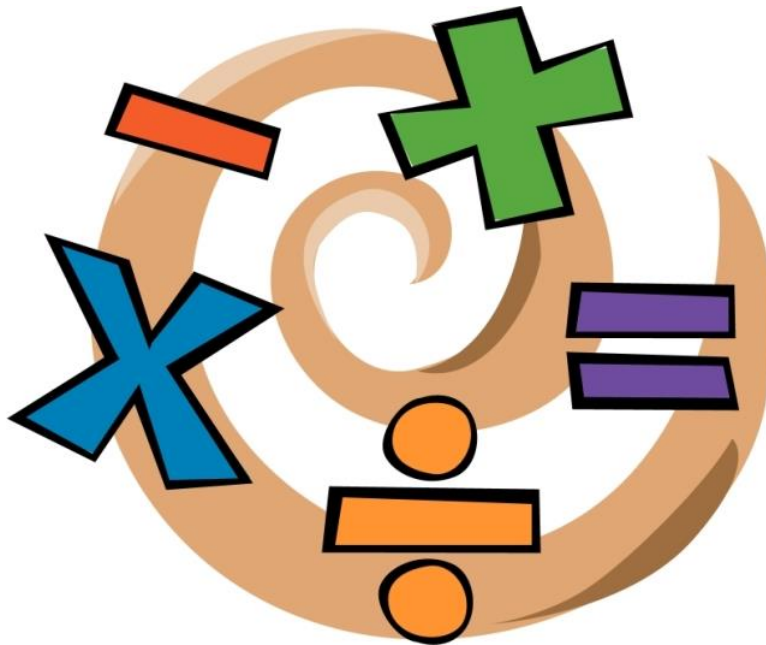




# **Rackheath Primary School**

## **Mathematics**

### **Calculations Policy**



**Aims of this policy:**

This policy outlines what we do at Rackheath Primary School to teach mental and written mathematical calculation. We support and extend children as needed in a range of ways using individual and group work in order to broaden, deepen and apply their calculation knowledge in order to prepare and skill our young people in everyday and real life situations. We achieve this through ensuring that our young people understand the different elements of mathematics. During each stage of the maths curriculum, children will use concrete, pictorial and abstract models to help embed the key skills.

Children should not move to the next year group's objects or methods as a way to extend; instead, mastery of the skill should be developed and the level of challenge through reasoning problems should be used.

**Vocabulary and technical/specific language and definition:**

Vocabulary builds as the children progress through the school. Technical, specific and correct vocabulary is used and modelled in all classes and children are encouraged to become familiar with the use of a range of vocabulary for all operations (+, -,  $\times$ ,  $\div$ ).

**Recording:**

All the time we are encouraging mental calculation as that ability to calculate "in your head" is an important part of mathematics. As calculations become more complex written methods become more important. Recording in mathematics, and in calculation in particular is an important tool and skill both for furthering the understanding of ideas and for communicating those ideas to others. A useful written method is one that helps children carry out a calculation and can be understood by others. Written methods are complementary to mental methods and should not be seen as separate from them. As a long term aim children should be able to choose an efficient method; mental, written, calculator- that is appropriate to a given task.

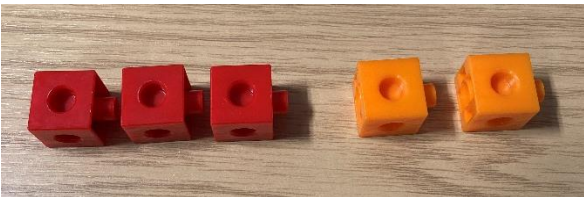
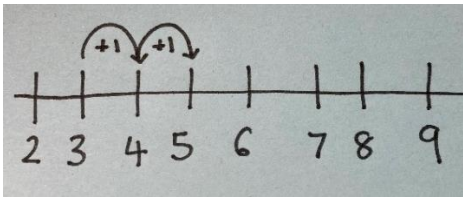
## Addition – EYFS

### Early Learning Goals:

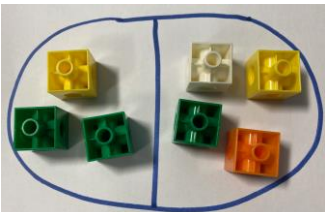
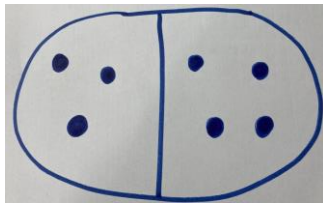
- Have a deep understanding of number to 10, including the composition of each number;
- Subitise (recognise quantities without counting) up to 5
- Automatically recall number bonds up to 5 and some number bonds to 10, including double facts.
- Verbally count beyond 20, recognising the pattern of the counting system
- Compare quantities up to 10 in different contexts, recognising when one quantity is greater than

**Key Vocabulary:** Add, more, and, make, sum, total, altogether, one more, two more..., how many more is..., equals

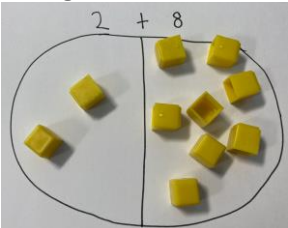
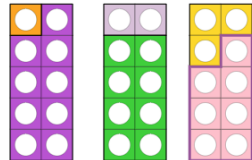
### Method: Counting on (starting with finding one more)

Concrete	Pictorial	Abstract
<b><math>3 + 2 = 5</math></b> 	<b><math>3 + 2 = 5</math></b> 	<p><i>In reception, children should be encouraged to use concrete and pictorial representations.</i>  <i>Followed by written calculation <math>3 + 2 = 5</math></i></p>

### Method: combining parts to make a whole

Concrete	Pictorial	Abstract
<b><math>3 + 4 = 7</math></b> 	<b><math>3 + 4 = 7</math></b> 	<p><i>In reception, children should be encouraged to use concrete and pictorial representations.</i>  <i>Followed by written calculation <math>3 + 4 = 7</math></i></p>

### Method: number bonds to 10

Concrete	Pictorial	Abstract
<b>Recognise number bonds to make 10</b> 	<b>Use Numicon to build blocks of 10.</b> 	<p><i>1 and 9 makes 10</i>  <i>2 and 8 makes 10</i>  <i>3 and 7 makes 10</i></p>


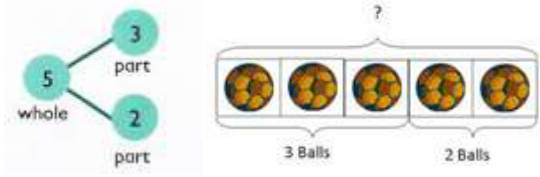
## Addition – Year 1

### Year 1 Statutory Requirements:


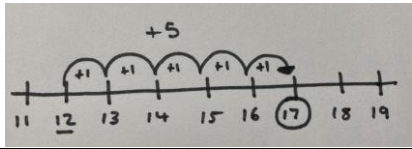
- Given a number, identifies one more
- Reads, writes and interprets mathematical statements involving addition (+)
- Represents and uses number bonds within 20
- Adds one-digit and two-digit numbers to 20, including zero
- Solves one-step problems that involve addition, using concrete objects and pictorial representations, and missing number problems

**Key Vocabulary:** Add, more, and, make, sum, total, altogether, one more, two more, 10 more..., plus, how many more is..., equals, double

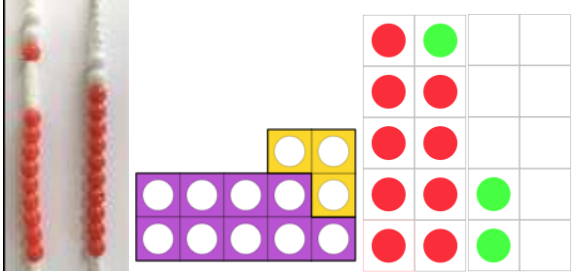
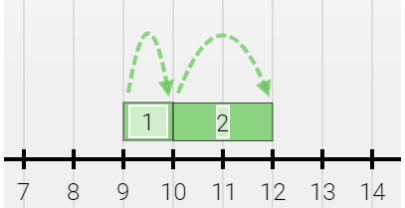
### Method: Combining parts to make a whole

Concrete	Pictorial	Abstract
<b><math>4 + 3 =</math></b> 		<b><math>2 + 3 = 5</math></b>  <b><math>5 = 2 + 3</math></b>

### Method: Counting on

Concrete	Pictorial	Abstract
<b><math>12 + 5</math></b> 	<b><math>12 + 5</math></b> 	<b><math>12 + 5 = 17</math></b> <b>(using fingers as an aid)</b> <b><math>17 = 12 + 5</math></b>

### Method: Regrouping to make 10s

Concrete	Pictorial	Abstract
 <b><math>(9 + 3)</math></b>	 <b><math>(9 + 3)</math></b>	<b><math>9 + 3</math> worked out as:</b> <b><math>9 + 1 = 10 + 2 = 12</math></b>

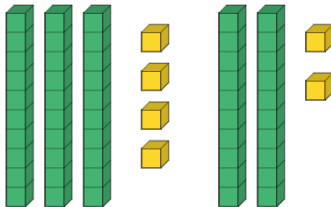
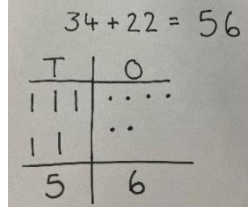
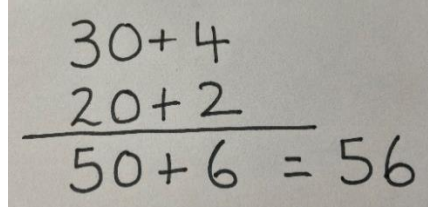
## Addition – Year 2

### Year 2 Statutory Requirements:

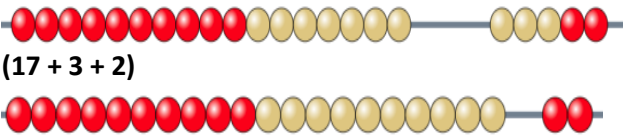
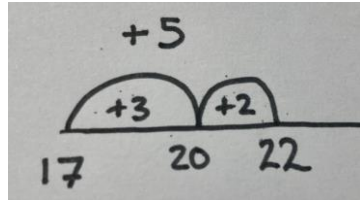
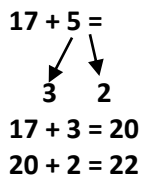
- solve problems with addition using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- applying their increasing knowledge of mental and written methods
- recall and use addition facts to 20 fluently, and derive and use related facts up to 100
- 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
- adding 3 one-digit numbers
- show that addition of 2 numbers can be done in any order (commutative)
- recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems

**Key Vocabulary:** add, addition, more, plus, make, sum, total, altogether, score, double, near double, one more, ten more... one hundred more, how many more to make...?, how many more is... than...?, how much more is...?, tens boundary

### Method: Adding Tens and Ones

Concrete	Pictorial	Abstract
<p><b><math>34 + 22 = 56</math></b></p>  <p>(Start by counting the ones)</p>	<p><b><math>34 + 22 = 56</math> (<math>56 = 34 + 22</math>)</b></p>  <p>(Start by counting the ones)</p>	<p><b><math>34 + 22 = 56</math> (<math>56 = 34 + 22</math>)</b></p>  <p>(Start by counting the ones)</p>

### Method: Counting on using a number line

<p><b><math>17 + 5</math></b></p>  <p>(<math>17 + 3 + 2</math>)</p>	<p><b><math>17 + 5 = 22</math></b></p> 	<p><b><math>17 + 5 =</math></b></p>  <p><math>17 + 3 = 20</math> <math>20 + 2 = 22</math></p>
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### Method: Using number bonds and tens frames

<p><b><math>28 + 6 = 34</math></b></p> 		<p><b><math>28 + 6 =</math></b></p>  <p><math>28 + 2 = 30</math> <math>30 + 4 = 34</math></p>
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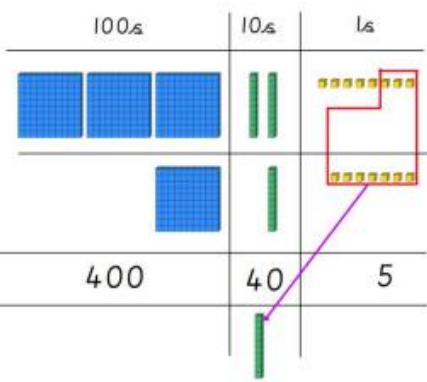
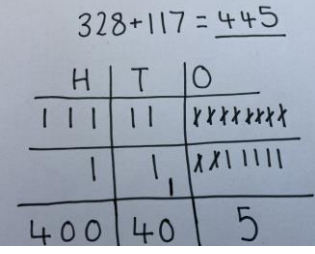
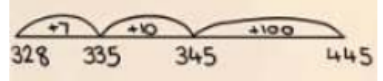
## Addition – Year 3

### Year 3 Statutory Requirements:

- add and subtract numbers mentally, including:
  - a three-digit number and 1s; a three-digit number and 10s; a three-digit number and 100s
- add numbers with up to 3 digits, using formal written methods of columnar addition
- 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
- add and subtract fractions with the same denominator within one whole

**Key Vocabulary:** add, increase, total, plus, sum, more, altogether, column addition, estimate, inverse, double, near double, one more, ten more... one hundred more, how many more to make ...? How many more is... than ...? How much more is...?, ones, tens boundary, hundreds boundary, partition, **Exchanging**

**Method:** Use expanded column method with place value resources to support the conceptual understanding of adding numbers up to three digits.

Concrete	Pictorial	Abstract
<p><b>328 + 117 = 445</b></p>  <p>400      40      5</p> <p><b>Exchanging</b></p>	<p><b>328 + 117 = 445</b></p>  <p><i>Number line should still be taught where appropriate</i></p> 	<p><b>328 + 117 = 445</b></p> $  \begin{array}{r}  300 + 20 + 8 \\  + 100 + 10 + 7 \\  \hline  400 + 40 + 5 = 445  \end{array}  $ <p style="text-align: center; color: red;">10</p>

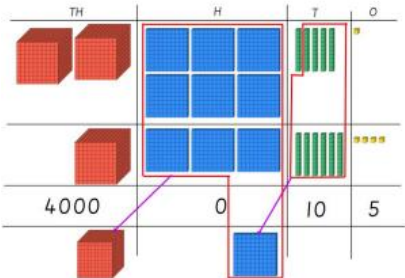
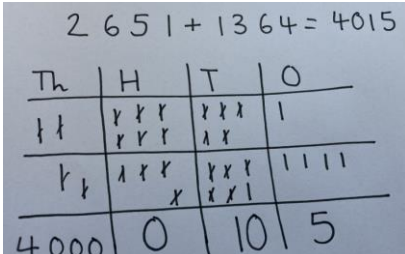
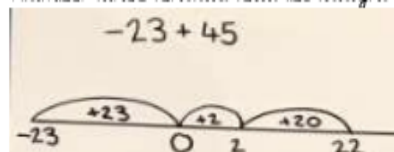
## Addition – Year 4

### Year 4 Statutory Requirements:

- add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
- estimate and use inverse operations to check answers to a calculation
- solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why
- add and subtract fractions with the same denominator

**Key Vocabulary:** add, addition, more, plus, increase, sum, total, altogether, score, double, near double, tens boundary, hundreds boundary, thousands boundary, inverse, **Exchanging**

**Method:** Use expanded column method with place value resources to support the conceptual understanding of adding numbers up to four digits.

Concrete	Pictorial	Abstract
<p><b>2651 + 1364 = 4015</b></p> 	<p><b>2651 + 1364 = 4015</b></p>  <p><i>Number line should still be taught where appropriate</i></p> 	<p><b>2651 + 1364 = 4015</b></p> $  \begin{array}{r}  2000 + 600 + 50 + 1 \\  + 1000 + 300 + 60 + 4 \\  \hline  4000 + 0 + 10 + 5 = 4015  \end{array}  $ <p><i>1000 100</i></p>

## Addition – Year 5

### Year 5 Statutory Requirements:

- 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
- add and subtract fractions with the same denominator, and denominators that are multiples of the same number

**Key Vocabulary:** Efficient written method, add, addition, more, plus, increase, sum, total, altogether, score, tens boundary, hundreds boundary, thousands boundary, units boundary, tenths boundary, inverse, partition, **Exchanging**

### Method: Expanded Column method

Concrete	Pictorial	Abstract
<p><b>2651 + 1364 = 4015</b></p>	<p><b>2651 + 1364 = 4015</b></p>	<p><b>2651 + 1364 = 4015</b></p>



## Addition – Year 6

### Year 6 Statutory Requirements:

- use their knowledge of the order of operations to carry out calculations involving the 4 operations
- solve addition multi-step problems in contexts, deciding which operations and methods to use and why
- solve problems involving addition
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy
- add fractions with different denominators and mixed numbers, using the concept of equivalent fractions

**Key Vocabulary:** order of operations, column addition, add, in total, answer, tens boundary, hundreds boundary, thousands boundary, millions boundary, units boundary, tenths boundary, hundredths boundary, decimal place, inverse, partition , **Exchanging**

### Method: Expanded Column method

Concrete	Pictorial	Abstract
<p><b>2651 + 1364 = 4015</b></p>	<p><b>2651 + 1364 = 4015</b></p>	<p><b>2651 + 1364 = 4015</b></p>

## Subtraction – EYFS

### Early Learning Goals:

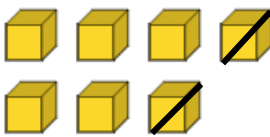
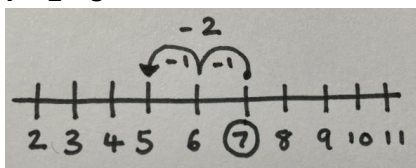
- Have a deep understanding of number to 10, including the composition of each number;
- Subitise (recognise quantities without counting) up to 5
- Automatically recall number bonds to 5 and some number bonds to 10, including double facts.
- Verbally count beyond 20, recognising the pattern of the counting system
- Compare quantities up to 10 in different contexts, recognising when one quantity is less than

**Key Vocabulary:** take away, subtract, One less, Two Less, fewer Take, give, how many less, left, less than.

### Method: Finding one Less

Concrete	Pictorial	Abstract
$6 - 1 = 5$ 	$6 - 1 = 5$	<i>In reception, children should be encouraged to use concrete and pictorial representations. Followed by written calculation <math>7 - 2 = 5</math></i>

### Method: Counting back (by taking away objects)

Concrete	Pictorial	Abstract
$7 - 2 = 5$ 	$7 - 2 = 5$ 	<i>In reception, children should be encouraged to use concrete and pictorial representations.</i>


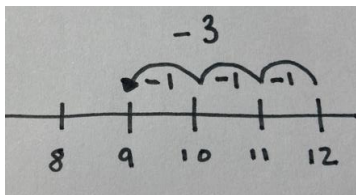
## Subtraction – Year 1

### Year 1 Statutory Requirements:


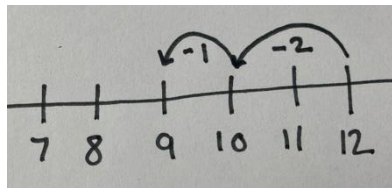
- Given a number, identifies one less
- Reads, writes and interprets mathematical statements involving subtraction (-)
- Represents and uses number bonds within 20
- Subtracts one-digit and two-digit numbers to 20, including zero
- Solves one-step problems that involve subtraction, using concrete objects and pictorial representations, and missing number problems

**Key Vocabulary:** subtract, less, take, make, sum, total, one less, two less, 10 less..., how many less is..., equals, half

### Method: Counting back (by taking away 1s)

Concrete	Pictorial	Abstract
<b><math>12 - 3 = 9</math></b> 	<b><math>12 - 3 = 9</math></b> 	<b><math>12 - 1 = 11 - 1 = 10 - 1 = 9</math></b>  <b>12, 11, 10, 9 (starting at 12 and counting back three using fingers)</b>

### Method: Taking away using number bonds

Concrete	Pictorial	Abstract
<b><math>12 - 3 = 9</math></b> <b>(Taking away 2 to get to 10 and then taking away the 1)</b> 	<b><math>12 - 3 = 9</math></b> 	<b><math>12 - 2 = 10</math></b> <b><math>10 - 1 = 9</math></b>

## Subtraction – Year 2

### Year 2 Statutory Requirements:

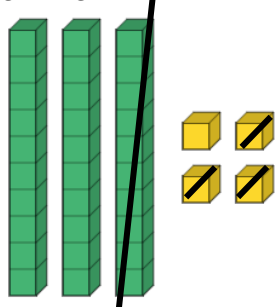
- solve problems with subtraction using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- applying their increasing knowledge of mental and written methods
- recall and use addition facts to 20 fluently, and derive and use related facts up to 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
- subtracting 3 one-digit numbers
- recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems

**Key Vocabulary:** subtract, less, take, minus, sum, total, one less, two less, 10 less..., how many less is..., equals, half, fewer

### Method:

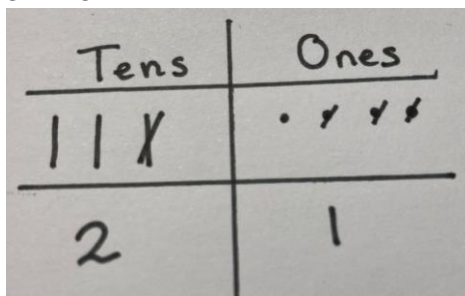
Concrete

$$34 - 13 = 21$$



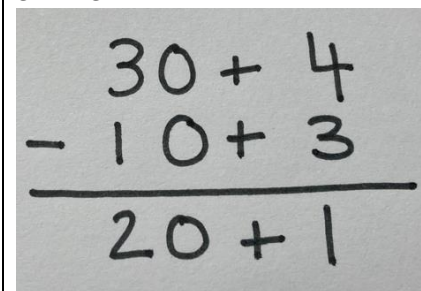
Pictorial

$$34 - 13 = 21$$



Abstract

$$34 - 13 = 21$$



### Method: Number line to count back

Concrete

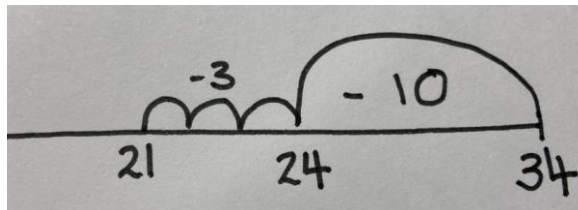
$$34 - 13 = 21$$



Start with 34 and remove tens and then ones

Pictorial

$$34 - 13 = 21$$



Abstract

$$34 - 13 = 34 - 10$$

$$24 - 3 = 21$$

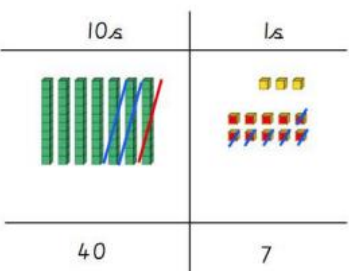
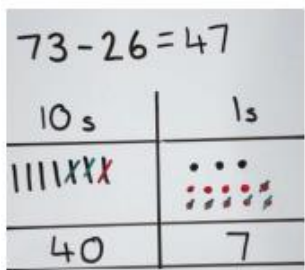
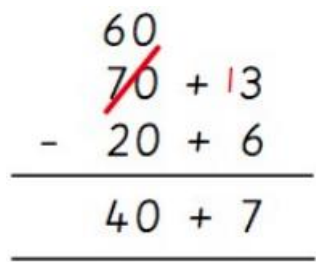
## Subtraction – Year 3

### Year 3 Statutory Requirements:


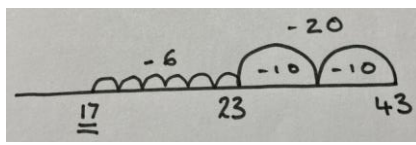
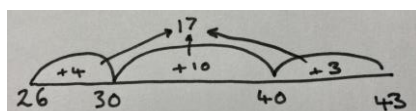
- add and subtract numbers mentally, including:
  - a three-digit number and 1s; a three-digit number and 10s; a three-digit number and 100s
- subtract numbers with up to 3 digits, using formal written methods of columnar subtraction
- estimate the answer to a calculation and use inverse operations to check answers
- solve problems, including missing number problems, using number facts, place value, and more complex subtraction
- add and subtract fractions with the same denominator within one whole

**Key Vocabulary:** subtract, decrease, less than, column subtraction, estimate, inverse, half, near half, one less, ten less... one hundred less, how many less to make ...? How many less is... than ...? How much more is...?, ones, tens boundary, hundreds boundary, partition, **Exchanging**

### Method: Partitioning subtraction

Concrete	Pictorial	Abstract
<p><b>73 – 26 = 47</b></p> <p><math>73 - 26 = 47</math></p> 	<p><b>73 – 26 = 47</b></p>  <p>(Write out the calculation and cross out as solve)</p>	<p><b>73 – 26 = 47</b></p> 

### Method: Number Line (counting back)

Concrete	Pictorial	Abstract
<p><b>43 – 26 = 17</b></p> 	<p><b>43 – 26 = 17</b></p>  	<p><b>43 – 26 = 43 – 20 = 23</b>  <b>23 – 6 = 17</b></p>

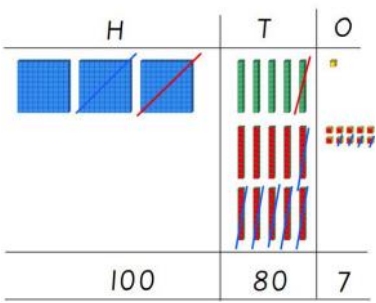
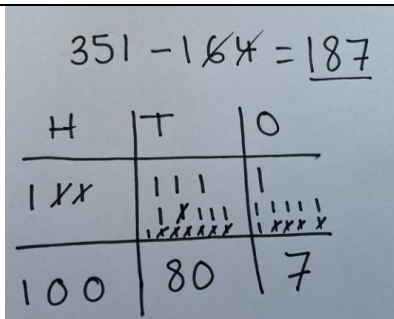
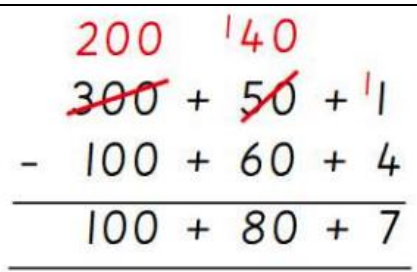
## Subtraction – Year 4

### Year 4 Statutory Requirements:

- add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
- estimate and use inverse operations to check answers to a calculation
- solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why
- add and subtract fractions with the same denominator

**Key Vocabulary:** subtract, decrease, less than, column subtraction, estimate, inverse, half, near half, one less, ten less... one hundred less, how many less to make ...? How many less is... than ...? how much more is...?, ones, tens boundary, hundreds boundary, partition, **Exchanging**

### Method: Expanded Subtraction

Concrete	Pictorial	Abstract												
<p><math>351 - 164 = 187</math></p>  <table border="1" style="margin-top: 10px; width: 100%;"> <thead> <tr> <th>H</th> <th>T</th> <th>O</th> </tr> </thead> <tbody> <tr> <td>100</td> <td>80</td> <td>7</td> </tr> </tbody> </table>	H	T	O	100	80	7	 <p style="text-align: center;"><math>351 - 164 = 187</math></p> <table border="1" style="margin-top: 10px; width: 100%;"> <thead> <tr> <th>H</th> <th>T</th> <th>O</th> </tr> </thead> <tbody> <tr> <td>100</td> <td>80</td> <td>7</td> </tr> </tbody> </table> <p><i>Number line should still be taught where appropriate</i>  <b>(Write out the calculation and cross out as solve)</b></p>	H	T	O	100	80	7	 $  \begin{array}{r}  200 + 30 + 1 \\  - 100 + 60 + 4 \\  \hline  100 + 80 + 7  \end{array}  $
H	T	O												
100	80	7												
H	T	O												
100	80	7												

## Subtraction – Year 5

### Year 5 Statutory Requirements:

- subtract whole numbers with more than 4 digits, including using formal written methods (columnar subtraction)
- subtract 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
- add and subtract fractions with the same denominator, and denominators that are multiples of the same number

**Key Vocabulary:** Efficient written method, subtract, decrease, less than, column subtraction, estimate, inverse, half, near half, one less, ten less... one hundred less, how many less to make ...? How many less is... than ...? how much more is...?, ones, tens boundary, hundreds boundary, partition, thousands boundary, millions boundary, tenths boundary, hundredths boundary, decimal place, inverse, partition, **Exchanging**

### Method: Formal Subtraction

Concrete	Pictorial	Abstract																								
<table><tr><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td>1</td><td>6</td><td>3</td><td>7</td></tr></table>	Th	H	T	O					1	6	3	7	<div>3264 - 1627 = 1637</div> <table><tr><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td>1</td><td>6</td><td>3</td><td>7</td></tr></table>	Th	H	T	O					1	6	3	7	<div><math display="block">\begin{array}{r} 3264 \\ - 1627 \\ \hline 1637 \end{array}</math></div>
Th	H	T	O																							
1	6	3	7																							
Th	H	T	O																							
1	6	3	7																							

## Subtraction – Year 6

### Year 6 Statutory Requirements:

- use their knowledge of the order of operations to carry out calculations involving the 4 operations
- solve subtraction multi-step problems in contexts, deciding which operations and methods to use and why
- solve problems involving subtraction
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy
- subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions

**Key Vocabulary:** order of operations, subtract, decrease, less than, column subtraction, estimate, inverse, half, near half, one less, ten less... one hundred less, how many less to make ...? How many less is... than ...? how much more is...?, ones, tens boundary, hundreds boundary, partition, thousands boundary, millions boundary, tenths boundary, hundredths boundary, decimal place, inverse, partition, **Exchanging**

### Method: Formal Subtraction

Concrete	Pictorial	Abstract



## Multiplication – EYFS

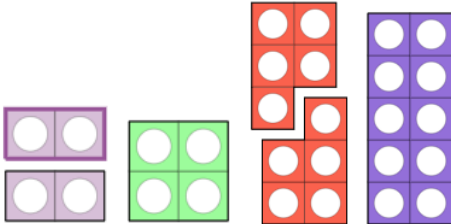
### Early Learning Goals:

- Explore and represent patterns within numbers up to 10, including evens and odds, double facts and quantities that can be distributed evenly.

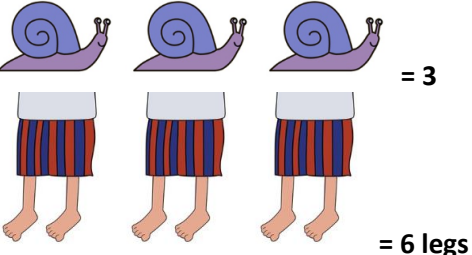
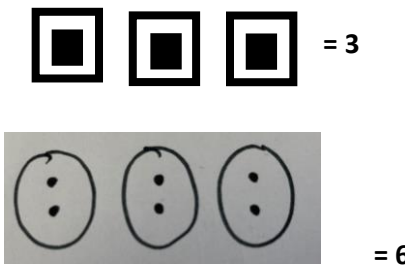
*All taught through games and role-play.*

**Key Vocabulary:** Sets of, groups, lots of.

### Method: Doubling

Concrete	Pictorial	Abstract
<p><b>Understanding that double means two of and then using concrete materials to find doubles up to 10</b></p> <p>The use of everyday objects to count with.</p>	<p><b>Understanding that double means two of and then using drawings to find doubles up to 10</b></p> 	<p><i>In reception, children should be encouraged to use concrete and pictorial representations.</i></p> <p><math>2 + 2 = 4</math></p>

### Method: Explore and represent patterns within numbers up to 10

Concrete	Pictorial	Abstract
<p><b>Use of stories and role play to explore</b></p> <p>Read 'One is a snail, 10 is a crab.'</p> 	<p><b>Through the use of outlines, children would be encouraged to draw on the correct number of dots and then count them.</b></p> 	<p><i>In reception, children should be encouraged to use concrete and pictorial representations.</i></p> <p><math>1 + 1 + 1 = 3</math></p> <p><math>2 + 2 + 2 = 6</math></p>

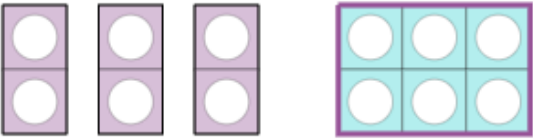
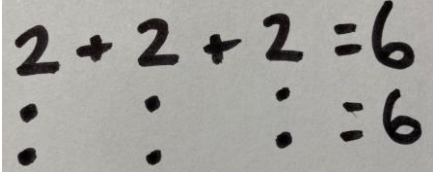
## Multiplication – Year 1

### Year 1 Statutory Requirements:

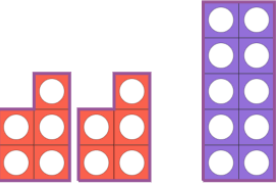
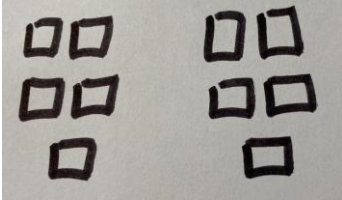
- Count in multiples of twos, fives and tens (to the 10th multiple).
- Solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

**Key Vocabulary:** Sets of, groups, lots of, array, multiplication, doubling, repeated addition

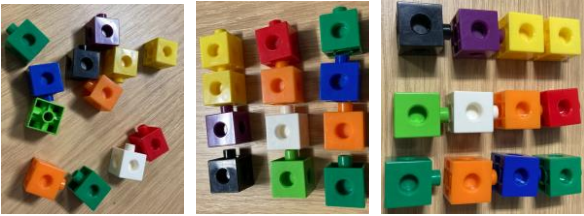
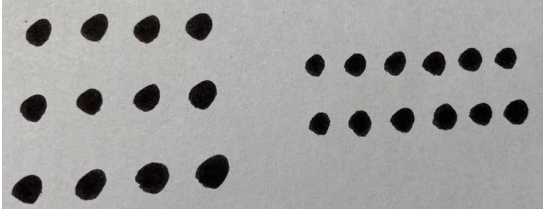
### Method: Repeated addition

Concrete	Pictorial	Abstract
<p><math>2 + 2 + 2 = 6</math></p> 	 <p>Drawing pictures to show the value and counting</p>	<p><math>2 + 2 + 2 = 6</math></p> <p>3 lots of 2 is the same as 6</p> <p><math>3 \times 2 = 6</math></p>

### Method: Doubling (numbers to 10)

Concrete	Pictorial	Abstract
<p><math>5 + 5 = 10</math> (double 5 is 10)</p> 	<p>Double 5 is 10</p> 	<p>Double 5 is 10</p> <p><math>5 + 5 = 10</math></p> <p><math>5 \times 2</math> is 10</p>

### Method: Building an array

Concrete	Pictorial	Abstract
<p><math>12 = 3</math> lots of 4 or 4 lots of 3</p> 	<p><math>12 = 3</math> lots of 4 or 4 lots of 3 (also 2 lots of 6 or 6 lots of 2)</p> 	<p><math>12 = 3 \times 4</math></p> <p><math>4 \times 3</math></p> <p><math>6 \times 2</math></p> <p><math>2 \times 6</math></p> <p><math>1 \times 12</math></p> <p><math>12 \times 1</math></p>

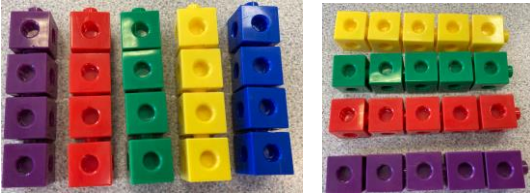
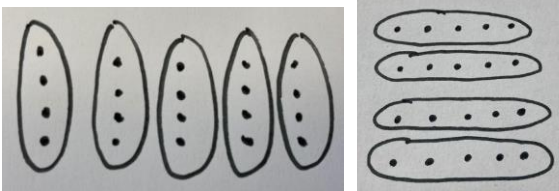
## Multiplication – Year 2

### Year 2 Statutory Requirements:

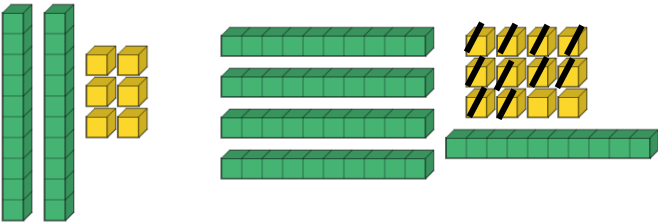
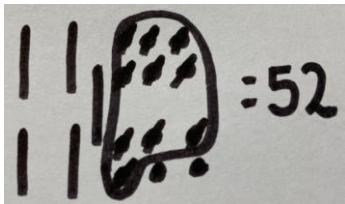
- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.
- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication ( $\times$ ), division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

**Key Vocabulary:** Sets of, groups, lots of, array, multiplication, doubling, repeated addition, **Exchanging**

### Method: Creating arrays

Concrete	Pictorial	Abstract
<b>5 x 4 (5 lots of 4)</b> 	<b>5 x 4 (same as 4 x 5)</b> 	<b>5 x 4 = 20 so</b> <b>4 x 5 = 20</b>

### Method: Doubling (using partitioning)

Concrete	Pictorial	Abstract
<b>26 x 2 = 52</b> 	<b>26 x 2 = 52</b> 	<b>26 x 2 = 52</b>  <b>20 x 2 = 40</b> <b>6 x 2 = 12</b>  <b>40 + 12 = 52</b>

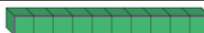








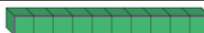








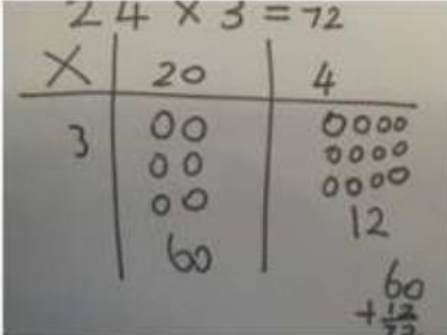
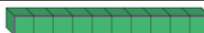








## Multiplication – Year 3

### Year 3 Statutory Requirements:

- Recall and use multiplication facts for the 3, 4 and 8 multiplication tables (continue to practise the 2, 5 and 10 multiplication tables).
- Count in steps of 4, 8, 50 and 100.
- 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 strategies and progressing to a formal written method.
- Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems, in which  $n$  objects are connected to  $m$  objects.

**Key Vocabulary:** Doubles, place value, near doubles, partitioning, ones, tens, hundreds, repeated addition, arrays, **Exchanging.**

### Method: Array Multiplication

Concrete	Pictorial	Abstract																										
<div>24 x 3</div> <table><tr><th>Tens</th><th>ones</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	Tens	ones													<div>24 x 3</div> 	<div>24 x 3</div> <table><tr><td>x</td><td>20</td><td>4</td></tr><tr><td>3</td><td>60</td><td>12</td></tr></table> <p>Represent through a bar to show part and whole.</p> <table><tr><td colspan="3">72</td></tr><tr><td>24</td><td>24</td><td>24</td></tr></table>	x	20	4	3	60	12	72			24	24	24
Tens	ones																											
																												
																												
																												
																												
																												
																												
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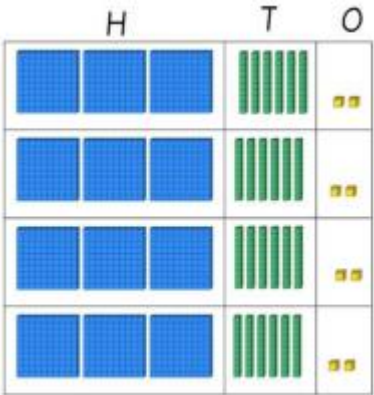
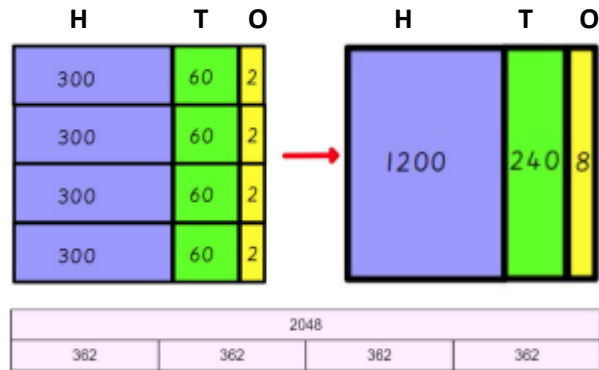
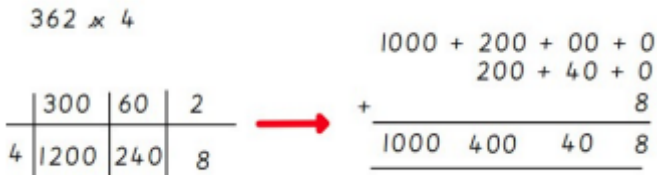
## Multiplication – Year 4

### Year 4 Statutory Requirements:

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

**Key Vocabulary:** Doubles, place value, near doubles, partitioning, ones, tens, hundreds, repeated addition, arrays, factors, product, **Exchanging**

### Method: Array Multiplication

Concrete	Pictorial	Abstract
<p>362 x 4</p> 	<p>362 x 4</p> 	<p>362 x 4</p> 

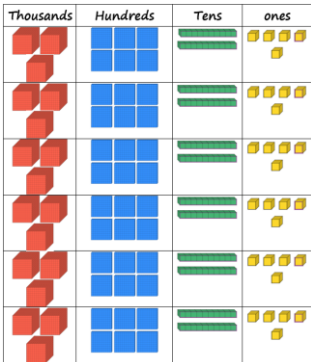
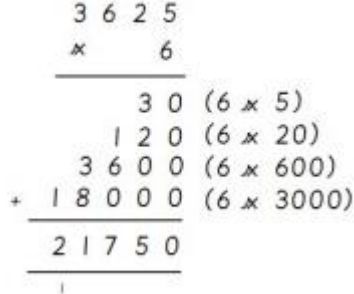
## Multiplication – Year 5

### Year 5 Statutory Requirements:

- Identify multiples and factors, including finding all factor pairs of a number, and common factors of two 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 mentally, drawing upon known facts.
- Multiply whole numbers and those involving decimals by 10, 100 and 1000.
- Recognise and use square numbers and cube numbers, as well as the notation for squared (2) and cubed (3).
- 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.
- Solve problems involving multiplication, including using their knowledge of factors and multiples, squares and cubes.
- Solve problems involving multiplication, including scaling by simple fractions and problems involving simple rates.

**Key Vocabulary:** Doubles, place value, near doubles, partitioning, ones, tens, hundreds, repeated addition, arrays, factors, product.

### Method: Formal Expanded Multiplication

Concrete	Pictorial	Abstract
<p><b>3625 x 6</b></p>  <p>Then using column addition to find an answer</p>	<p><b>3625 x 6</b></p> $  \begin{array}{r}  3625 \times 6 \\  3000 \times 6 = 18,000 \\  600 \times 6 = 3,600 \\  20 \times 6 = 120 \\  5 \times 6 = 30 \\  \hline  21,750  \end{array}  $	 <p>Once secure, can move onto compact method towards end of year 5</p>

## Multiplication – Year 6

### Year 6 Statutory Requirements:

- Perform mental calculations, including with mixed operations and large numbers.
- Multiply one-digit numbers, with up to two decimal places, by whole numbers.
- Identify common factors, common multiples and prime numbers.
- Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.
- 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.

**Key Vocabulary:** Doubles, place value, near doubles, partitioning, ones, tens, hundreds, repeated addition, arrays, factors, product.

### Method: Compact Formal Subtraction

Concrete	Pictorial	Abstract
<p><i>Children must be confident with abstract method from year 5 before moving on to a compact method or attempting multiplications such as 4-digit x 2 digit or 3 digit x 3 digit.</i></p>		<p><b>Compact formal multiplication</b></p> $  \begin{array}{r}  3625 \\  \times 26 \\  \hline  21750 \\  \phantom{21}3 \phantom{1} \phantom{7} \phantom{5} \phantom{0} \\  72500 \\  \phantom{72}5 \phantom{0} \phantom{0} \phantom{0} \\  \hline  94250  \end{array}  $

## Division – EYFS

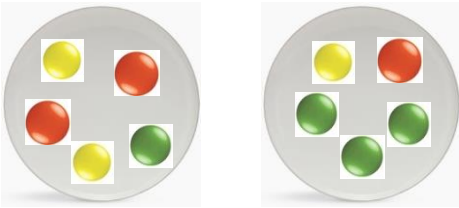
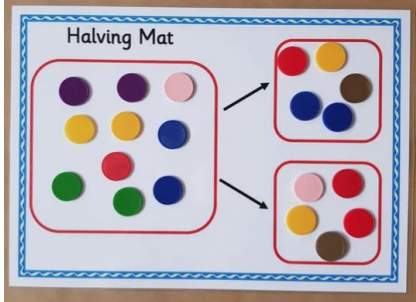
### Early Learning Goals:

- Explore and represent patterns within numbers up to 10, including evens and odds, double facts and quantities that can be distributed evenly.

*All taught through games and role-play.*

**Key Vocabulary:** Sharing, halving.

**Method:** Sharing

Concrete	Pictorial	Abstract
<p><b>What is half of 10?</b>  <i>Use of food and plates to get children to fairly share out the items.</i>  <i>e.g. 10 smarties a shared between two plates.</i>  <i>“One for you and one for me, one for...”</i></p> 	<p><b>What is half of 10?</b></p> 	<p><i>In reception, children should be encouraged to use concrete and pictorial representations.</i></p> <p><i>Some children may begin to remember keys facts and can recall from memory halves up to 10.</i></p>
Concrete	Pictorial	Abstract
<p><b>Method:</b> Sharing</p> <p><b>3 teddy bears are having a picnic. They have brought 6 sandwiches. How many would they each get?</b></p> <p><i>Children would use party bags and would use plastic food to role-play this scenario to imagine what is happening to get to an answer.</i></p>	<p><b>3 teddy bears are having a picnic. They have brought 6 sandwiches. How many would they each get?</b></p>	<p><i>In reception, children should be encouraged to use concrete and pictorial representations.</i></p>



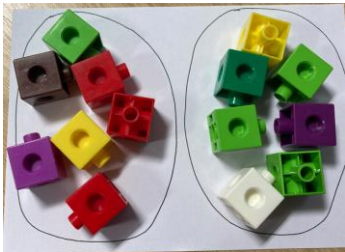
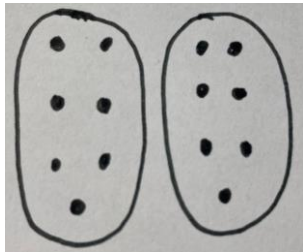
## Division – Year 1

### Year 1 Statutory Requirements:


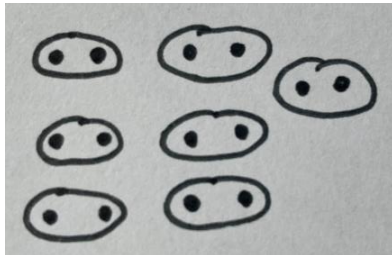
- Solve one-step problems involving division by calculating the answer, using concrete objects, pictorial representations and arrays with the support of the teacher.
- Count in multiples of twos, fives and tens (to the 10th multiple).

**Key Vocabulary:** Share, half, divide into, group

### Method: Sharing

Concrete	Pictorial	Abstract
<b><math>14 \div 2</math></b> 	<b><math>14 \div 2</math></b> 	<b>14 shared between 2 is 7</b>  <b>Also recorded as <math>14 \div 2 = 7</math></b>

### Method: Grouping

Concrete	Pictorial	Abstract
<b><math>14 \div 2</math></b> 	<b><math>14 \div 2</math></b> 	<b>14 grouped into 2s give us 7 groups</b>  <b>Also recorded as <math>14 \div 2 = 7</math></b>


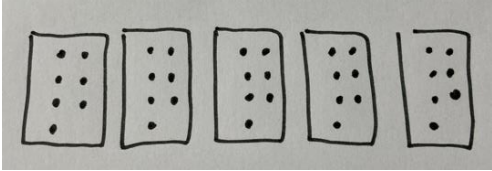
## Division – Year 2

### Year 2 Statutory Requirements:


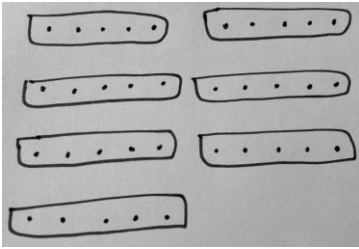
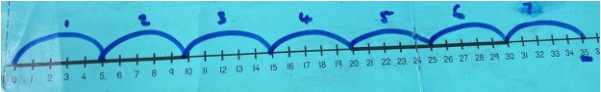
- Recall and use division facts for the 2, 5 and 10 multiplication tables.
- Solve problems involving division, using materials, arrays, repeated subtraction, mental methods, and multiplication and division facts, including problems in contexts.
- Calculate mathematical statements for division within the multiplication tables and write them using the division ( $\div$ ) and equals (=) signs.
- Show that division of one number by another is not commutative [i.e. can be done in any order].

**Key Vocabulary:** Partition, inverse, chunking, remainder, divide, group, share, grouping.

### Method: Sharing

Concrete	Pictorial	Abstract
<p><b><math>35 \div 5 = 7</math></b></p> 	<p><b><math>35 \div 5 = 7</math></b></p> 	<p><b><math>35 \div 5 = 7</math></b>  <b>35 shared between 5 is 7</b></p>

### Method: Grouping (moving into using a number line)

Concrete	Pictorial	Abstract
<p><b><math>35 \div 5 = 7</math></b></p> 	<p><b><math>35 \div 5 = 7</math></b></p>  	<p><b><math>35 \div 5 = 7</math></b>  <b>35 grouped into 5s gives us 7 groups</b></p>

## Division – Year 3

### Year 3 Statutory Requirements:

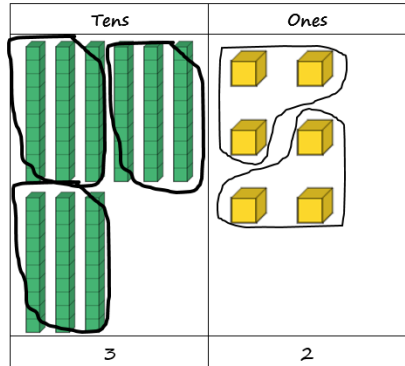
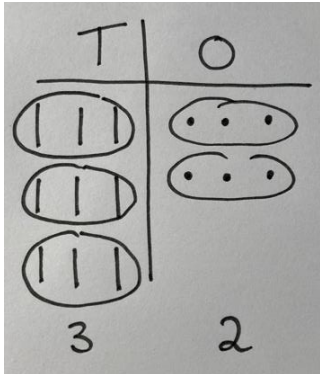
- Recall and use division facts for the 3, 4 and 8 multiplication tables.
- Write and calculate mathematical statements for division, using the multiplication tables that they know, including for 2 digit numbers divided by single-digit numbers, using mental strategies and progressing to formal written methods.
- Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems, in which n objects are connected to m objects.

**Key Vocabulary:** Remainder, divide, array, share / group, half.

### Method: Chunking

Concrete	Pictorial	Abstract
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### Method: Grouping

Concrete	Pictorial	Abstract
<b><math>96 \div 3 = 32</math></b> Set out the tens and ones and then try to put them into 'groups' that you are dividing by. With this method, you start by grouping the highest place value. 	<b><math>96 \div 3 = 32</math></b> 	<b><math>96 \div 3 = 32</math></b>  <b>(children should continue to use abstract and pictorial representations)</b>

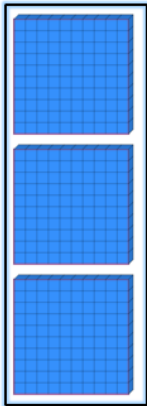
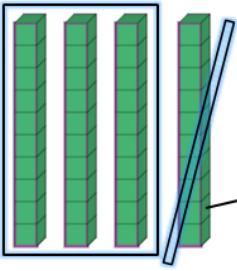
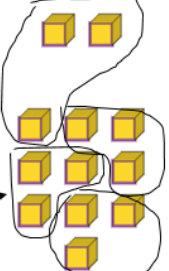
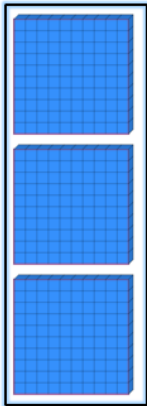
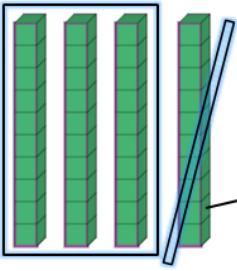
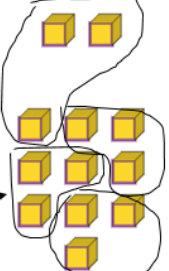
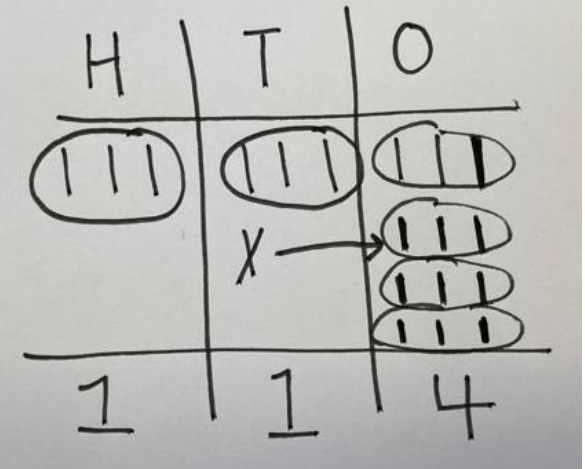
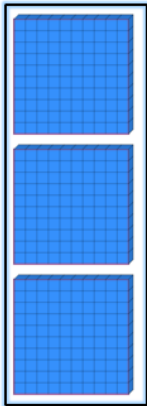
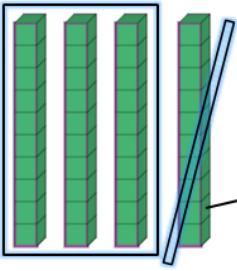
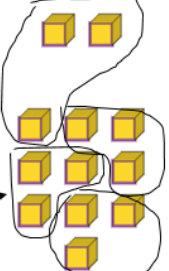
## Division – Year 4

### Year 4 Statutory Requirements:

- Recall division facts for multiplication tables up to  $12 \times 12$ .
- Use place value, known and derived facts to divide mentally, including dividing by 1.
- Recognise and use factor pairs in mental calculations.
- Divide two-digit and three-digit numbers by a one-digit number, using formal written layout.
- Solve problems involving division, integer scaling problems and harder correspondence problems, such as,  $n$  objects are connected to  $m$  objects.

**Key Vocabulary:** Divide by, quotient, inverse, partitioning, halving, factors, facts, array, chunking, remainder.

### Method:

Concrete	Pictorial	Abstract									
<p><b><math>342 \div 3</math></b> Set out the Hundreds, tens and ones and then try to put them into 'groups' that you are dividing by. With this method, you start by grouping the highest place value.</p> <table border="1"> <thead> <tr> <th>H</th><th>T</th><th>O</th></tr> </thead> <tbody> <tr> <td></td><td> (exchange the 10)</td><td></td></tr> <tr> <td>1</td><td>1</td><td>4</td></tr> </tbody> </table>	H	T	O		 (exchange the 10)		1	1	4	<p><b><math>342 \div 3</math></b> (put into groups of what you are dividing by)</p> 	<p><b><math>342 \div 3</math></b> (children should continue to use abstract and pictorial representations)</p>
H	T	O									
	 (exchange the 10)										
1	1	4									

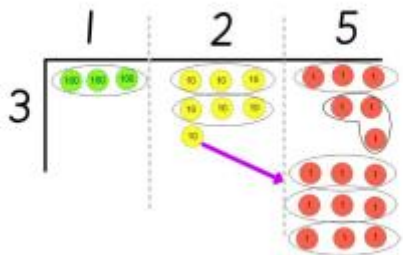
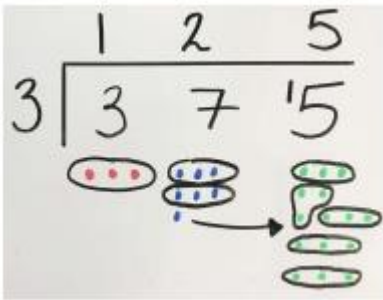
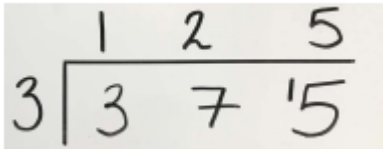
## Division – Year 5

### Year 5 Statutory Requirements:

- Divide numbers up to 4 digits by a one-digit number, using the formal written method of short division and interpret remainders appropriately for the context.
- Solve problems involving 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.

**Key Vocabulary:** Divide by, quotient, inverse, partitioning, halving, factors, facts, array, chunking, remainder.

### Method: Formal Division (Bus stop)

Concrete	Pictorial	Abstract
<p><math>375 \div 3 = 125</math></p> 		

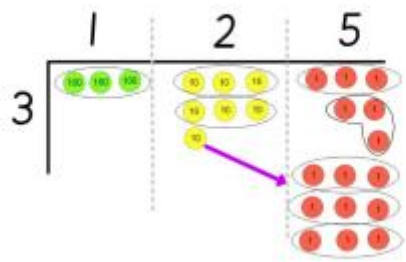
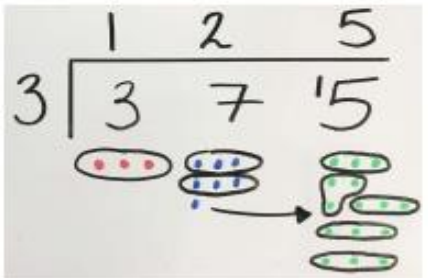
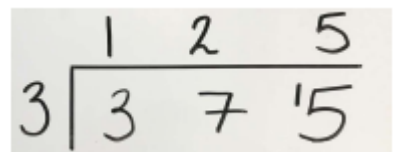
## Division – Year 6

### Year 6 Statutory Requirements:

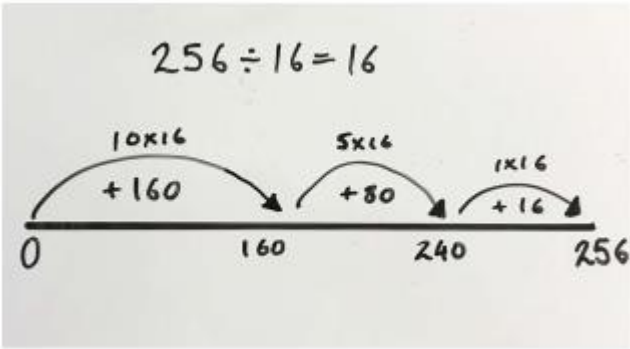
- Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context
- Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
- Perform mental calculations, including with mixed operations and large numbers
- Use their knowledge of the order of operations to carry out calculations involving the four operations
- 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.

**Key Vocabulary:** Divide by, quotient, inverse, partitioning, halving, factors, facts, array, chunking, remainder.

### Method: Formal Division (Bus stop)

Concrete	Pictorial	Abstract
<p><math>375 \div 3 = 125</math></p> 		

### Method: Chunking

Concrete	Pictorial	Abstract
	<p>When dividing by two digit numbers</p> 	<p>When dividing by two digit numbers</p> 