

Calculation Policy

Alexander McLeod Primary School

Mathematics at Alexander McLeod Primary School: mission statement

'Mathematics is a creative and highly inter-connected discipline essential to everyday life. A high-quality mathematics education provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject' - National Curriculum, 2014

At our school, we aim to meet the National Curriculum objectives by providing an engaging and contextualised mathematics curriculum which enables all children to succeed. We have adopted aspects from the White Rose Hub's calculation framework, which we adapt and use in combination with our own Mathematics Policy.

Our aims:

- To deliver a relevant and ambitious curriculum that supports our pupils to understand how and when to use the calculation methods taught.
- To provide an inclusive and safe environment that equips all children, including those with special educational needs and/or disabilities, to unlock their full potential.
- To adequately prepare children for the next stage of their educational journey.
- To provide opportunities for children to demonstrate mastery in each area of calculation.

Understanding of number

At our school, we believe that children need a firm understanding of number in order to be successful mathematicians. Therefore, we prioritise number skills and application of number from the very start of each academic year. Each unit of mathematics is planned to support a deeper understanding of mathematical concepts in order that children can use and apply the skills they learn in problem-solving activities and real-life contexts.

The journey to written methods

This policy is set out in calculation areas: addition, subtraction, multiplication and division. Within each specific area there is a progression of strategies for encouraging a sound understanding of the mathematical concept before teaching the formal written methods. The calculation strategies that are outlined reflect this ideology. The initial emphasis is on mental strategies supported by concrete apparatus, pictorial representations and jottings. Once this understanding is secure, the children move on to written methods of calculation.

One very important aspect of our mathematics provision is that we strive to avoid misconceptions in calculation areas by only teaching formal written methods to children once they have mastered and demonstrated a clear understanding of the concept that underpins each calculation area.

Mastering Number

The journey to understanding mathematical calculations begins in EYFS for our children. In EYFS children use the Mastering Number programme from the NCTEM. This programme develops solid number sense, including fluency and flexibility with number facts, which will have a lasting impact on future learning for all children. The Mastering Number programme is used to cover Mathematics in the EYFS curriculum. In Year 1 and 2 it is used as a supporting programme separate from the maths lessons.

Addition

Key vocabulary:

add, more, plus, and, make, sum, altogether, increase, total, count on

Our addition journey

Counting groups of concrete objects.
How many are there? Let me give you three more. How many do you have now?

Creating parts using concrete objectives to make a whole.

Consolidating understanding by using pictorial representations such as part- Whole model and Singapore bar chart.

Using the number bonds method of addition

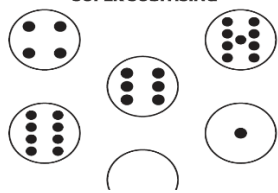


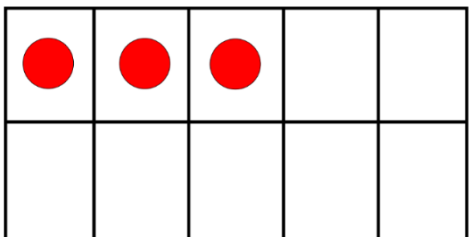
$$\begin{aligned} 36 + 26 &= \\ 6 + 4 &= 10 + 2 = 12 \\ 30 + 20 &= 50 \\ 50 + 12 &= 62 \end{aligned}$$

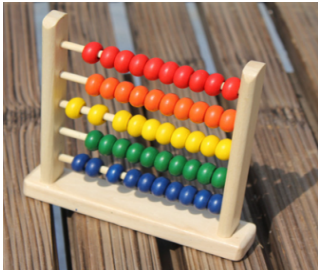
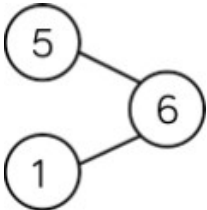
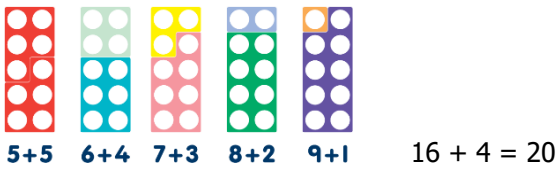

Using the expanded column method

Using the column method (this is the **formal written method** for addition)

Addition in EYFS

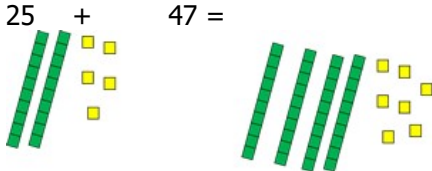
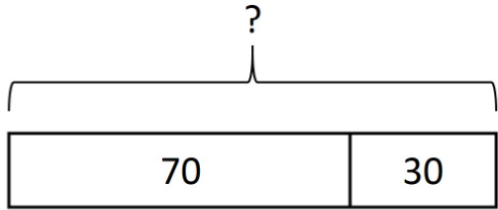
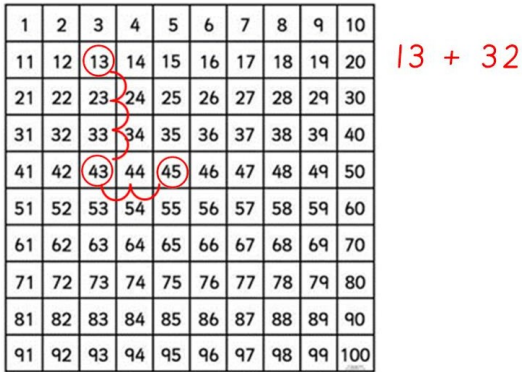
- Read and write numbers in numerals from 0 to 9. Count to 20, demonstrating that the next number in the count is one more and the previous number is one less.
- Demonstrate an understanding that the number of objects remains the same when they are rearranged, providing nothing has been added or taken away.
- Demonstrate an understanding that the total number of objects changes when objects are added or taken away
- Identify how many objects there are in a group of up to 10 objects, recognising smaller groups on sight and counting the objects in larger groups up to 10.
- Use real-life materials (e.g. apples or crayons) to add and subtract 1 from a group of objects and indicate how many are now present

Method	Example / representation
Children learn the skill of subitising to support their understanding of number.	<p style="text-align: center;">SUPER SUBITISING</p> 
Using a range of concrete objects, children develop their understanding of addition through counting activities	<p>How many bears are there?</p>  <p>What about if I give you two more? How many are there now?</p> 
Children use die-frames and ten-frames to add numbers to 10, placing counters and objects on the frame.	

Addition in Year 1	
Method	Example / representation
<ul style="list-style-type: none"> • Read, write and interpret mathematical statements involving addition using equals signs. • Represent and use number bonds within 20. • Add one-digit and two-digit numbers to 20, including zero. • Solve one-step problems that involve addition, using concrete objects and pictorial representations, and missing number problems. 	
Children use beads and counting sticks to help them to create parts to add	
Children's understanding of the concept of addition is supported using part-part-whole diagrams	
Children's understanding of number bonds is supported with pictorial representations and practical resources	
Children use objects to help them add numbers together and then write corresponding simple number sentences using the add (+) and equals (=) signs	
Children to write addition number sentences about addition using concrete objects and pictorial resources to support.	$12 + 4 = 16$

Addition in Year 2

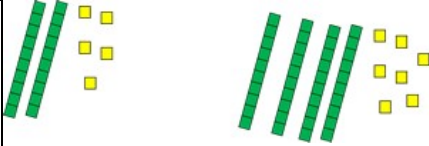
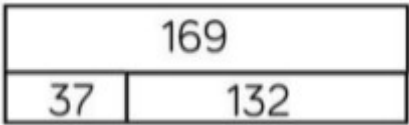
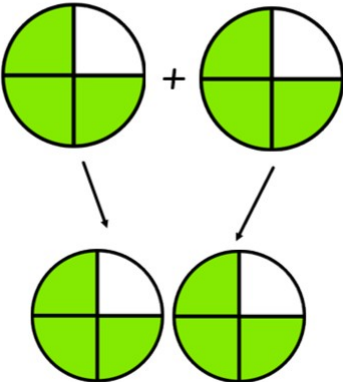
- Solve problems with addition: using concrete objects and pictorial representations, including those involving numbers, quantities and measures; applying their increasing knowledge of mental and written methods.
- Recall and use addition facts to 20 fluently, and derive and use related facts up to 100.
- Add numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and 1s, a two-digit number and 10s, 2 two-digit numbers and adding 3 one-digit numbers.
- Show that addition of 2 numbers can be done in any order (commutative) and subtraction of one number from another cannot.
- Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

Method	Example / representation
Children use concrete apparatus (such as dienes and place value counters) and pictorial representations to support their understanding of addition with two-digit numbers	$25 + 47 =$ 
Children's understanding of the concept of addition is supported using part-part-whole and Singapore bar model diagrams	
Children use hundred squares to support jumping in steps of 1 and 10	
<p>Number bond addition</p> <p>Children's formal method will use place value and number bonds to support addition.</p>	$25 + 32 =$ $5 + 2 = 7$ $20 + 30 = 50$ $50 + 7 = 57$ $36 + 26 =$ $6 + 4 = 10 + 2 = 12$ $30 + 20 = 50$ $50 + 12 = 62$

Addition in Year 3

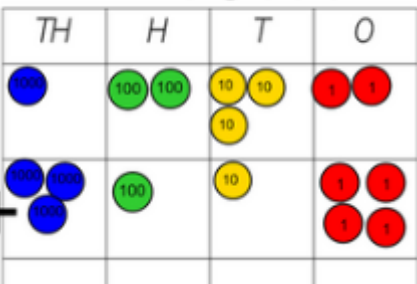
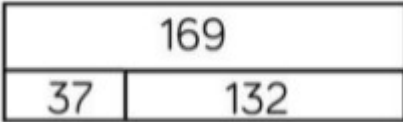
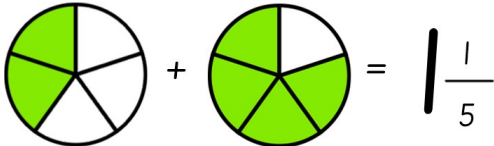
- Add numbers mentally, including:
 - i. a three-digit number and 1s
 - ii. a three-digit number and 10s
 - iii. a three-digit number and 100s
- Add numbers with up to 3 digits, using formal written methods of columnar addition and.
- Estimate the answer to a calculation and use inverse operations to check answers.
- Solve problems, including missing number problems, using number facts, place value, and more complex addition.

Method	Example / representation				
Children use concrete apparatus (such as dienes and place value counters) and pictorial representations to support their understanding of addition with 2-digit and 3-digit numbers	 $25 + 47$				
Children use visual representations (such as part-part-whole diagrams or Singapore bar) to support their understanding of the concept of addition	<table border="1" style="margin: auto;"> <tr> <td colspan="2" style="text-align: center;">169</td> </tr> <tr> <td style="text-align: center;">37</td> <td style="text-align: center;">132</td> </tr> </table> $169 = 37 + 132$	169		37	132
169					
37	132				
Children use the expanded method to add numbers together	$ \begin{array}{r} 14 \\ + 22 \\ \hline 6 \quad (4 + 2) \\ 30 \quad (10 + 20) \\ \hline 36 \end{array} $				

Addition in Year 4	
	<ul style="list-style-type: none"> • Add numbers with up to 4 digits using the formal written methods of columnar addition where appropriate • Estimate and use inverse operations to check answers to a calculation • Solve addition two-step problems in contexts, deciding which operations and methods to use and why.
Method	Example / representation
Children use concrete apparatus (such as dienes and place value counters) and pictorial representations to support their understanding of addition with 2-digit and 3-digit numbers	 $25 + 47 =$
Children use visual representations (such as part-part-whole diagrams or Singapore bar) to support their understanding of the concept of addition	$169 = 37 + 132$ 
Children begin to use the formal written method of column addition <u>only once they are secure with the expanded method (see year 3)</u>	$\begin{array}{r} 9 \ 1 \ 4 \ 7 \\ + \ 2 \ 5 \ 3 \\ \hline 9 \ 4 \ 0 \ 0 \\ \hline \uparrow \ \uparrow \end{array}$ NB: Exchanging is marked BELOW
Children's understanding of addition with fractions (that have the same denominator) is supported with concrete and pictorial representations	$\frac{3}{4} + \frac{3}{4} = \frac{6}{4}$ 

Addition in Year 5

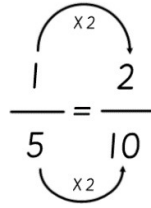
- Add whole numbers with more than 4 digits, including using formal written methods (columnar addition)
- Add numbers mentally with increasingly large numbers.
- Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.
- Solve addition multi-step problems in contexts, deciding which operations and methods to use and why.

Method	Example / representation
Concrete – place value counters	$1232 + 3114$ 
Children use visual representations (such as part-part-whole diagrams or Singapore bar) to support their understanding of the concept of addition	 $169 = 37 + 132$
Children use the formal written method of column addition including for adding decimal numbers	$\begin{array}{r} 1479.47 \\ + 253.18 \\ \hline 1404.465 \\ \hline \quad + \quad + \quad + \end{array}$ <p>NB: Exchanging is marked BELOW</p> $\begin{array}{r} 91.47 \\ + 2.53 \\ \hline 94.00 \\ \hline \quad + \quad + \end{array}$
Children's understanding of addition with fractions is supported with concrete and pictorial representations	

Calculation Policy

Children add together fractions with different denominators using their understanding of equivalent fractions

$$\frac{1}{5} + \frac{3}{10} =$$

$$\frac{1}{5} = \frac{2}{10}$$


$$\frac{2}{10} + \frac{3}{10} = \frac{5}{10}$$

Addition in Year 6	
Method	Example / representation
Concrete – Place value counters	
Children use the formal written method of column addition including for adding decimal numbers	$ \begin{array}{r} 1479.47 \\ + 253.18 \\ \hline 1404.465 \\ \begin{array}{l} \uparrow \uparrow \uparrow \\ \text{NB: Exchanging is marked BELOW} \end{array} \end{array} $ $ \begin{array}{r} 91.47 \\ + 2.53 \\ \hline 94.00 \\ \begin{array}{l} \uparrow \uparrow \end{array} \end{array} $
Children add or subtract fractions with different denominators using their understanding of equivalent fractions or by cross-multiplying where necessary	$ \begin{array}{l} \frac{4}{5} - \frac{2}{10} = \\ \times 2 \left(\frac{8}{10} - \frac{2}{10} = \frac{6}{10} \right) \end{array} $ $ \left(\frac{3}{4} + \frac{1}{7} \right) = \frac{21}{28} + \frac{4}{28} = \frac{25}{28} $

Subtraction

Key vocabulary:

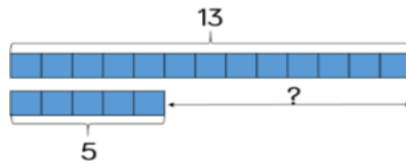
subtract, less, minus, take-away, difference, decrease, change, left over, count back, fewer

Our subtraction journey

Counting groups of concrete objects
How many are there? I'm going to take away two. How many do you have left?

Creating a whole and subtracting a part to create the missing part.

Using visual representations to show subtraction.



Using the number-bonds method of subtraction.

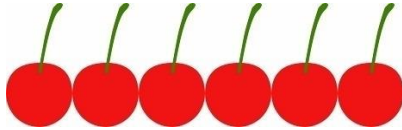

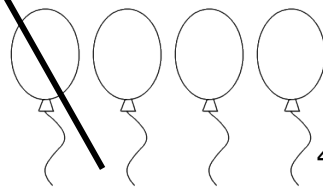
$$\begin{aligned} 63 - 15 &= \\ 63 - 10 &= 53 \\ 53 - 3 &= 50 - 2 = 48 \end{aligned}$$

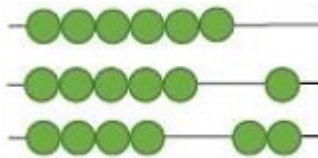
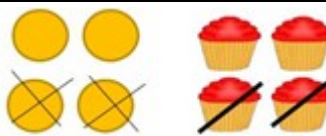
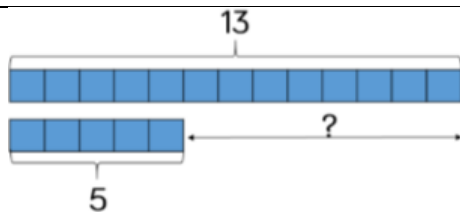
Using the expanded column method

Using the column method (this is the **formal written method** for subtraction)

Subtraction in EYFS

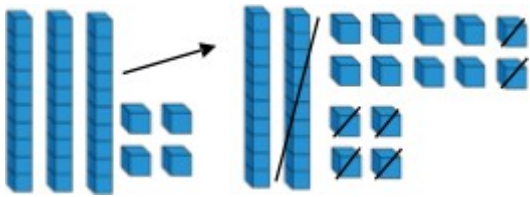
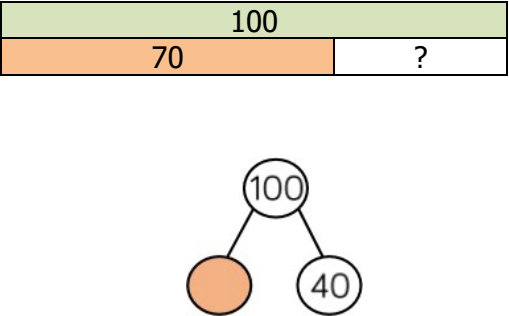
- Read and write numbers in numerals from 0 to 9. Count to 20, demonstrating that the next number in the count is one more and the previous number is one less.
- Demonstrate an understanding that the number of objects remains the same when they are rearranged, providing nothing has been added or taken away.
- Demonstrate an understanding that the total number of objects changes when objects are added or taken away
- Use real-life materials (e.g. apples or crayons) to add and subtract 1 from a group of objects and indicate how many are now present

<u>Method</u>	<u>Example / representation</u>
<p>Using a range of concrete objects, children develop their understanding of subtraction through counting activities</p>	<p>How many cherries are there?</p>  <p>What about if I eat four of them? How many are there left?</p> 
<p>Children begin to use jottings to help them solve subtraction problems, e.g. by drawing a set of objects and then crossing some off</p>	 <p>$4 - 1 = 3$</p>

<u>Subtraction in Year 1</u>	
<ul style="list-style-type: none"> • Read, write and interpret mathematical statements involving subtraction and equals signs. • Represent and use number bonds and related subtraction facts within 20. • Subtract one-digit and two-digit numbers to 20, including zero. • Solve one-step problems that involve subtraction, using concrete objects and pictorial representations, and missing number problems 	
<u>Method</u>	<u>Example / representation</u>
Children use beads and counting sticks to help them create a whole and remove a part.	 $6 - 0 = 6$ $6 - 1 = 5$ $6 - 2 = 4$
Children use jottings to help them solve subtraction problems, e.g. by drawing a set of objects and then crossing some off	 $4 - 2 = 2$
Children use objects to help them subtract numbers and then write corresponding simple number sentences using the subtract (-) and equals (=) signs	
Children use concrete objects and pictorial representations to support writing subtraction in number sentences.	$16 - 4 = 12$

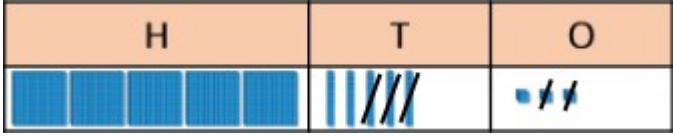
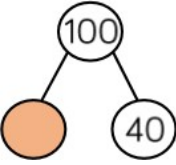
Subtraction in Year 2

- Solve problems with Subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measures; applying their increasing knowledge of mental and written methods.
- Recall and use subtraction facts to 20 fluently, and derive and use related facts up to 100.
- Subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and 1s, a two-digit number and 10s, 2 two-digit numbers.
- Show that addition of 2 numbers can be done in any order (commutative) and subtraction of one number from another cannot.
- Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

<u>Method</u>	<u>Example / representation</u>								
<p>Children use concrete apparatus (such as dienes and place value counters) and pictorial representations to support their understanding of subtraction with two-digit numbers</p>	 <p>Before After</p> <table border="1" data-bbox="837 1003 1173 1097"> <tr> <td>T</td> <td>O</td> <td>T</td> <td>O</td> </tr> <tr> <td>40, 30, 20, 10</td> <td>20, 10</td> <td>20, 10</td> <td>10</td> </tr> </table> <p>$43 - 22 = 21$</p>	T	O	T	O	40, 30, 20, 10	20, 10	20, 10	10
T	O	T	O						
40, 30, 20, 10	20, 10	20, 10	10						
<p>Children's understanding of the concept of subtraction is supported using part-part-whole and Singapore bar model diagrams</p>									
<p>Number bond subtraction</p> <p>Children's formal method will use place value and number bonds to support subtraction.</p>	<p> $63 - 21 =$ $63 - 20 = 43$ $43 - 1 = 32$ </p> <p> $63 - 15 =$ $63 - 10 = 53$ $53 - 3 = 50 - 2 = 48$ </p>								










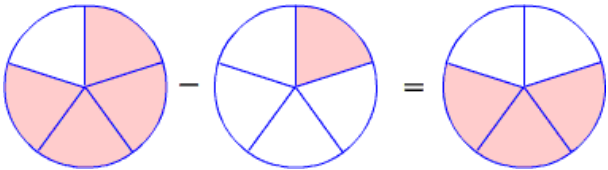
Subtraction in Year 3

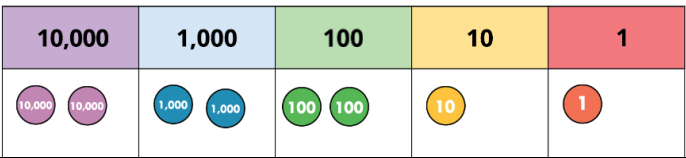
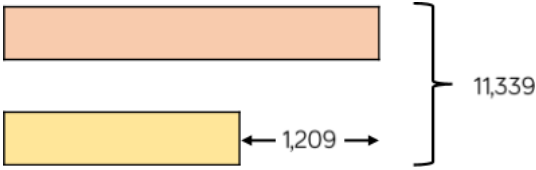
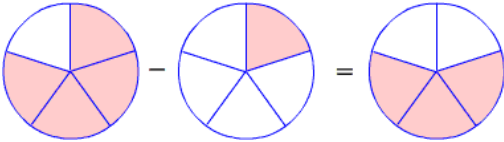
- Subtract numbers mentally, including:
 - iv. a three-digit number and 1s
 - v. a three-digit number and 10s
 - vi. a three-digit number and 100s
- Subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction.
- Estimate the answer to a calculation and use inverse operations to check answers.
- Solve problems, including missing number problems, using number facts, place value, and more complex subtraction.

<u>Method</u>	<u>Example / representation</u>
Children use concrete apparatus (such as dienes and place value counters) and pictorial representations to support their understanding of subtraction with 2-digit and 3-digit numbers	
Children use visual representations (such as part-part-whole diagrams or Singapore bar) to support their understanding of the concept of subtraction	
Children use the expanded method to subtract numbers	$ \begin{array}{r} 28 \\ - 12 \\ \hline 6 \quad (8 - 2) \\ 10 \quad (20 - 10) \\ \hline 16 \end{array} $

Subtraction in Year 4

- Subtract numbers with up to 4 digits using the formal written methods of columnar subtraction where appropriate
- Estimate and use inverse operations to check answers to a calculation
- Solve subtraction two-step problems in contexts, deciding which operations and methods to use and why.

<u>Method</u>	<u>Example / representation</u>						
C	<table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 33%; color: black;">H</td> <td style="width: 33%; color: black;">T</td> <td style="width: 33%; color: black;">O</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>	H	T	O			
H	T	O					
							
Children use visual representations (such as part-part-whole diagrams or Singapore bar) to support their understanding of the concept of subtraction	<table border="1" style="width: 100%; text-align: center;"> <tr> <td colspan="3" style="background-color: #d9e1f2;">8,435</td> </tr> <tr> <td style="background-color: #fce4d6;">367</td> <td style="background-color: #d9ead3;">579</td> <td style="background-color: #fff2cc;">?</td> </tr> </table>	8,435			367	579	?
8,435							
367	579	?					
Children begin to use the formal written method of column subtraction <u>only once they are secure with the expanded method (see year 3)</u>	$ \begin{array}{r} 52\overline{)814} \\ - 3125 \\ \hline 2159 \end{array} $						
Children's understanding of subtraction with fractions (that have the same denominator) is supported with concrete and pictorial representations							

Subtraction in Year 5	
Method	Example / representation
Concrete – Place value counters	
Children use visual representations (such as part-part-whole diagrams or Singapore bar) to support their understanding of the concept of subtraction and when solving problems	
Children use the formal written method of column subtraction including for subtracting decimal numbers	$\begin{array}{r} 0 \cancel{1} 3 \ 4 \ 8 \cancel{9} 17 \ 1 \ 2 \\ - \ 7 \ 1 \ 8 \ 9 \ 1 \ 0 \\ \hline 6 \ 3 \ 0 \ 8 \ 0 \ 2 \end{array}$ $\begin{array}{r} 5 \ 2 \ . \cancel{7} 8 \ 14 \\ - \ 3 \ 1 \ . \ 2 \ 5 \\ \hline 2 \ 1 \ . \ 5 \ 9 \end{array}$
Children's understanding of subtraction with fractions is supported with concrete and pictorial representations	

Calculation Policy

Children subtract fractions with different denominators using their understanding of equivalent fractions

$$\frac{9}{10} - \frac{1}{2} =$$

$$\frac{1}{2} = \frac{5}{10}$$

$$\frac{9}{10} - \frac{5}{10} = \frac{4}{10}$$

Subtraction in Year 6											
<ul style="list-style-type: none"> Solve subtraction multi-step problems in contexts, deciding which operations and methods to use and why Solve problems involving addition, subtraction, multiplication and division. Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. 											
Method	Example / representation										
Concrete – Place value counters	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="background-color: #d9ead3;">10,000</td> <td style="background-color: #d9ead3;">1,000</td> <td style="background-color: #d9ead3;">100</td> <td style="background-color: #d9ead3;">10</td> <td style="background-color: #d9ead3;">1</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	10,000	1,000	100	10	1					
10,000	1,000	100	10	1							
Children use visual representations (such as part-part-whole diagrams or Singapore bar) to support their understanding of the concept of subtraction and when solving problems	<p>11,339</p> <p>← 1,209 →</p>										
Children use the formal written method of column subtraction including for subtracting decimal numbers	$\begin{array}{r} 0 \cancel{1} 3 \ 4 \ 8 \cancel{1} 7 \ 1 \ 2 \\ - \ 7 \ 1 \ 8 \ 9 \ 1 \ 0 \\ \hline 6 \ 3 \ 0 \ 8 \ 0 \ 2 \end{array}$ $\begin{array}{r} 5 \ 2 \ . \cancel{7} 8 \ 1 4 \\ - \ 3 \ 1 \ . \ 2 \ 5 \\ \hline 2 \ 1 \ . \ 5 \ 9 \end{array}$										
Children add or subtract fractions with different denominators using their understanding of equivalent fractions or by cross-multiplying where necessary	$\begin{array}{l} \frac{4}{5} - \frac{2}{10} = \\ \times 2 \left(\frac{8}{10} - \frac{2}{10} = \frac{6}{10} \right) \end{array}$ $\left(\frac{3}{4} + \frac{1}{7} \right) = \frac{21}{28} + \frac{4}{28} = \frac{25}{28}$										

Multiplication

Key vocabulary:

count in 2s, 5s, etc., lots of, groups of, multiply, product, double, triple, times, multiple, factor, array

Our multiplication journey

Counting groups of the same number of concrete objects.
How many pairs of socks do you have? How many socks is that all together?

Counting in sequences and recognising multiples of 2, 5 and 10.

Multiplying using arrays:



$$5 \times 4 = 20$$
$$4 \times 5 = 20$$

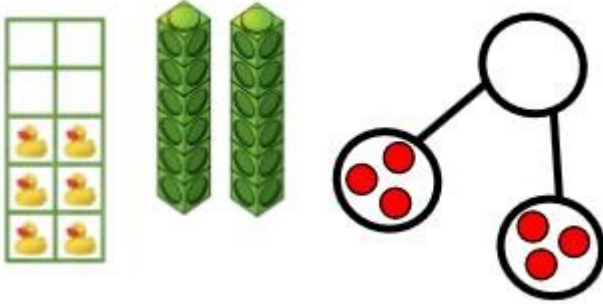
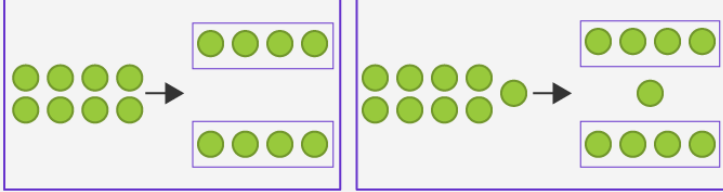
Using the grid method.

Using the expanded method for multiplication.

Using short and long multiplication (these are the **formal written methods** for multiplication)

Multiplication in EYES


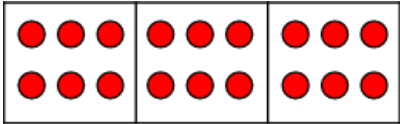



- Know that double means twice as many.
- Be able to halve amounts.
- Share a whole into groups.
- Be able to recognise odd and even numbers.

<u>Method</u>	<u>Example / representation</u>
<p>Children are given opportunities to build doubles using concrete objects as well as using pictorial representations to support their understanding of the concept of doubling</p>	
<p>Visual representations help children to understand that when halving, they share an amount into two <u>equal</u> groups</p>	

Multiplication in Year 1	
<ul style="list-style-type: none"> Solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. Count in multiples of twos, fives and tens. 	
Method	Example / representation
<p>Children count in groups of 2, 5 and 10</p> <p>They use pictures, bead strings and number lines to support their counting</p>	
<p>Children count equal groups using repeated addition</p>	<p>How many fingers altogether?</p>
<p>Children begin to make arrays by making equal groups and building them up in columns or rows</p> <p>They use a range of concrete and pictorial representations alongside sentence stems to support their understanding</p>	<p>There are ____ apples in each row. There are ____ rows. ____ + ____ + ____ = ____ There are ____ apples altogether.</p>
<p>Children explore doubling with numbers up to 20 to reinforce understanding that 'double' is twice as many as an amount</p> <p>Children show and explain what doubling means using concrete and pictorial representations</p>	




















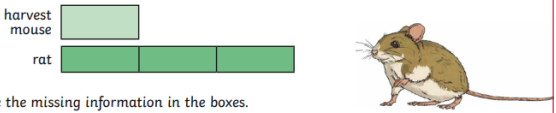


Multiplication in Year 2

- Recall and use multiplication facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.
- Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (\times) and equals (=) signs.
- Show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot.
- Solve problems involving multiplication, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

<u>Method</u>	<u>Example / representation</u>
Children recognise equal groups of concrete objects and use repeated addition to find the total amount	 <p>There are ___ equal groups. There are ___ cubes in each group. There are ___ cubes altogether.</p>
Children recognise and write the multiplication sign (\times) in calculations	 <p>$6 \times 3 = 18$</p>
Children's understanding of multiplication is supported by groups of concrete objects as well as pictorial representations Children use appropriate mathematical vocabulary to describe multiplication calculations	 <p>___ \times ___ = ___ lots of ___ = ___ multiplied by ___ =</p>
Children represent multiplication calculations using arrays and understand that multiplication can be carried out in any order (commutative)	 <p>$4 \times 2 = 8$</p> <p>$2 \times 4 = 8$</p>  <p>$5 \times 3 = 15$</p> <p>$3 \times 5 = 15$</p>



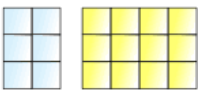
Multiplication in Year 3

- Recall and use multiplication facts for the 3, 4 and 8 multiplication tables
- Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.
- Solve problems, including missing number problems, involving multiplication, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.

Method	Example / representation																														
Children represent multiplication calculations using arrays and understand that multiplication can be carried out in any order (commutative)	 <p>$5 \times 3 = 15$</p> <p>$3 \times 5 = 15$</p>																														
Children use their understanding of repeated addition to represent a two-digit number multiplied by a one-digit number with concrete manipulatives	<table border="1" data-bbox="654 828 941 1075"> <thead> <tr> <th>Tens</th> <th>Ones</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table> <p>$21 \times 3 = 63$</p>	Tens	Ones																												
Tens	Ones																														
																															
																															
																															
Children learn to use the grid method to multiply numbers together by partitioning	<table border="1" data-bbox="654 1108 1396 1534"> <thead> <tr> <th></th> <th></th> <th>Tens</th> <th>Ones</th> <th></th> </tr> </thead> <tbody> <tr> <td></td> <td>X</td> <td>20</td> <td>3</td> <td>200</td> </tr> <tr> <td>Tens</td> <td>10</td> <td>200</td> <td>30</td> <td>100</td> </tr> <tr> <td>Ones</td> <td>5</td> <td>100</td> <td>15</td> <td>30</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td><u>+ 15</u></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>345</td> </tr> </tbody> </table>			Tens	Ones			X	20	3	200	Tens	10	200	30	100	Ones	5	100	15	30					<u>+ 15</u>					345
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Tens	10	200	30	100																											
Ones	5	100	15	30																											
				<u>+ 15</u>																											
				345																											
Children use their understanding of multiplication to help them solve scaling problems	 <p>harvest mouse </p> <p>rat </p> <p>Type the missing information in the boxes.</p> <p>The rat's tail is <input type="text"/> times longer than the tail of the harvest mouse.</p>																														


Multiplication in Year 4

- **Recall multiplication facts for multiplication tables up to 12×12 .**
- Use place value, known and derived facts to multiply mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers.
- Recognise and use factor pairs and commutativity in mental calculations.
- Multiply two-digit and three-digit numbers by a one-digit number using formal written layout.
- Solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

<u>Method</u>	<u>Example / representation</u>																							
<p>Children use the grid method to multiply numbers together by partitioning.</p> <p>Dienes to be used practically for concrete lessons.</p>	<p>$123 \times 12 = 1476$</p> <table style="float: right; margin-left: 20px;"> <tr><td>1000</td></tr> <tr><td>200</td></tr> <tr><td>200</td></tr> <tr><td>40</td></tr> <tr><td>30</td></tr> <tr><td>6</td></tr> <tr><td><hr style="width: 100%;"/></td></tr> <tr><td>1476</td></tr> </table> <table style="margin-left: 20px;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">X</td> <td style="border-right: 1px solid black; padding: 5px;">100</td> <td style="border-right: 1px solid black; padding: 5px;">20</td> <td style="padding: 5px;">3</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="border-top: 1px solid black; border-right: 1px solid black; padding: 5px;">10</td> <td style="border-top: 1px solid black; border-right: 1px solid black; padding: 5px;">1000</td> <td style="border-top: 1px solid black; border-right: 1px solid black; padding: 5px;">200</td> <td style="border-top: 1px solid black; padding: 5px;">30</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="border-top: 1px solid black; border-right: 1px solid black; padding: 5px;">2</td> <td style="border-top: 1px solid black; border-right: 1px solid black; padding: 5px;">200</td> <td style="border-top: 1px solid black; border-right: 1px solid black; padding: 5px;">40</td> <td style="border-top: 1px solid black; padding: 5px;">6</td> <td style="padding: 5px;"></td> </tr> </table>	1000	200	200	40	30	6	<hr style="width: 100%;"/>	1476	X	100	20	3		10	1000	200	30		2	200	40	6	
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<p>Children use the expanded method of multiplication</p>	<p style="text-align: center;"> $\begin{array}{r} 23 \\ \times 4 \\ \hline 12 \quad (3 \times 4) \\ + 80 \quad (20 \times 4) \\ \hline 92 \end{array}$ </p>																							
<p>Children are taught to multiply 3 numbers together using the idea that it doesn't matter how we group the numbers when we multiply</p> <p>Children learn the principles of the commutative, associative and distributive laws</p>	<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 20px;"> <p>  $2 \times 4 = \underline{\quad}$ $2 \times 4 = \underline{\quad}$ $2 \times 4 = \underline{\quad}$ </p> </div> <div style="margin-right: 20px;"> <p> $3 \times 2 \times 4 = 3 \times 8 = \underline{\quad}$ </p> </div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 20px;"> <div style="margin-right: 20px;"> <p>  $3 \times (2+4)$ </p> </div> <div style="margin-right: 20px;"> <p>=</p> </div> <div> <p>  $3 \times 2 + 3 \times 4$ </p> </div> </div>																							

Multiplication in Year 5

- Identify multiples and factors, including finding all factor pairs of a number, and common factors of 2 numbers
- Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
- Establish whether a number up to 100 is prime and recall prime numbers up to 19
- Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers
- Multiply and divide numbers mentally, drawing upon known facts
- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000
- Recognise and use square numbers and cube numbers, and the notation for squared (²) and cubed (³)
- Solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes
- Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign
- Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates
- Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.

<u>Method</u>	<u>Example / representation</u>																																								
Children use the formal written method of short multiplication	$\begin{array}{r} 124 \\ \times \quad 6 \\ \hline 744 \\ + \\ \hline \end{array}$ <p style="text-align: right;">NB: Exchanging is marked BELOW</p>																																								
Children learn the formal written method of long multiplication	$\begin{array}{r} 825 \\ \times \quad 13 \\ \hline 2475 \\ + 8250 \\ \hline 10725 \\ + \\ \hline \end{array}$ <p style="text-align: right;">NB: Exchanging is marked BELOW</p>																																								
Children learn to multiply whole numbers and those including decimals by 10, 100 and 1000 by moving the digits around a fixed decimal point on a place value grid	<table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="padding: 0 5px;">TTh</td><td style="padding: 0 5px;">Th</td><td style="padding: 0 5px;">H</td><td style="padding: 0 5px;">T</td><td style="padding: 0 5px;">U</td><td style="padding: 0 5px;">.</td><td style="padding: 0 5px;">$\frac{1}{10}$</td><td style="padding: 0 5px;">$\frac{1}{100}$</td> </tr> <tr> <td></td><td></td><td></td><td></td><td style="text-align: center;">3</td><td style="text-align: center;">.</td><td style="text-align: center;">5</td><td></td> </tr> <tr> <td></td><td></td><td></td><td style="text-align: center;">3</td><td style="text-align: center;">5</td><td style="text-align: center;">.</td><td></td><td></td> </tr> <tr> <td></td><td></td><td style="text-align: center;">3</td><td style="text-align: center;">5</td><td style="text-align: center;">0</td><td style="text-align: center;">.</td><td></td><td></td> </tr> <tr> <td></td><td style="text-align: center;">3</td><td style="text-align: center;">5</td><td style="text-align: center;">0</td><td style="text-align: center;">0</td><td style="text-align: center;">.</td><td></td><td></td> </tr> </table>	TTh	Th	H	T	U	.	$\frac{1}{10}$	$\frac{1}{100}$					3	.	5					3	5	.					3	5	0	.				3	5	0	0	.		
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With the use of materials and diagrams, children are supported to multiply fractions and mixed numbers by whole numbers	<div style="text-align: center;">  </div> $1\frac{1}{4} \times 2 = 2\frac{2}{4}$																																								

Multiplication in Year 6

- Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.
- Perform mental calculations, including with mixed operations and large numbers.
- Identify common factors, common multiples and prime numbers.
- Use their knowledge of the order of operations to carry out calculations involving the 4 operations.
- Solve problems involving addition, subtraction, multiplication and division.

<u>Method</u>	<u>Example / representation</u>
Children use the formal written method of short multiplication	$\begin{array}{r} 124 \\ \times \quad 6 \\ \hline 744 \\ + \\ \hline \end{array}$ <p>NB: Exchanging is marked BELOW</p>
Children learn the formal written method of long multiplication	$\begin{array}{r} 825 \\ \times \quad 13 \\ \hline 2475 \\ + 8250 \\ \hline 10725 \\ + \\ \hline \end{array}$ <p>NB: Exchanging is marked BELOW</p>
Children multiply decimal numbers by ignoring the decimal places in the question and putting them back into the answer afterwards	$1.24 \times 6 = 7.44$ $\begin{array}{r} 124 \\ \times \quad 6 \\ \hline 744 \\ + \\ \hline \end{array}$
Children multiply fractions together by first multiplying the numerators together, then multiplying the denominators together Children use their knowledge of factors and multiples to simplify their answers where necessary	$\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$

Division

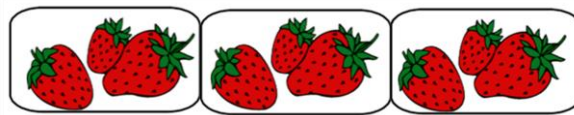
Key vocabulary:

Share between, lots of, groups of, divided by, divisible by, remainder, 'How many ___s are in ___?'

Our division journey

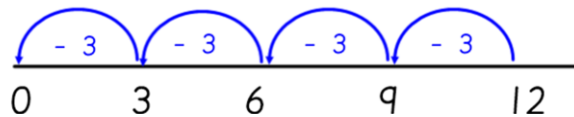
Sorting concrete objects into equal groups

Dividing by grouping:
 $9 \div 3 = 3$





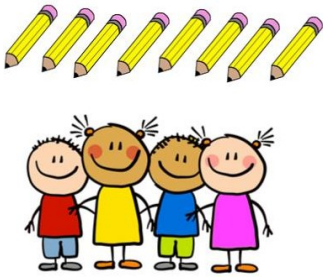
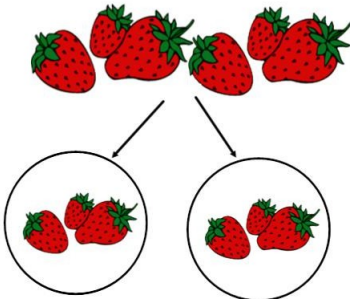
Dividing by repeated subtraction




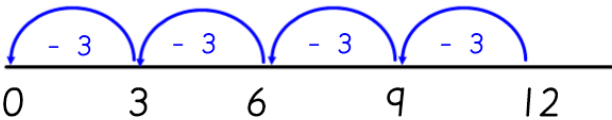
$$12 \div 3 = 4$$


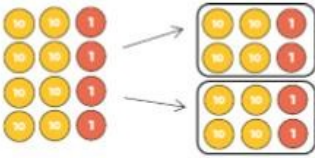
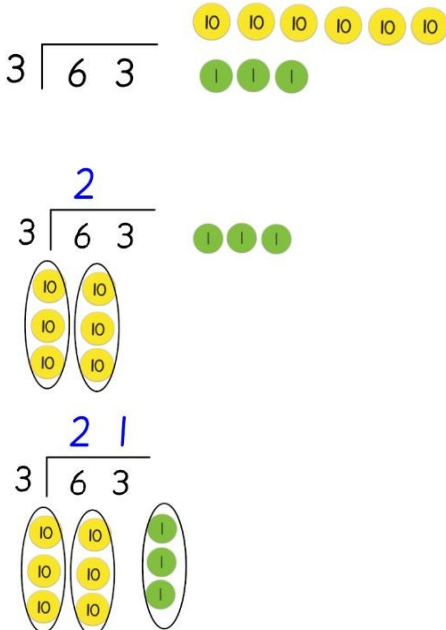


Using short and long division (these are the **formal written methods** for division)

<u>Division in EYFS</u>	
<ul style="list-style-type: none"> • Be able to halve amounts. • Share a whole into groups. 	
<u>Method</u>	<u>Example / representation</u>
Children experience early division by sharing objects and counting how many are in each group	 <p>Share the six cakes between two plates.</p>
Children use concrete objects to support their understanding of halving by sharing a whole amount into two equal groups	

<u>Division in Year 1</u>	
<ul style="list-style-type: none"> Solve one-step problems involving division by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. 	
<u>Method</u>	<u>Example / representation</u>
Children share concrete objects out in role-play scenarios	 <p>Share the pencils equally between the children. How many pencils does each child get?</p>
Children's understanding of the concept of division is supported with visual representations and use of appropriate mathematical vocabulary e.g. share	

<u>Division in Year 2</u>	
<ul style="list-style-type: none"> Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (\times), division (\div) and equals ($=$) signs. Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods and multiplication and division facts, including problems in contexts. Show that the multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot. 	
<u>Method</u>	<u>Example / representation</u>
Children share concrete objects into groups to support their understanding of the concept of division	<p>Share the 12 cubes equally into the two boxes.</p>  <p>There are ___ cubes altogether. There are ___ boxes. There are ___ cubes in each box.</p>
Children are taught to make links between division and multiplication and begin to understand the inverse relationship Children will recognise and write the divide sign (\div) in number sentences	 <p>I have ___ cubes altogether. There are ___ in each group. There are ___ groups.</p> <p>$\square \div \square = \square$ $\square \times \square = \square$</p>
Children are encouraged to make jottings to represent their division calculations	 <p>$12 \div 3 = 4$</p>
Children begin to divide on a number line using repeated subtraction	<p>$12 \div 3 = 4$</p> 

<u>Division in Year 3</u>	
<u>Method</u>	<u>Example / representation</u>
<ul style="list-style-type: none"> Recall and use division facts for the 3, 4 and 8 multiplication tables Write and calculate mathematical statements for division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods. Solve problems, including missing number problems, involving division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects. 	 <p> $5 \times 3 = 15$ $3 \times 5 = 15$ $15 \div 3 = 5$ $15 \div 5 = 3$ </p>
<p>Children’s understanding of how to divide two-digit numbers by one digit numbers by partitioning is supported by concrete resources and pictorial representations</p>	<p>$84 \div 2 = 42$</p> 
<p>Children begin to use the formal written method of short division (referred to as the ‘bus stop’ method) but always supported by appropriate resources</p>	 <p> $3 \overline{) 63}$ $10 \ 10 \ 10 \ 10 \ 10 \ 10$ $3 \overline{) 63}$ $1 \ 1 \ 1$ $3 \overline{) 63}$ $1 \ 1 \ 1$ $3 \overline{) 63}$ $1 \ 1 \ 1$ </p>

<u>Division in Year 4</u>	
<ul style="list-style-type: none"> • Recall division facts for multiplication tables up to 12×12. • Use place value, known and derived facts to and divide mentally. • Recognise and use factor pairs and commutativity in mental calculations. • Consolidate formal method of division. 	
<u>Method</u>	<u>Example / representation</u>
Children use concrete resources and visual representations to explore the concept of remainders	
Children use the formal written method of short division (referred to as the 'bus stop' method) and apply their knowledge of multiplication tables	$ \begin{array}{r} 131 \\ 3 \overline{) 423} \end{array} $
Children also encounter remainders when using the formal written method of short division	$ \begin{array}{r} 060 \text{ r}7 \\ 9 \overline{) 547} \end{array} $

<u>Division in Year 5</u>																																									
<u>Method</u>	<u>Example / representation</u>																																								
Children use the formal written method of short division (referred to as the 'bus stop' method) and apply their knowledge of multiplication tables	$ \begin{array}{r} 1824 \\ 3 \overline{) 5472} \\ \underline{15} \\ 9 \\ \underline{18} \\ 7 \\ \underline{21} \\ 0 \end{array} $																																								
Children use the formal written method of short division and begin to convert remainders to more accurate decimal answers	$ \begin{array}{r} 138r2 \\ 4 \overline{) 5426} \\ \underline{20} \\ 14 \\ \underline{12} \\ 26 \\ \underline{20} \\ 6 \end{array} $ $ \begin{array}{r} 138.5 \\ 4 \overline{) 5426.20} \\ \underline{20} \\ 14 \\ \underline{12} \\ 26 \\ \underline{20} \\ 60 \\ \underline{60} \\ 0 \end{array} $																																								
Children learn to divide whole numbers and those including decimals by 10, 100 and 1000 by moving the digits around a fixed decimal point on a place value grid	<table style="border-collapse: collapse; margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 0 10px;">TTh</td> <td style="padding: 0 10px;">Th</td> <td style="padding: 0 10px;">H</td> <td style="padding: 0 10px;">T</td> <td style="padding: 0 10px;">U</td> <td style="padding: 0 10px;">.</td> <td style="padding: 0 10px;">$\frac{1}{10}$</td> <td style="padding: 0 10px;">$\frac{1}{100}$</td> </tr> <tr> <td></td> <td style="text-align: center;">3</td> <td style="text-align: center;">5</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">.</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">3</td> <td style="text-align: center;">5</td> <td style="text-align: center;">0</td> <td style="text-align: center;">.</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td style="text-align: center;">3</td> <td style="text-align: center;">5</td> <td style="text-align: center;">.</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">3</td> <td style="text-align: center;">.</td> <td style="text-align: center;">5</td> <td></td> </tr> </table>	TTh	Th	H	T	U	.	$\frac{1}{10}$	$\frac{1}{100}$		3	5	0	0	.					3	5	0	.						3	5	.							3	.	5	
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<u>Division in Year 6</u>						
<u>Method</u>	<u>Example / representation</u>					
Children use the formal written method of short division and convert remainders to more accurate decimal answers	$ \begin{array}{r} 138 \text{ r}2 \\ 4 \overline{) 5426} \\ \underline{40} \\ 142 \\ \underline{120} \\ 220 \\ \underline{200} \\ 20 \end{array} $ $ \begin{array}{r} 138.5 \\ 4 \overline{) 5426.20} \\ \underline{40} \\ 142 \\ \underline{120} \\ 220 \\ \underline{200} \\ 20 \end{array} $					
Children learn to divide by two-digit numbers using the formal written method of long division	$ \begin{array}{r} 063 \\ 15 \overline{) 945} \\ \underline{-90} \\ 45 \\ \underline{-45} \\ 0 \end{array} $ <table style="margin-left: 150px;"> <tr><td>15</td></tr> <tr><td>30</td></tr> <tr><td>45</td></tr> <tr><td>60</td></tr> <tr><td>75</td></tr> </table>	15	30	45	60	75
15						
30						
45						
60						
75						
Children divide fractions using the KFC (Keep Flip Change) method Children know that whole numbers have a denominator of 1	$ \frac{5}{12} \div \frac{1}{4} = $ $ \frac{5}{12} \times \frac{4}{1} = \frac{20}{12} $					