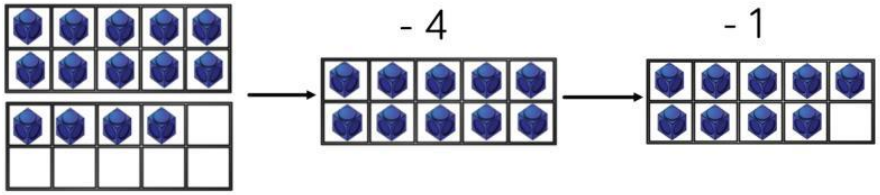
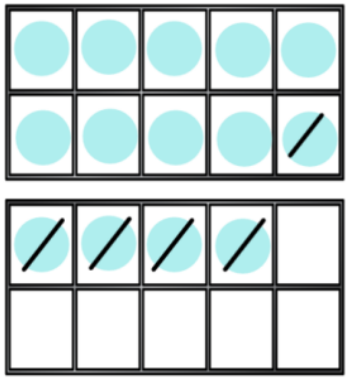
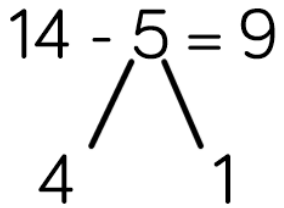
Addition	Concrete & Pictorial Representations	Written Recording
Year 5 Column layout- exchanging (including decimals) .	Use place value equipment on a place value grid to represent additions. Represent exchange where necessary.  O · Tth Hth 0 · 9 2 + 0 · 3 3 1 · 2 5 1 Include examples where the numbers of decimal places are different.  O · Tth Hth 5 · 0 0 + 1 · 2 5 6 · 2 5	Add using a column method, ensuring that children understand the link with place value. O · Tth Hth 0 · 2 3 + 0 · 4 5 0 · 6 8 Include exchange where required, alongside an understanding of place value. O · Tth Hth 0 · 9 2 + 0 · 3 3 1 · 2 5 1 Include additions where the numbers of decimal places are different. *3.4 + 0.65 = ?* O · Tth Hth 3 · 4 0 + 0 · 6 5 ·

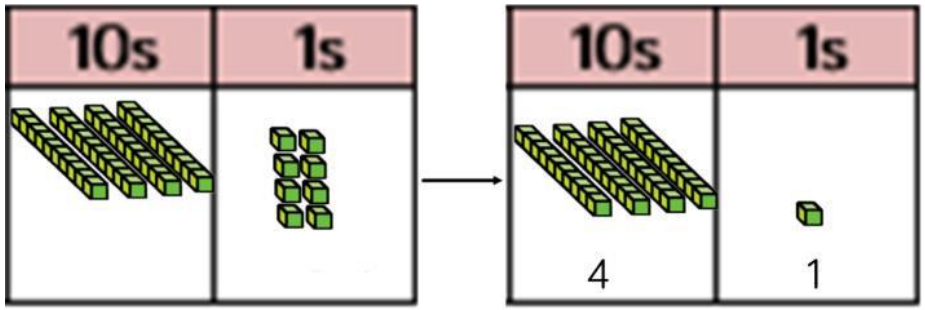
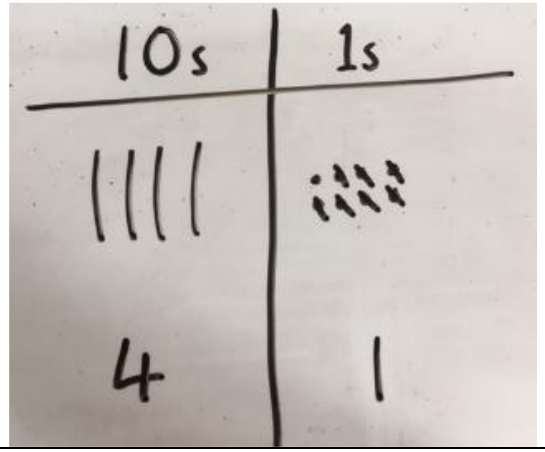
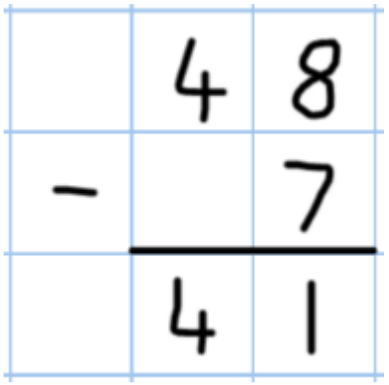
Addition	Concrete & Pictorial Representations	Written Recording
Year 6 Comparing and selecting efficient methods	Discuss similarities and differences between methods, and choose efficient methods based on the specific calculation. Compare written and mental methods alongside place value representations.   Use bar model and number line representations to model addition in problem-solving and measure contexts. 	Use column addition where mental methods are not efficient. Recognise common errors with column addition. *32,145 + 4,302 = ?* TTh Th H T O 3 2 1 4 5 + 4 3 0 2 3 6 4 4 7 TTh Th H T O 3 2 1 4 5 + 4 3 0 2 7 5 1 6 5 *Which method has been completed accurately?* *What mistake has been made?* Column methods are also used for decimal additions where mental methods are not efficient. H T O · Tth Hth 1 4 0 · 0 9 + 4 9 · 8 9 1 8 9 · 9 8 1

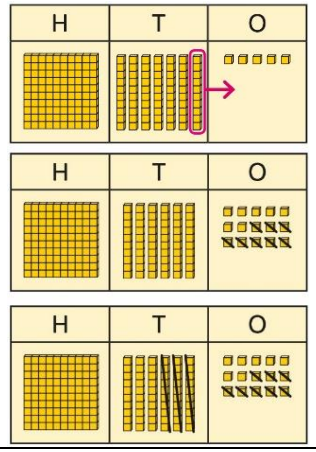
Subtraction	Concrete and Pictorial Representations	Written Recording
Reception Subtraction by taking away	Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items such as beanbags could be used). 4 – 3 = 1   Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used. 	4- 3 = □ □ = 4 – 3  

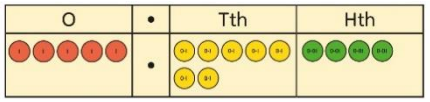
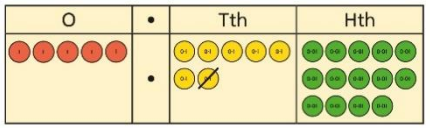
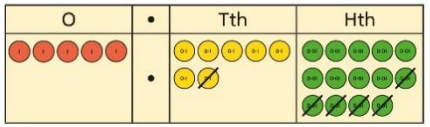
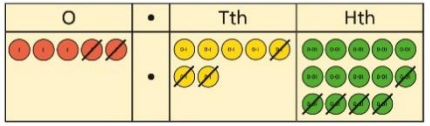
Subtraction	Concrete and Pictorial Representations	Written Recording
Reception / Year 1 Subtraction by counting back	Counting back (using number lines or number tracks) children start with 6 and count back 2. 6 – 2 = 4  Children to represent what they see pictorially e.g.  	Children to represent the calculation on a number line or number track and show their jumps. Encourage children in Year 1 to use an empty number line  

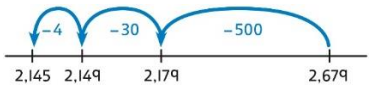
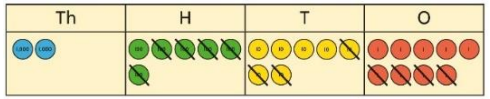
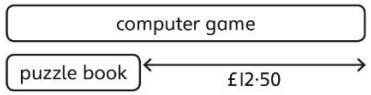
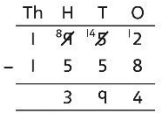
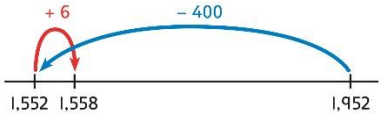
Subtraction	Concrete and Pictorial Representations	Written Recording
Year 1 Find the difference by	Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used). Calculate the difference between 8 and 5.  Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate.  	Find the difference between 8 and 5. 8 – 5, the difference is [] Children to explore why 9 - 6 = 8 – 5 = 7 – 4 have the same difference.

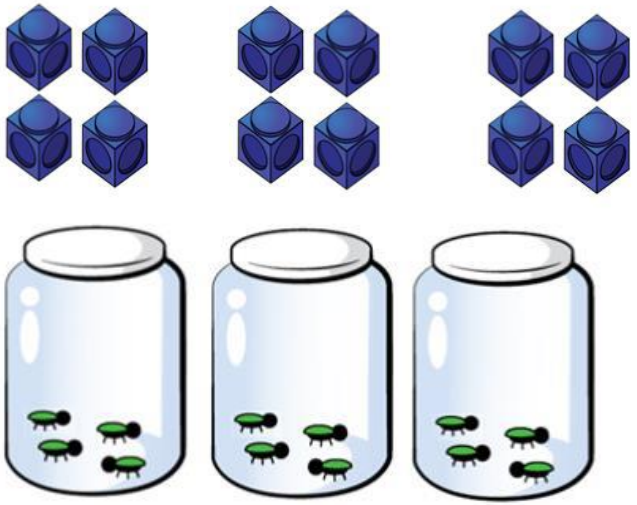
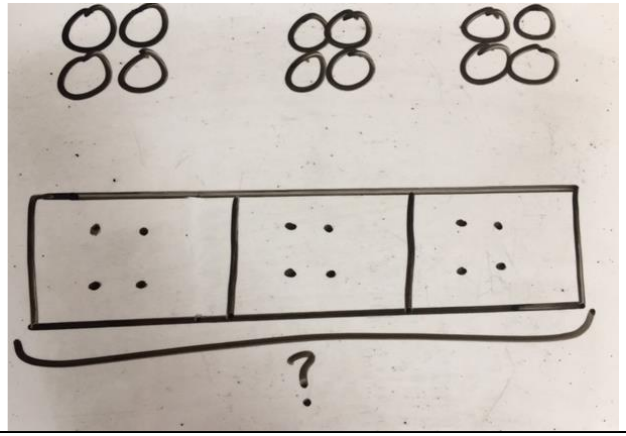
Subtraction	Concrete and Pictorial Representations	Written Recording
Year 1 Subtraction within 20	Making 10 using ten frames. 14 – 5  Children to represent the ten frame pictorially and discuss what they did to make 10. 	Children to show how they can make 10 by partitioning the subtrahend.  14 – 4 = 10 10 – 1 = 9

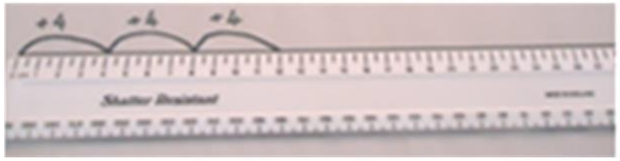
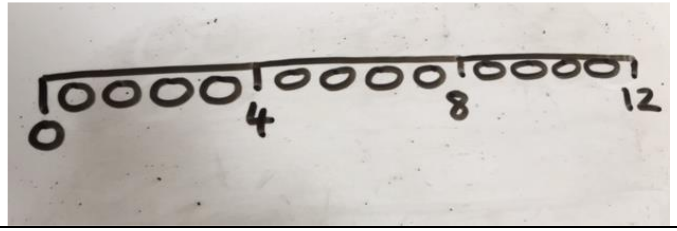
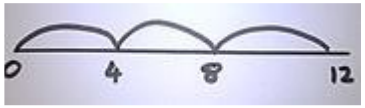
Subtraction	Concrete and Pictorial Representations	Written Recording
Year 2 Column layout – no exchanging	Using Base 10 apparatus to take away without exchanging 48-7  Children to represent the base 10 pictorially, crossing out  	Column layout or children could count back 7. 

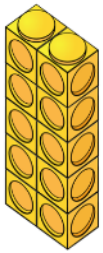
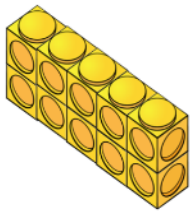
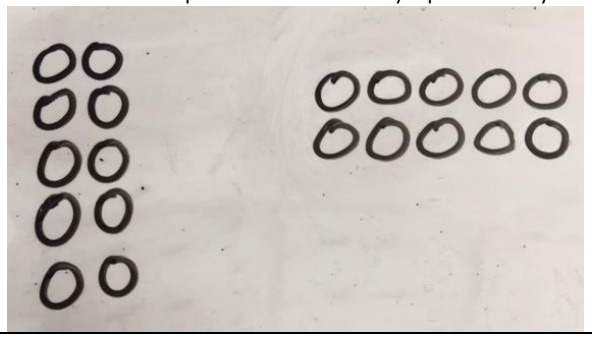
Subtraction	Concrete and Pictorial Representations	Written Recording
Year 3 Column layout with exchanging (up to 3 digits)	**Place Value Equipment** 	Formal column layout. Children must understand what has happened when they have crossed out digits. H T O 1 ~~6~~ ~~7~~ 5 – 3 8 1 3 7 175 – 38 = 137
Year 4 Column subtraction with exchanging (up to 4 digits).	**Place Value Counters** on Grids – Thousands, Hundreds, Tens and Units. Children may need to exchange more than once.	Develop **compact column subtraction with more than one exchange** ~~6~~ ~~5~~ ~~3~~ 8 – 2,789 3,749 ~~3~~ ~~7~~ ~~3~~ 2 – 837 2,895

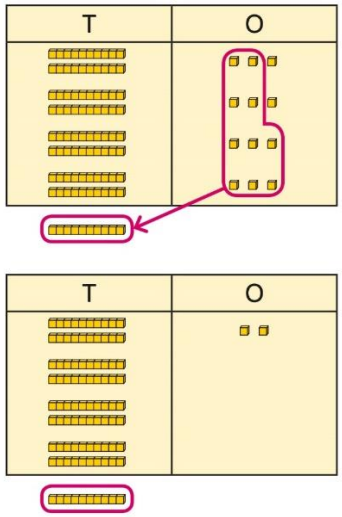
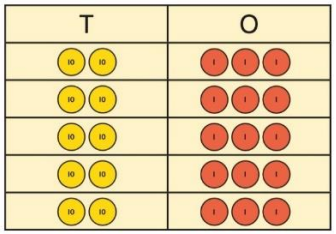
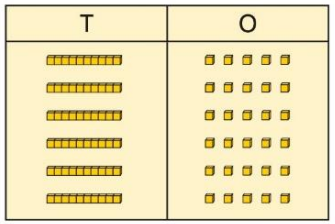
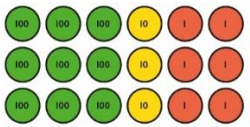
Subtraction	Concrete and Pictorial Representations	Written Recording
Year 5 Column subtraction with exchanging (2-place decimals)	Use a place value grid to represent the stages of column subtraction, including exchanges where required. *5·74 – 2·25 = ?*  O · Tth Hth 5 · 7 4 – 2 · 2 5 · Exchange 1 tenth for 10 hundredths.  O · Tth Hth 5 · 6 ¹7 ¹4 – 2 · 2 5 · Now subtract the 5 hundredths.  O · Tth Hth 5 · 6 ¹7 ¹4 – 2 · 2 5 · 9 Now subtract the 2 tenths, then the 2 ones.  O · Tth Hth 5 · 6 ¹7 ¹4 – 2 · 2 5 3 · 4 9	Use column subtraction, with an understanding of place value, including subtracting numbers with different numbers of decimal places. *3·921 – 3·75 = ?* O · Tth Hth Thth 3 · 9 2 1 – 3 · 7 5 0 ·

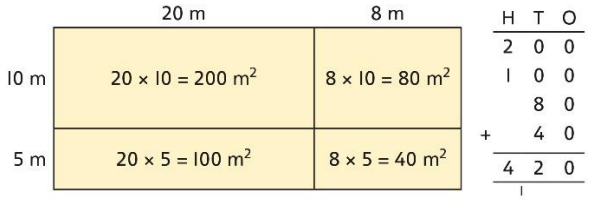
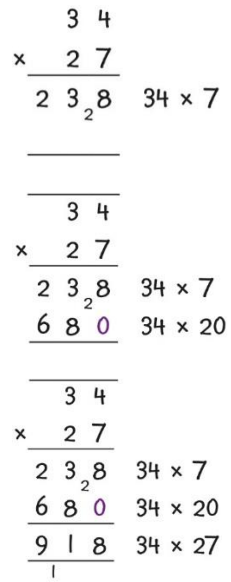
Subtraction	Concrete and Pictorial Representations	Written Recording
Year 6 Comparing and selecting efficient methods	Compare subtraction methods alongside place value representations.   Th H T O 2 6 7 9 − 5 3 4 2 1 4 5 Use a bar model to represent calculations, including 'find the difference' with two bars as comparison.  	Compare and select methods. Use column subtraction when mental methods are not efficient. Use two different methods for one calculation as a checking strategy.  Th H T O 1 ~~8~~ ~~14~~ 12 − 1 5 5 8 3 9 4  Use column subtraction for decimal problems, including in the context of measure. H T O · Tth Hth 3 0 9 · 6 0 − 2 0 6 · 4 0 1 0 3 · 2 0

Multiplication	Concrete and Pictorial Representations	Written Recording
Year 1 Recognising and making equal groups. Doubling Counting in multiples	Repeated grouping/repeated addition 3 × 4 (3 groups of 4) 4 + 4 + 4 There are 3 equal groups, with 4 in each group.  Children to represent the practical resources in a picture and use a bar model. 	3 × 4 = 12 4 + 4 + 4 = 12

Multiplication	Concrete and Pictorial Representations	Written Recording
Year 2	Number lines to show repeated groups 3 x 4 (3 lots of 4)   Cuisenaire rods can be used too. Represent this pictorially alongside a number line e.g.: 	Abstract number line showing three jumps of four. 3 × 4 = 12 

Multiplication	Concrete and Pictorial Representations	Written Recording
Year 2 Arrays- showing commutative multiplication	Use arrays to illustrate commutativity counters and other objects can also be used. 2 × 5 = 5 × 2  2 lots of 5  5 lots of 2 Children to represent the arrays pictorially. 	Children to be able to use an array to write a range of calculations e.g. 10 = 2 × 5 5 × 2 = 10 2 + 2 + 2 + 2 + 2 = 10 10 = 5 + 5

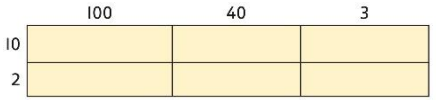
Multiplication	Concrete and Pictorial Representations	Written Recording
Year 3 Column layout to TU x U	Using place value counters (with exchanging)  Children to represent the counters/base 10, pictorially e.g. the image below.  	Formal written method  T O 1 5 × 6 + 6 × 5 6 × 10 T O 2 8 × 5 4 0 1 0 0 1 4 0 5 × 8 5 × 20
Year 4 Column multiplication (2 and 3 digit multiplied by 1 digit)	Use place value equipment alongside a column method for multiplication of up to 3-digit numbers by a single digit.  3 1 2 × 3 9 3 6	Use the formal column method for up to 3-digit numbers multiplied by a single digit. 3 1 2 × 3 9 3 6

Multiplication	Concrete and Pictorial Representations	Written Recording
Year 5 Multiplying 2-digit numbers by 2-digit numbers	Use an area model and add the parts. *28 × 15 = ?*  *28 × 15 = 420*	Use column multiplication, ensuring understanding of place value at each stage. 

Year 5

Multiplying up to 4-digits by 2-digits

Use the area model then add the parts.



Th	H	T	O
1	0	0	0
	4	0	0
	2	0	0
		8	0
		3	0
+			6
1	7	1	6
		1	

143 × 12 = 1,716

There are 1,716 boxes of cereal in total.

143 × 12 = 1,716

Use column multiplication, ensuring understanding of place value at each stage.

	1	4	3	
×		1	2	
	2	8	6	143 × 2
1	4	3	0	143 × 10
1	7	1	6	143 × 12
		1		

Progress to include examples that require multiple exchanges as understanding, confidence and fluency build.

1,274 × 32 = ?
First multiply 1,274 by 2.

	1	2	7	4	
×			3	2	
	2	5	1 4	8	1,274 × 2

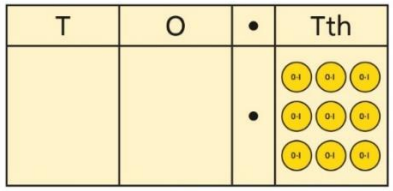
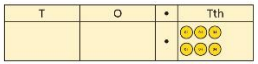
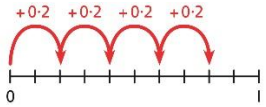
Then multiply 1,274 by 30.

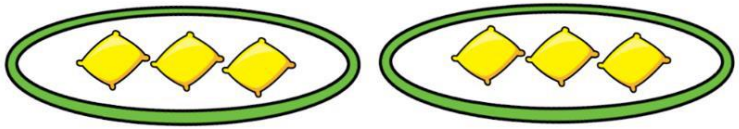
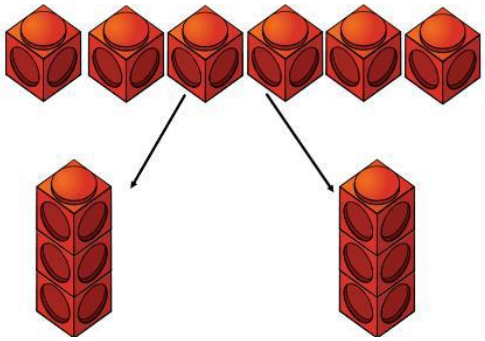
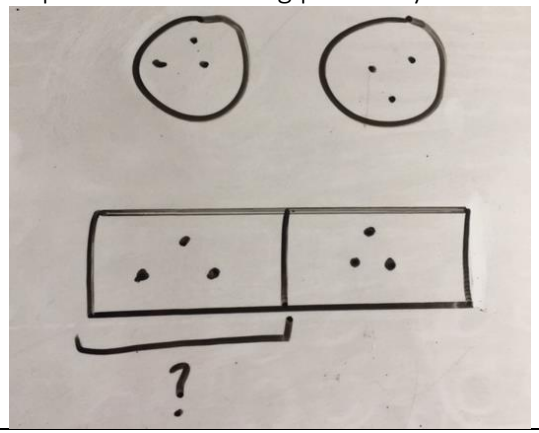
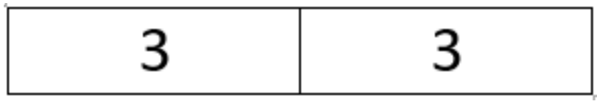
	1	2	7	4	
×			3	2	
	2	5	1 4	8	1,274 × 2
3	8	2 2	1 2	0	1,274 × 30

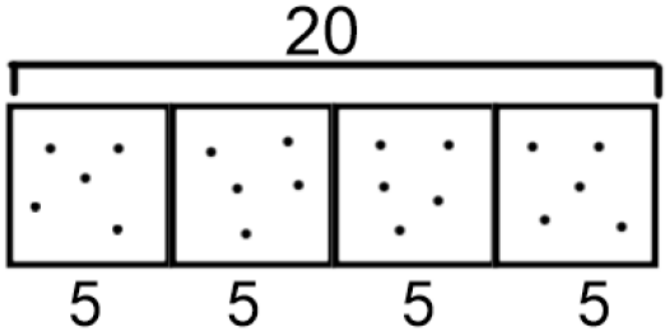
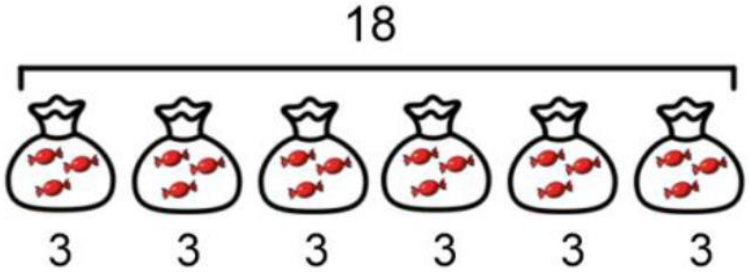
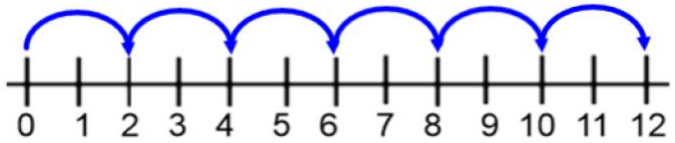
Finally, find the total.

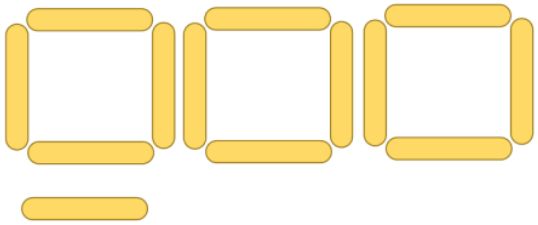
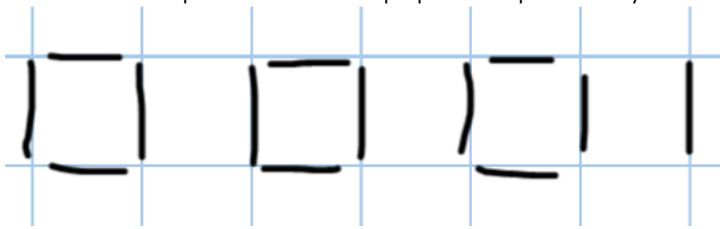
	1	2	7	4	
×			3	2	
	2	5	1 4	8	1,274 × 2
3	8	2 2	1 2	0	1,274 × 30
4	0	7	6	8	1,274 × 32
		1			

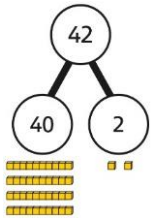
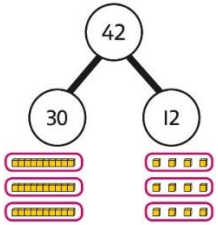
1,274 × 32 = 40,768

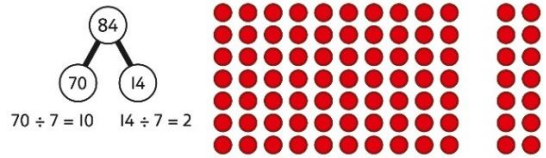
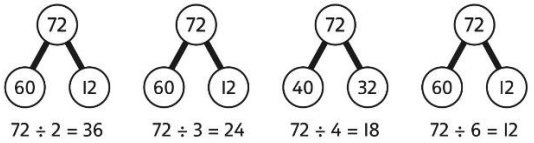
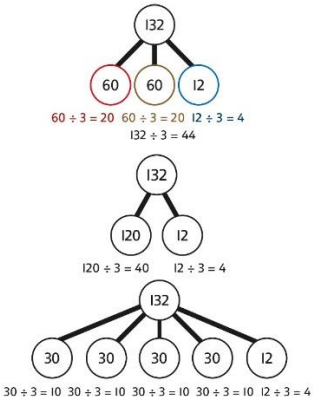
Multiplication	Concrete and Pictorial Representations	Written Recording
Year 6 Multiplying Decimals	Represent calculations on a place value grid. 3 × 3 = 9 3 × 0·3 = 0·9  Understand the link between multiplying decimals and repeated addition.   	Use known facts to multiply decimals. *4 × 3 = 12* *4 × 0·3 = 1·2* *4 × 0·03 = 0·12* *20 × 5 = 100* *20 × 0·5 = 10* *20 × 0·05 = 1* Find families of facts from a known multiplication. *I know that 18 × 4 = 72.* *This can help me work out:* *1·8 × 4 = ?* *18 × 0·4 = ?* *180 × 0·4 = ?* *18 × 0·04 = ?* Use a place value grid to understand the effects of multiplying decimals. H T O • Tth Hth 2 × 3: 6 • 0·2 × 3: 0 • 6 0·02 × 3: •

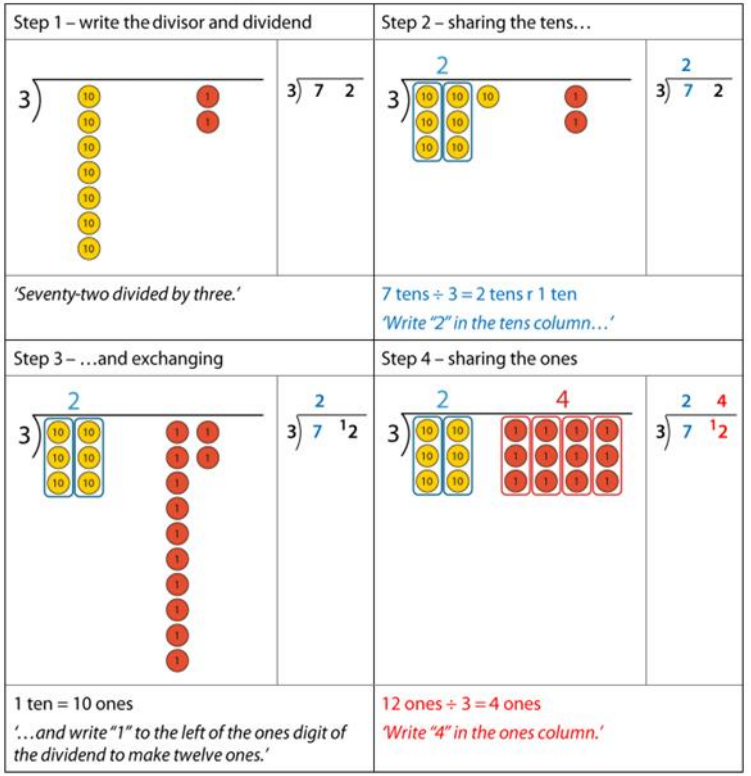
Division	Concrete and Pictorial Representations	Written Recording
Year 1 Sharing objects into groups Division as grouping	Sharing using a range of objects. 6 ÷ 2   Represent the sharing pictorially. 	6 ÷ 2 = 3 

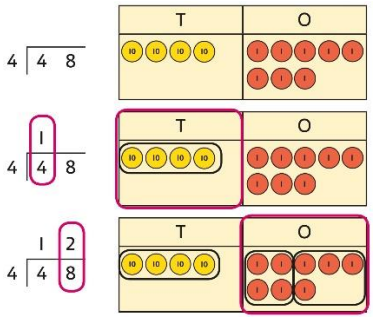
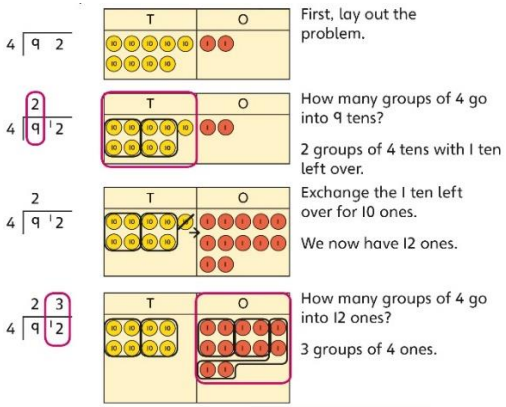
Division	Concrete and Pictorial Representations	Written Recording
Year 2 Division as sharing Repeated addition	Sharing into equal groups : e.g. 20 divided by 4 is 20 shared equally into 4 parts  Grouping and counting e.g. 18 divided by 3 is 18 split into equal groups of 3  	Abstract number line to represent the equal groups that have been added. 
Year 2 Division within arrays- linking to multiplication	Recognise the links between multiplication and division through use of arrays: 3 x 4 = 12 4 x 3 = 12 12 ÷ 4 = 3 12 ÷ 3 = 4 	

Division	Concrete and Pictorial Representations	Written Recording
Year 3 Division with a remainder	2d ÷ 1d with remainders using lollipop sticks. Cuisenaire rods, above a ruler can also be used. 13 ÷ 4 Use of lollipop sticks to form wholes- squares are made because we are dividing by 4.  There are 3 whole squares, with 1 left over. Children to represent the lollipop sticks pictorially.  There are 3 whole squares, with 1 left over. Use place value equipment to understand the concept of remainder in division. *29 ÷ 2 = ?*  *29 ÷ 2 = 14 remainder 1*	65 divided by 3 equals 21 remainder 2 Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line. '21 groups of 3, with 2 left over' 65 ÷ 3 =  Partition to divide, understanding the remainder in context. *67 children try to make 5 equal lines.* *67 = 50 + 17* *50 ÷ 5 = 10* *17 ÷ 5 = 3 remainder 2* *67 ÷ 5 = 13 remainder 2* *There are 13 children in each line and 2 children left out.*

Division	Concrete and Pictorial Representations	Written Recording
Year 3 2d divided by 1d	Children explore which partitions support particular divisions.  *I need to partition 42 differently to divide by 3.*  *42 = 30 + 12* *42 ÷ 3 = 14*	Children partition flexibly to divide where appropriate. *42 ÷ 3 = ?* *42 = 40 + 2* *I need to partition 42 differently to divide by 3.* *42 = 30 + 12* *30 ÷ 3 = 10* *12 ÷ 3 = 4* *10 + 4 = 14* *42 ÷ 3 = 14*

Year 4 Short division (up to 3 digits by 1 digit- concrete and pictorial)	Represent how to partition flexibly where needed. *84 ÷ 7 = ?* *I will partition into 70 and 14 because I am dividing by 7.*  84 ÷ 7 = 12	Make decisions about appropriate partitioning based on the division required.  Understand that different partitions can be used to complete the same division. 

Division	Concrete and Pictorial Representations	Written Recording
		'Seventy-two sticks are shared equally between three children. How many sticks does each child get?' 72 ÷ 3 = ? 

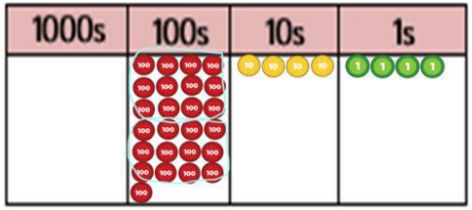
Division	Concrete and Pictorial Representations	Written Recording
Year 5 Short division (up to 4 digits by a 1 digit number including remainders)	Use place value equipment on a place value grid alongside short division. The model uses grouping. A sharing model can also be used, although the model would need adapting.  Lay out the problem as a short division. *There is 1 group of 4 in 4 tens.* *There are 2 groups of 4 in 8 ones.* Work with divisions that require exchange.  	Use short division for up to 4-digit numbers divided by a single digit. $$7 \overline{)\,3\,{}^{3}8\,{}^{3}9\,{}^{4}2} \quad 0\;5\;5\;6$$ *3,892 ÷ 7 = 556* Use multiplication to check. *556 × 7 = ?* *6 × 7 = 42* *50 × 7 = 350* *500 × 7 = 3500* *3,500 + 350 + 42 = 3,892*

Year 6
Long division (up to 4 digits by a 2 digit number)

Long division using place value counters

2544 ÷ 12

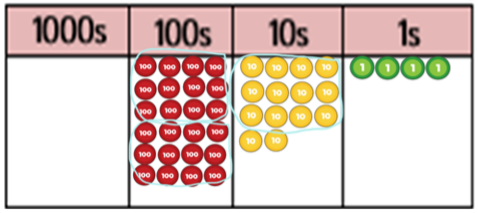
We can't group 2 thousands into groups of 12 so will exchange them.



We can group 24 hundreds into groups of 12 which leaves with 1 hundred.

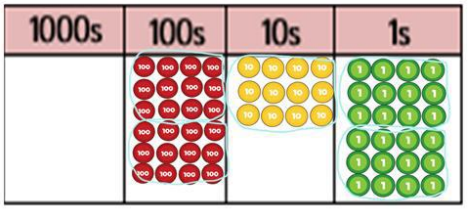
$$\begin{array}{r} 02 \\ 12\overline{)2544} \\ 24 \\ \hline 1 \end{array}$$

A 0 can be used as a place holder for the tens and ones column.



After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens.

$$\begin{array}{r} 021 \\ 12\overline{)2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 2 \end{array}$$



After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder.

$$\begin{array}{r} 0212 \\ 12\overline{)2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 24 \\ 24 \\ \hline 0 \end{array}$$

Children should exchange into the tenths and hundredths column too

'Becky has 434 cm of ribbon to wrap up prizes for a school competition. Each prize needs 31 cm of ribbon. How many prizes can she wrap?'

434 ÷ 31 = ?

Ratio chart:

	×31
1	31
2	62
3	
4	124
5	155
6	
7	
8	248
9	
10	310

Step 1 – write the divisor, frame and dividend

$31\overline{)4\ \ 3\ \ 4}$

Step 2 – divide the hundreds

$$\begin{array}{r} 0 \\ 31\overline{)4\ \ 3\ \ 4} \end{array}$$

4 hundreds ÷ 31 = 0 hundreds r 4 hundreds

- *'Write "0" in the hundreds column of the answer line.'*

Step 3 – exchange hundreds for tens, combine with the existing tens and divide…

$$\begin{array}{r} 0\ \ 1 \\ 31\overline{)4\ \ 3\ \ 4} \\ 3\ \ 1 \end{array}$$

(1 ten × 31 = 31 tens)

4 hundreds = 40 tens

40 tens + 3 tens = 43 tens

43 tens ÷ 31 = 1 ten and a remainder

- *'Write "1" in the tens column of the answer line and write "31" underneath the "43".'*

Division	Concrete and Pictorial Representations	Written Recording

Step 4 – subtract to find the remainder

```
   0 1
31)4 3 4
   3 1        (1 ten × 31 = 31 tens)
   1 2
```

43 tens – 31 tens = 12 tens

- *'Write "12" underneath the "31".'*

Step 5 – exchange tens for ones and combine with the existing ones

```
   0 1
31)4 3 4
   3 1  ↓     (1 ten × 31 = 31 tens)
   1 2  4
```

12 tens = 120 ones

120 ones + 4 ones = 124 ones

- *'Write "4" after the "12".'*

Step 6 – divide the ones

```
   0 1 4
31)4 3 4
   3 1        (1 ten × 31 = 31 tens)
   1 2 4
   1 2 4      (4 ones × 31 = 124 ones)
```

124 ones ÷ 31 = 4 ones

(refer to the ratio chart)

- *'Write "4" in the ones column of the answer line and write "124" underneath the "124", aligning the digits.'*

Step 7 – subtract to show there is no remainder

```
   0 1 4
31)4 3 4
   3 1        (1 ten × 31 = 31 tens)
   1 2 4
   1 2 4      (4 ones × 31 = 124 ones)
   ---
     0
```

124 ones – 124 ones = 0 ones

- *'Write "0" underneath the "31".'*

- *'Becky can wrap fourteen presents.'*