Last Reviewed: May 2023
Next Review: May 2026

St Laurence's CE Primary School

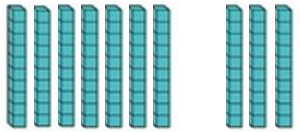
CALCULATION POLICY: ADDITION AND SUBTRACTION

Mental calculation strategies for addition and subtraction:

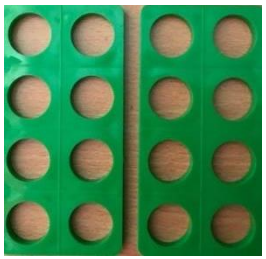
All these mental calculation strategies are taught explicitly using a Concrete – Pictorial – Abstract (CPA) approach in every year group, for example, extending to decimals in upper Key Stage 2.

Number bonds: 7 + 3 = 10

70 + 30 = 100



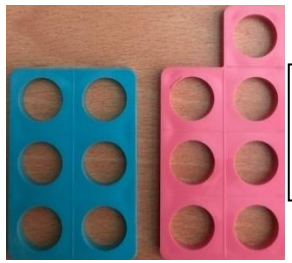
Doubles: 8 + 8 = 16



8 + 8 is connected to 8 X 2

Add decimals using knowledge of doubles e.g. 0.8 + 0.8 = 1.6

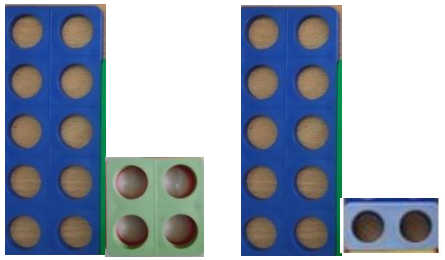
Near doubles: 6 + 7 = 13



6 + 7 is commutative with 7 + 6

Add decimals using near doubles, e.g. 2.5 + 2.6 = 5 + 0.1

Partitioning: 14 + 12 = 26



Add decimals using partitioning
e.g. 1.4 + 1.2 = 2.0 + 0.6 = 2.6

Bridging: 7 + 5 =

To begin: 7 + 3 = 10 Then: 10 + 2 = 12

Bridging through 60 for time, i.e. 70 minutes = 1 hour and 10 minutes.

Bridging through decimals

Adjusting: 16 + 9 = 25

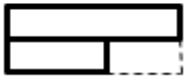
To begin: 16 + 10 = 26

Then: 26 – 1 = 25

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

Finding the difference: 10 – 6 = 4

David has 10 sweets and Chloe has six sweets. How many more does David have than Chloe?



Reordering: 8 + 7 + 2 = 17
e.g. calculating numbers in a different order
To begin: 8 + 2 = 10
Then: 10 + 7 = 17

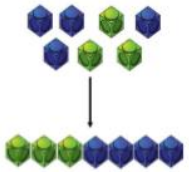
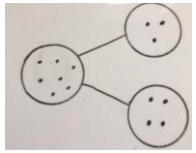
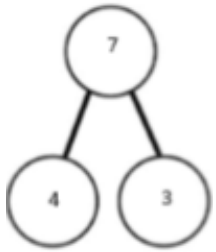
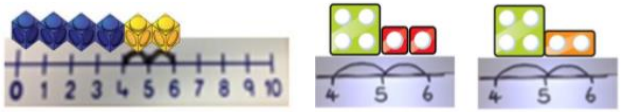
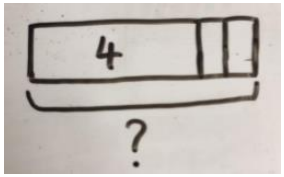
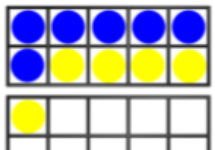
Reorder increasingly complex calculations
e.g. 1.7 + 2.8 + 0.3 = 1.7 + 0.3 + 2.8
or 4.7 + 5.6 – 0.7 …
4.7 – 0.7 + 5.6 = 4 + 5.6.

e.g. 0.8 + 0.35 = 0.8 + 0.2 + 0.15			

ADDITION

Key Language:

sum, total, part, whole, add, plus, altogether, more, is equal to, is the same as

Concrete	Pictorial	Abstract
Combining two parts to make a whole (using multilink, teddy bears, cars, shells). 	Children represent cubes using dots or crosses. (Could include drawing parts in a part-part-whole model) 	4 + 3 = 7 4 is a part, 3 is a part and the whole is 7. 
Counting on using number lines (using cubes or Numicon) 	A bar model which encourages children to count on rather than count all. 	The abstract number line: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? 4 + 2 
Regrouping to make 10	Children to draw the ten frame and counters/cubes. 	Children develop an understanding of equality 6 + □ = 11 6 + 5 = 5 + □ 6 + 5 = □ + 4

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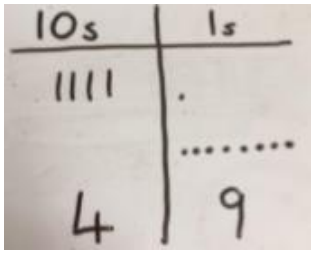
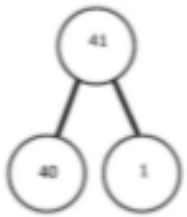
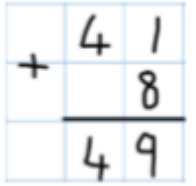
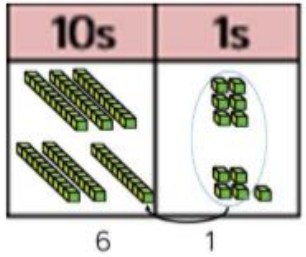
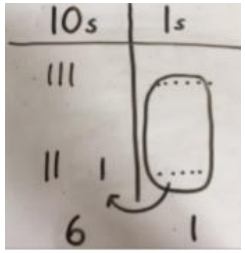
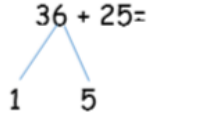
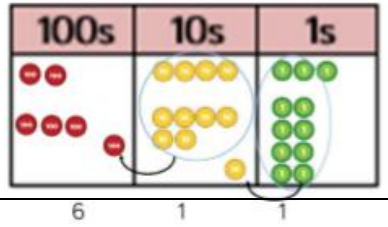
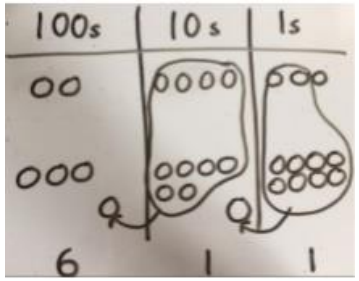
(using ten frames and counters/cubes or using Numicon) 6 + 5 		
TO + O using base 10 Continue to develop understanding of partitioning and place value. 41 + 8 	Children represent base 10 using lines for tens and dots for ones. 	41 + 8  1 + 8 = 9 40 + 9 =49 
TO + TO using base 10 Continue to develop understanding of place value. 36 + 25 	Children represent the base 10 in a place value chart. 	Looking for ways to make 10.  30 + 20 = 50 5 + 5 = 10 50 + 10 + 1 = 61 Column Method Expanded: 36 + 25 11 50 61 Compact: 36 +25 61 1
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. 243+ 368 	Children represent the counters in a place value chart, circling when they make an exchange 	Column Method: Expanded (ones first): 243 + 368 11 100 500 611 Compact: 243 +368 611 1 1

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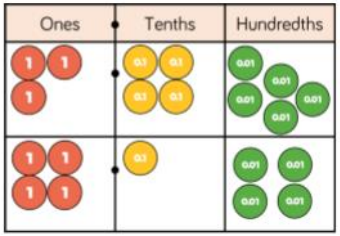
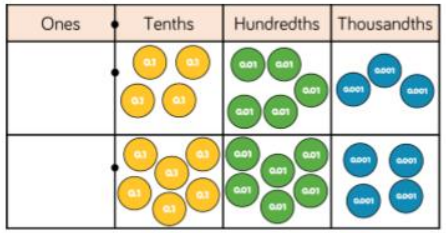
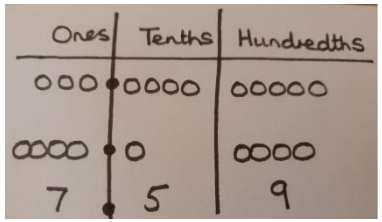
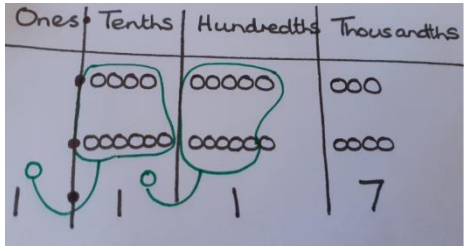
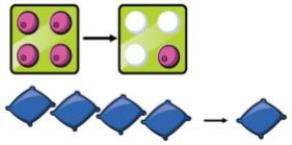
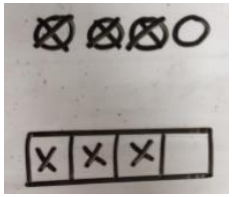
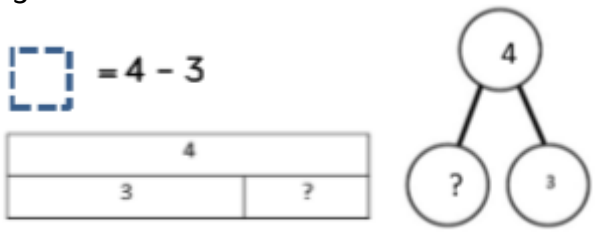
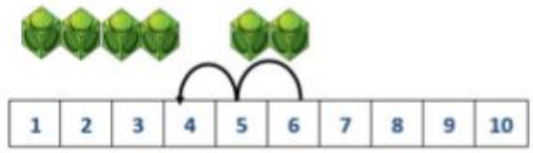
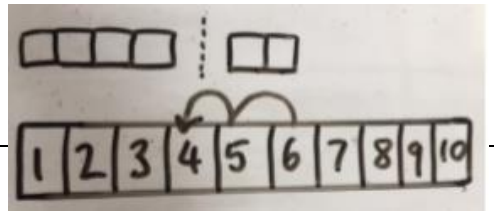
<table>
<tr>
<td>Adding decimals
Using place value counters.

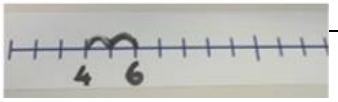
3.45 + 4.14
 

0.453 + 0.664
 
</td>
<td>Children represent the counters in a place value chart, circling when they make an exchange
 

 
</td>
<td>Column Method: Regrouping

3.45
+ 4.14
7.59

0.453
+ 0.664
1.117
1 1</td>
</tr>
<tr>
<td colspan="3">SUBTRACTION</td>
</tr>
<tr>
<td colspan="3"><u>Key Language:</u>
take away, less than, difference, subtract, minus, fewer, decrease, reduce</td>
</tr>
<tr>
<td>Taking away ones
Physically removing objects from a whole (ten frames, Numicon, cubes, bean bags etc).
4 take away 3
  </td>
<td>Children draw objects (or circles) and cross out the correct amount. The bar model can also be used.
 
</td>
<td>4-3 =
 
</td>
</tr>
<tr>
<td>Counting back
Using number lines or number tracks.
6 count back 2
 
</td>
<td>Children represent what they see pictorially e.g.
 
</td>
<td>Children represent the calculation on a number line or track (including an empty number line)
6 – 2 =
 

 
</td>
</tr>
</table>

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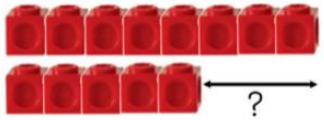
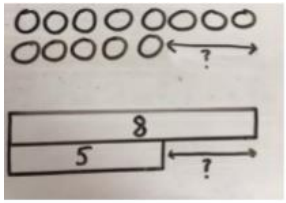
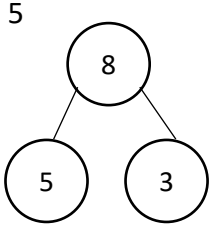
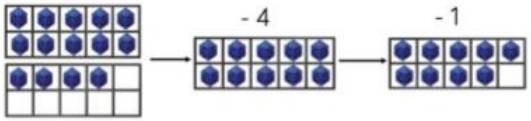
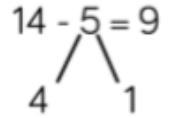
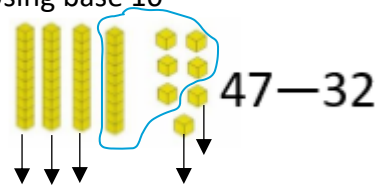
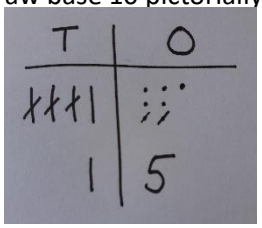
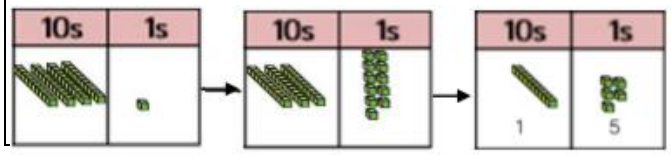
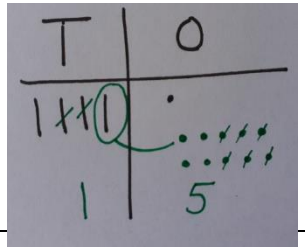
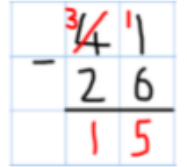
Finding the difference Using cubes, Numicon, Cuisenaire rods etc. How many more is 8 than 5? 	Children draw the concrete objects they have used or use the bar model to illustrate what they need to calcuate. 	Find the difference between 8 and 5 8-5 = 3 so the difference is 3  Children explore why 9-6 = 8-5 = 7-4
Bridging 10 Making 10 using 10 frames 14 – 5 = 	Children represent the ten frame pictorially and say what they did to make 10. 	Children show how they can make 10 by partitioning the subtrahend.  14 – 4 = 10 10 – 1 = 9
TO-TO – No exchange Using base 10 	Children draw base 10 pictorially 	Column Method Expanded: 40 + 7 - 30 + 2 10 + 5 = 15 Compact: T O 4 7 - 3 2 1 5
Column Method with exchange Using base 10 **41 -26** 	Children represent the base 10 pictorially, showing the exchange. 	Column Method Children must understand what has happened when they have crossed out digits. 30 1 ~~40~~ + 1 - 20 + 6 

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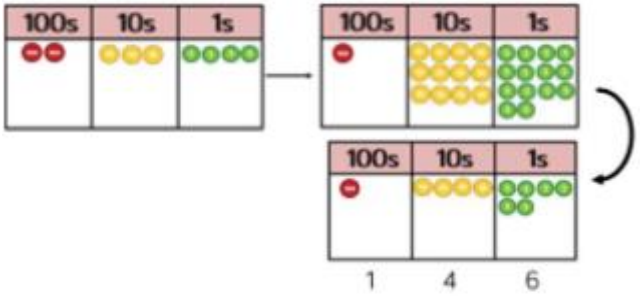
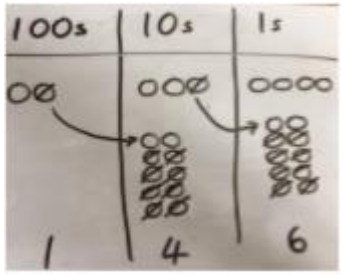
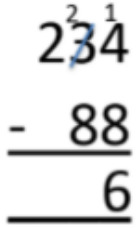
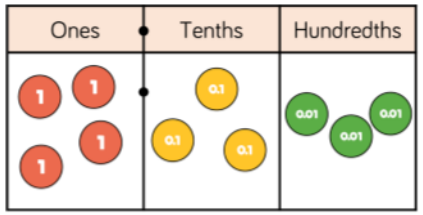
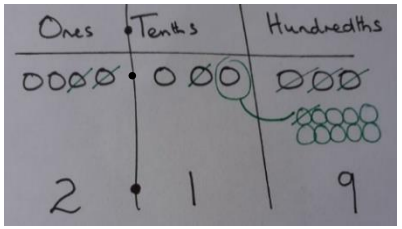
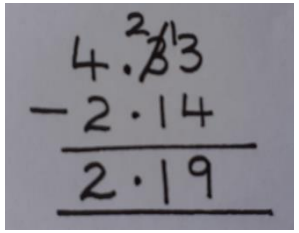
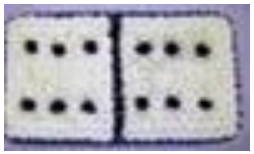
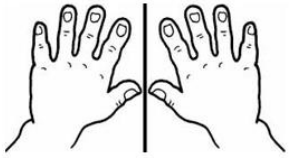
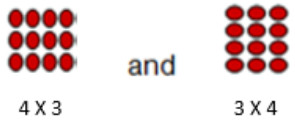
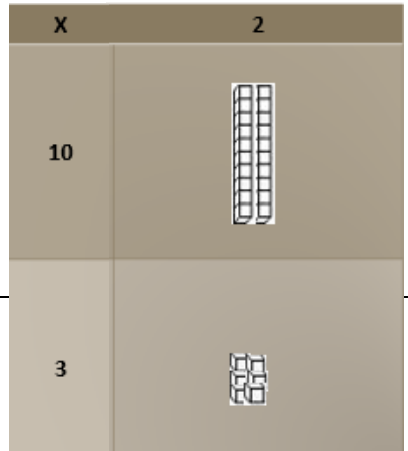
		10 + 5 = 15
Column Method with exchange Using place value counters 234 - 88= 	Children represent the place value counters pictorially, showing the exchange. 	Formal Column Method Children must understand what has happened when they have crossed out digits. 
Subtracting decimals Using place value counters 4.33 - 2.14 = 	Children represent the place value counters pictorially, showing the exchange. 	Column Method 

Mental calculation strategies for multiplication and division:

Doubling and halving: Double six is 12… Double five is ten…   Double 16 can be calculated by working out…	**Knowing multiplication and division facts to 12 X 12:** Arrays:  Number lines:  Scaling: 	**Multiplying a teen number by one-digit number:** 

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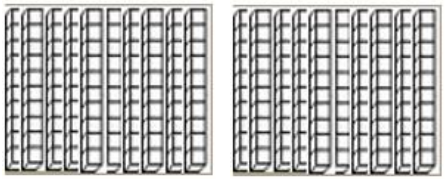
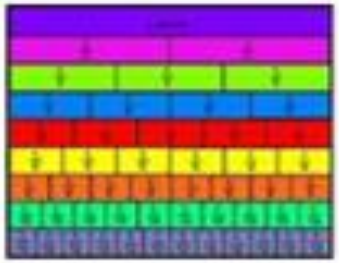
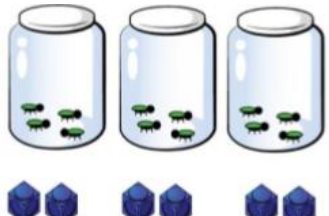
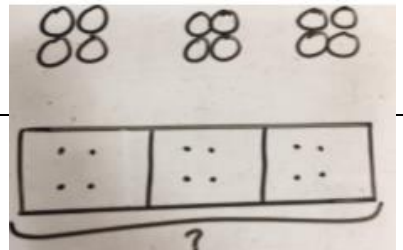
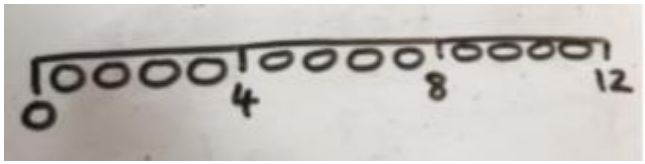
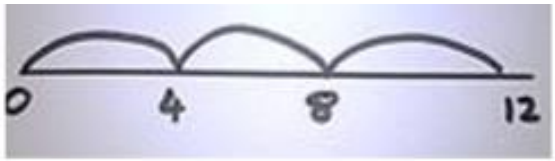
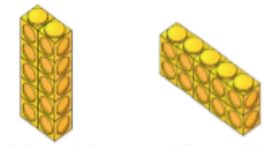
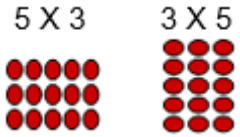
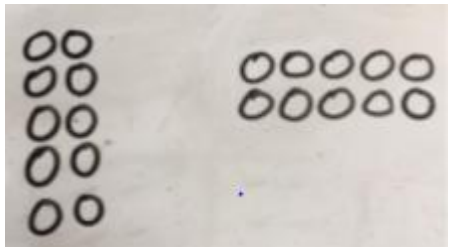
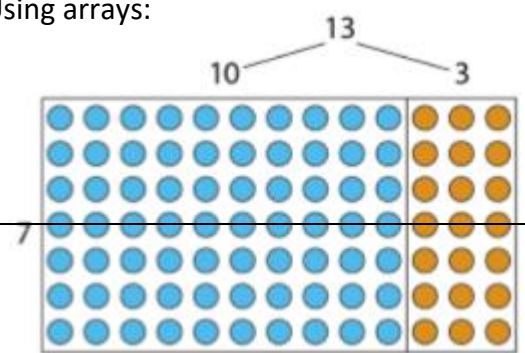
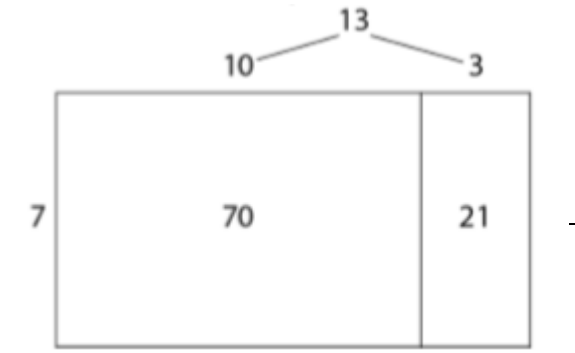
Double ten → 20 Double six → 12  Links to finding four-times a given value (double and double again) and finding a quarter of a value (halve and halve again).		
Multiplying and dividing by multiples of ten: **20 x 10 =**  **Hundreds** | **Tens** | **Ones** 2 | 0 'Add a place value holder'	**Use knowledge of multiplication and division facts to find fractions, decimals and percentages:** $\frac{1}{4}$ of 16, $\frac{1}{6}$ of 42, $\frac{1}{9}$ of 27 Find $\frac{1}{10}$ or 10% 	**Make connections between number facts** 

MULTIPLICATION		
<u>Key Language:</u> **double, lots of, groups of, times, equal groups, array, repeated addition, multiplied by, product of, commutative, grid**		
Repeated addition/Repeated Grouping 4 + 4 + 4 3 x 4  There are 3 equal	Children represent the concrete resources in a picture or a bar model. 	4 + 4 + 4 = 12 3 x 4 = 12

groups, with 4 in each group		
Number lines to show repeated groups:   Could use Cuisenaire rods: 	Represent pictorially alongside a number line e.g. 	Abstract number line showing three jumps of four. 3 x 4 = 12 
Arrays Use cubes, counters or other objects to show commutativity.  	Children represent arrays pictorially. 	Children use arrays to write a range of calculations. 10 = 2x5 5x2=10 2+2+2+2+2 = 10 10 = 5+5
TO x O Using arrays: 	Children represent as a grid. 	Children are encouraged to show the steps that they have taken. $13 \times 7 = 10 \times 7 + 3 \times 7$ $= 70 + 21$ $= 91$ $7 \times 13 = 7 \times 10 + 7 \times 3$ $= 70 + 21$ $= 91$

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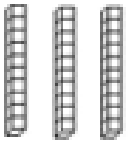
TO x O

Partitioning using Numicon, base 10 or Cuisenaire rods.

4 x 15 =

3 x 13 =

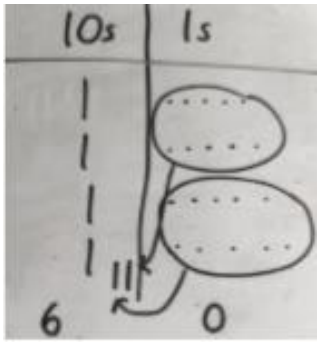
3 x 10 =



3 x 3 =

Children represent the concrete materials pictorially.

4 X 15 =

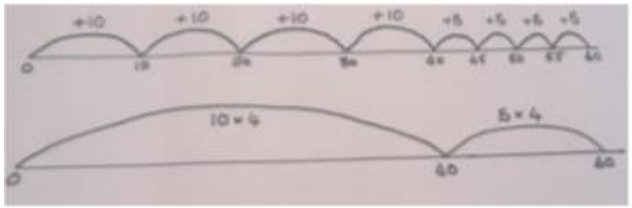


Children are encouraged to show the steps they have taken using an informal written method.

4 x 15
10 5

10 x 4 = 40
5 x 4 = 20
40 + 20 = 60

Could also use a number line:



Column Multiplication (No regrouping)

Base 10
34 x 2

Informal method (partitioning)

$34 \times 2 = 30 \times 2 + 4 \times 2$

$= 60 + 8$

$= 68$

Expanded method

	10s	1s
	3	4
×		2
		8
	6	0
	6	8

2 × 4 ones = 8 ones

2 × 3 tens = 6 tens

Compact layout with headings

	10s	1s
	3	2
×		3
	9	6

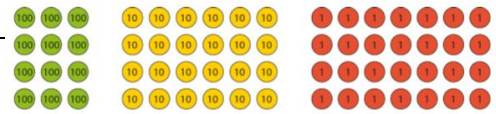
Compact layout

$$\begin{array}{r} 21 \\ \times\ 4 \\ \hline 84 \end{array}$$

Column Multiplication (With regrouping)

Place Value counters

367 x 4 =



Multiplication algorithm – expanded layout:

	1,000s	100s	10s	1s
		3	6	7
×				4
			2	8

Multiplication algorithm – compact layout:

$$\begin{array}{r} 3\ 6\ 7 \\ \times\ \ \ \ 4 \\ \hline 1\ 4\ 6\ 8 \\ \hline 2\ 2 \end{array}$$

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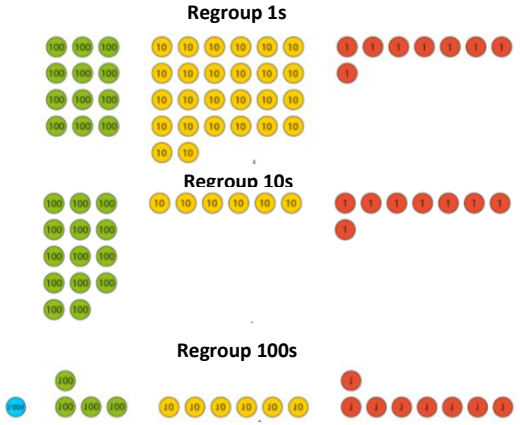

4 × 7 ones = 28 ones
= 2 tens + 8 ones
4 × 6 tens = 24 tens
= 2 hundreds + 4 tens
4 × 3 hundreds = 12 hundreds
= 1 thousand + 2 hundreds

Column Multiplication – Multiplying by 2-digits

Up to 4-digits by a 2-digit e.g.18 x 13

Grid:

	10	8
10	100	80
3	30	24

Expanded:

18
X13
24
30
80
100
234
1

Compact:

18
X 13
54
2
180
234
1

When multiplying 3 and 4-digit by 2-digit etc, children should be confident with the compact method.

$$\begin{array}{r} 1\ 2\ 4 \\ \times\ \ 2\ 6 \\ \hline 7\ 4\ 4 \\ 2\ 4\ 8\ 0 \\ \hline 3\ 2\ 2\ 4 \\ \hline 1\ 1 \end{array}$$

DIVISION

Key Language:

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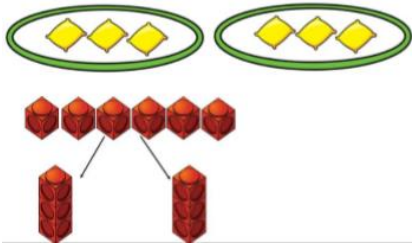
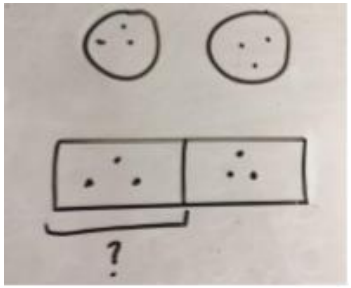
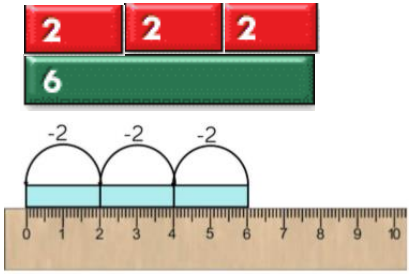
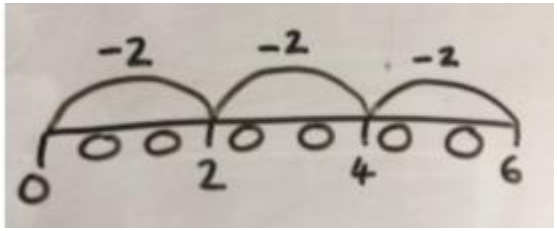
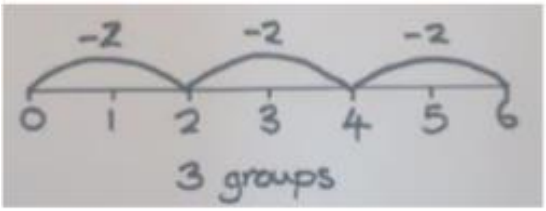
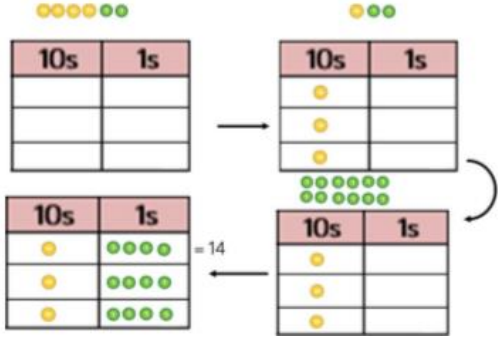
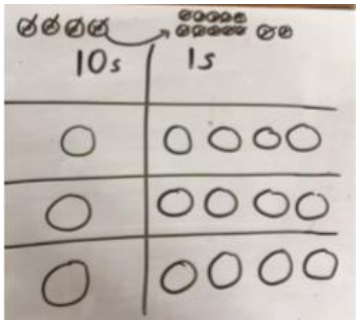
<table>
<tr><th colspan="3">share, group, divide, equally, divided by, half, halve, remainder</th></tr>
<tr>
<td>Sharing using a range of objects
6 ÷ 2 =
 
“Two children share six pencils between them”</td>
<td>Represent the sharing pictorially.
  </td>
<td>6 ÷ 2 = 3

Children should also be able to use their 2 times tables facts</td>
</tr>
<tr>
<td>Repeated subtraction
Using Cuisenaire rods:
 
3 groups of 2</td>
<td>Represent repeated subtraction pictorially:
  </td>
<td>Abstract number line:
  </td>
</tr>
<tr>
<td>Sharing using place value counters or base 10
Use knowledge of tables facts /inverse.
Using place value counters: 42 ÷ 3 =
  </td>
<td>Represent place value counters pictorially
  </td>
<td>Children demonstrate their understanding of place value counters and write calculations to show the process.

E.g. 42 ÷ 3

42 = 30 +12

30 ÷ 3 = 10 12÷3 = 4

10 + 4 = 14</td>
</tr>
</table>

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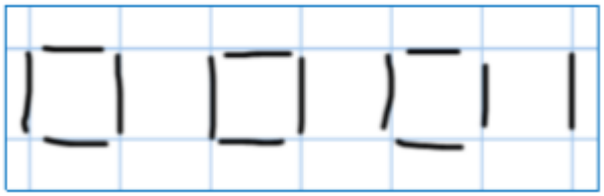
Division with remainders

Using counters, lollipop sticks or other materials

13 ÷ 4 =

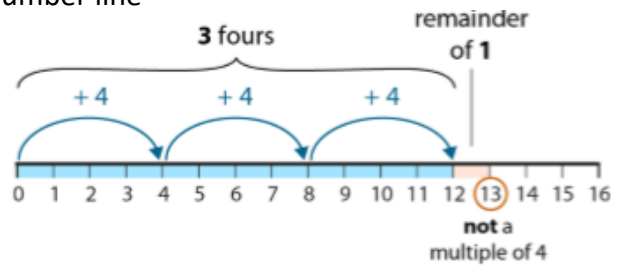
'Twelve is the largest multiple of four that is less than or equal to thirteen.'

Represent grouping counters or other materials



13 ÷ 4 = 3 remainder 1

Number line



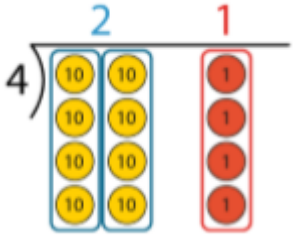
'Thirteen divided into groups of four is equal to three with a remainder of one.'

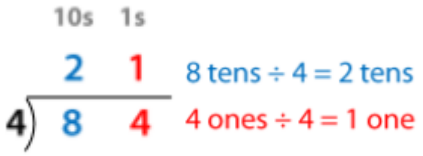
Short Division (No remainder)

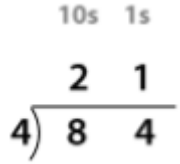
84 ÷ 4 =

Sharing

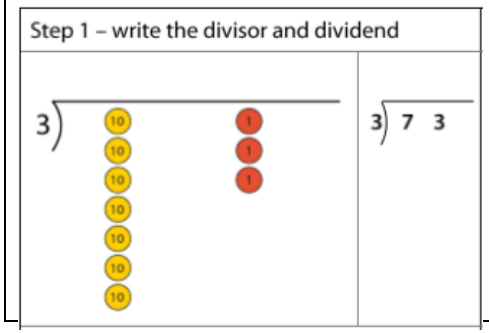
Using place value counters

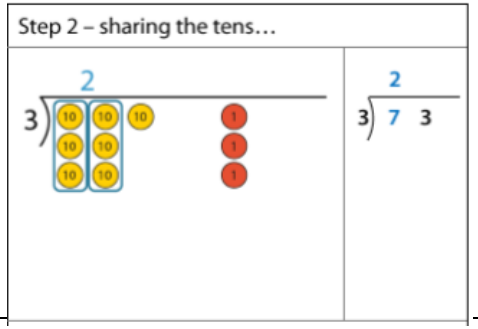


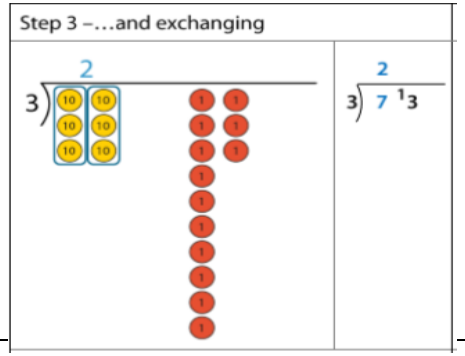


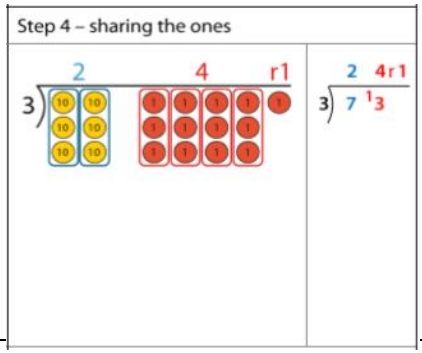


Short Division with remainder









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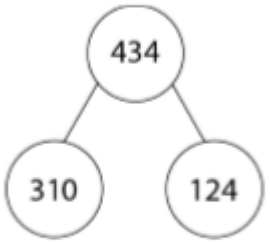
Dividing by 2-digits:

434 ÷ 31 =

Partitioning



310 ÷ 31 = 10
124 ÷ 31 = 4
434 ÷ 31 = 14

Short division

$$\begin{array}{r} 0\ 1\ 4 \\ 31\overline{)\,4\ {}^{4}3\ {}^{12}4} \end{array}$$

Long division

$$\begin{array}{r} 0\ 1\ 4 \\ 31\overline{)\,4\ 3\ 4} \\ \underline{3\ 1\ \downarrow} \\ 1\ 2\ 4 \\ \underline{1\ 2\ 4} \\ 0 \end{array}$$

Dividing by 2-digits with remainder: Long division

354 ÷ 15 =

Remainders should be rounded as appropriate to the context.

In some cases, the decimal and proper fraction remainder are both appropriate.

$\begin{array}{r} 2\ 3\ \text{r}\,9 \\ 15\overline{)\,3\ 5\ 4} \\ 3\ 0 \\ \underline{\quad 5\ 4} \\ 4\ 5 \\ \underline{\quad\ 9} \end{array}$	$\begin{array}{r} 2\ 3\ \frac{9}{15} \\ 15\overline{)\,3\ 5\ 4} \\ 3\ 0 \\ \underline{\quad 5\ 4} \\ 4\ 5 \\ \underline{\quad\ 9} \end{array}$	$\begin{array}{r} 2\ 3.6 \\ 15\overline{)\,3\ 5\ 4.0} \\ 3\ 0 \\ \underline{\quad 5\ 4} \\ 4\ 5 \\ \underline{\quad\ 9\ 0} \\ 9\ 0 \\ \underline{\quad\ 0} \end{array}$
So, 354 ÷ 15 = 23 r 9	$\frac{9}{15} = \frac{3}{5}$ So, $354 \div 15 = 23\frac{3}{5}$	So, 354 ÷ 15 = 23.6

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Calculation Policy: Guidance

Many of the representations in this policy have been taken from the NCETM Primary Mastery Materials and from the White Rose Maths Calculation policy. As some calculation methods are applicable to more than one year group, this policy instead details the progression in calculation skills and representations. The table below highlights where methods fit with the requirements of the National Curriculum.

	EYFS/ Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Addition	Combining 2 parts to make a whole. Counting on using number lines. Regrouping to make 10.	TO + O using base 10 TO + TO using base 10	Using base 10 and place value counters (up to 3-digits). Column method - Regrouping	Using base 10 and place value counters (up to 4-digits). Column method - Regrouping	Column method – Regrouping Adding decimals using place value counters.	Column method – Abstract methods Adding decimals
Subtraction	Taking away ones Counting back Finding the difference	Counting back Finding the difference Bridging 10 TO – TO using base 10	Column method with exchange using base 10. Column Method using place value counters (up to 3-digits).	Column method with exchange (up to 4-digits).	Column method – Abstract method for whole numbers. Begin to subtract decimals using place value counters.	Column Method – Abstract methods Subtract decimals
Multiplication	Repeated addition/Repeated grouping. Number lines to show repeated groups.	Arrays (to illustrate commutativity).	TO x O using arrays and partitioning with concrete materials. 2-digit x 1-digit using base 10, Numicon	Column multiplication -introduce with base 10/place value counters. 2-and 3-digit x 1digit	Column multiplication Abstract (but begin with Year 4 methods if needed) Up to 4-digit x 1 or 2 digits	Column multiplication Abstract methods

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Division	Sharing using a range of objects.	Repeated subtraction (equal groups).	Sharing using place value counters or base 10. Division with a remainder – using concrete materials.	Short division – no remainder. Short division with remainder (up to 3-digit by 1- digit – concrete and pictorial).	Short division with remainder (up to 4-digit by 1- digit).	Short division Long division – dividing by 2-digits, including remainders.