



Written Calculations Policy

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Approved By:	Full Governing Body
Last reviewed on:	May 2024
Next review on:	May 2026

Rationale

This policy contains the key pencil and paper procedures that will be taught within our school. It has been written to ensure consistency and progression throughout the school and reflects a whole school agreement. The calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in written calculations across the school. Please note that early learning in number and calculation in Reception follows the 'Development Matters' EYFS document, and this calculation policy is designed to build on progressively from the content and methods established in the Early Years Foundation Stage.

Teaching and Learning

This calculation policy should be used to support children to develop a deep understanding of number and calculation. At Grimsdyke School, we use 'White Rose' as a format as a basis for our planning and use the philosophy of: fluency, reasoning and problem solving. White Rose also follows the Concrete – Pictorial – Abstract approach to teaching maths. This policy has been designed to teach children through the use of concrete, pictorial and abstract representations. It is important that conceptual understanding, supported by the use of representation, is secure for all procedures. Reinforcement is achieved by going back and forth between these representations.

- Concrete representation - a pupil is first introduced to an idea or skill by acting it out with real objects. This is a 'hands on' component using real objects and is a foundation for conceptual understanding.
- Pictorial representation - a pupil has sufficiently understood the 'hands on' experiences performed and can now relate them to representations, such as a diagram or picture of the problem. This helps children make the connection between the physical object and abstract levels of understanding, which is the stage they move onto next.
- Abstract representation - The abstract stage brings in mathematical symbols, for example +, -, x, ÷ to indicate addition, subtraction, multiplication and division. This is used when a pupil is secure in their understanding of representing problems by using mathematical notation, for example $12 \times 2 = 24$.

Planning, Progression and Continuity

The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014, however it is vital that pupils are taught according to the year group that they are currently working at and then given 'mastery' opportunities within their age-related expectations in order to fully embed the concepts learned. Furthermore, if a teacher feels a child is ready to move onto the next stage of a calculation which is in the next year group's expectations, then this should be facilitated.

At the centre of the mastery approach to the teaching of mathematics is the belief that all children have the potential to succeed. They should have access to the same curriculum content and, rather than being extended with new learning, they should deepen their conceptual understanding by tackling challenging and varied problems. Similarly, with calculation strategies, children must not simply rote learn procedures but demonstrate their understanding of these procedures through the use of concrete materials and pictorial representations. This policy outlines the different calculation strategies that should be taught and used in Year 1 to Year 6 in line with the

requirements of the 2014 Primary National Curriculum. Each operation is broken down into skills for the year group and shows recommended models and visuals to support the teaching of the corresponding concepts alongside.

'Real things and structured images enables children to understand the abstract. The concrete and the images are a means for children to understand the symbolic so it's important to move between all modes to allow children to make connections'. (Morgan, D. 2016)

Addition

EYFS

Objectives

- Addition involves putting groups together or counting on
- To know the number bonds up to 10
- Say which number is one more than a given number for numbers to 20.
- They can solve addition problems for numbers to 20 using practical apparatus.

Vocabulary

- Number
- More
- Less
- Add
- More
- Make
- Sum
- Total
- Altogether

Concrete

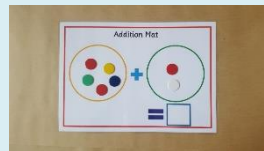
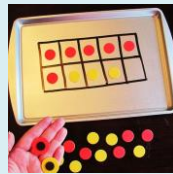
Use toys and general classroom resources for children to physically manipulate.



Use specific maths resources such as counters, connecting cubes, Numicon etc.

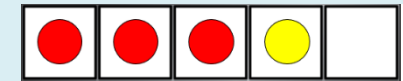
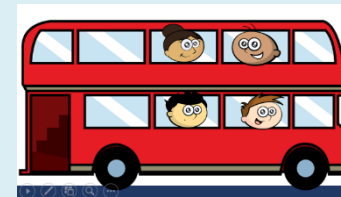
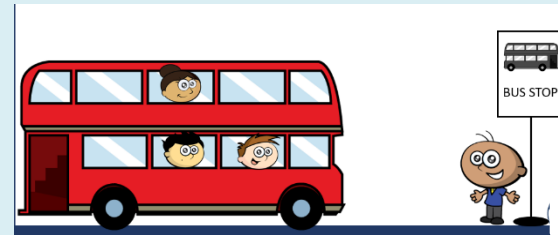


Use visual supports such as ten frames, part part whole and addition mats, with the physical objects and manipulatives.

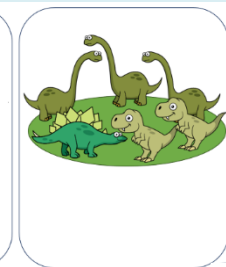
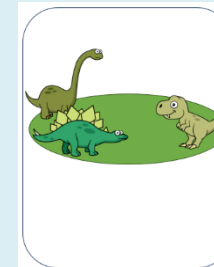


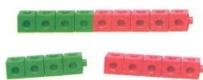
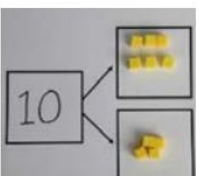

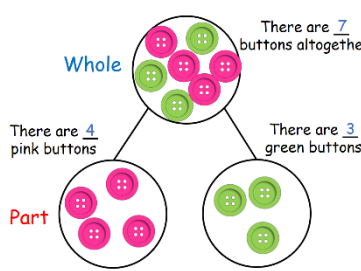





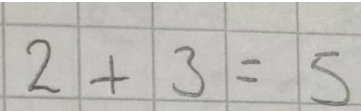
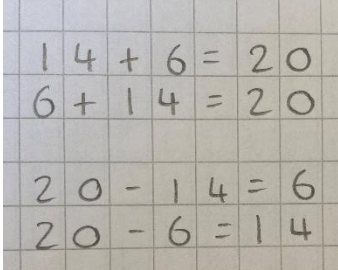
Pictorial

Adding one more



How many have been added?



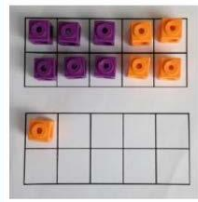
Year 1	Concrete	Pictorial	Abstract
<p>Objectives</p> <ul style="list-style-type: none"> To know that equals means the same as To know that a number bonds join numbers together to make another number To know the number bonds up to 20 To know that addition is finding the total of two or more numbers or objects To know the mathematical symbols for addition (+) To know that adding a zero has no effect on the answer To know different terminology for addition such as put together, add, altogether, total, more than To identify and say one more than a given number To add one-digit and two-digit numbers to 20, including zero To read, write and interpret mathematical statements involving addition 	<p>Use cubes to add two numbers together as a group or in a bar.</p>  <p>Use part-part whole model</p>  <p>Adding 1 with string beads</p> 	<p>Part whole model</p>  <p>Number bonds to 10</p>  <p>Adding together</p>  <p>There are <u>3</u>  There are <u>2</u>  There are <u>5</u> leaves altogether.</p> 	<p>Notation for addition</p>  <p>We also teach that calculations can be represented in different ways such as $5=2+3$ or $3+2=5$</p> <p>Number bonds to 20</p> 

- To solve one-step problems that involve addition using concrete objects and pictorial representations

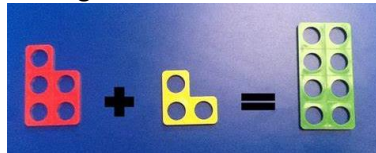
Vocabulary

- Add
- More
- Plus
- Make
- Altogether
- Total
- Equal to
- Equals
- Count on
- Number line
- Balancing
- Part part whole

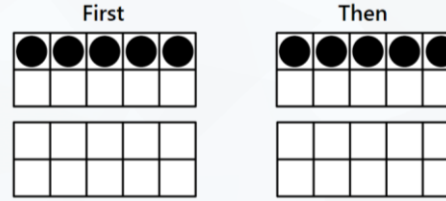
Use ten frames



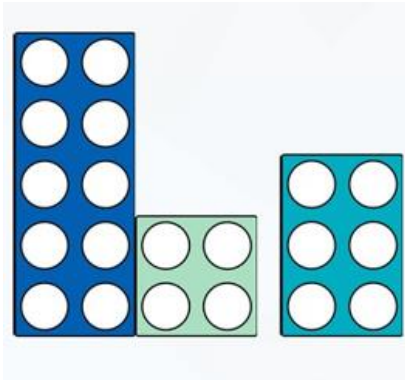
Adding with numicon



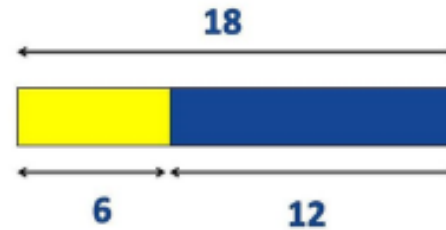
Addition with base 10

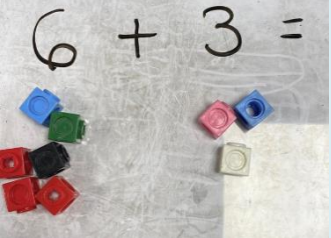


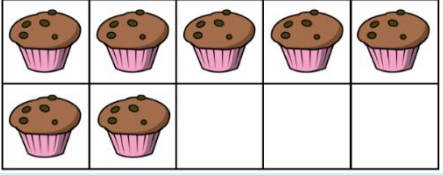
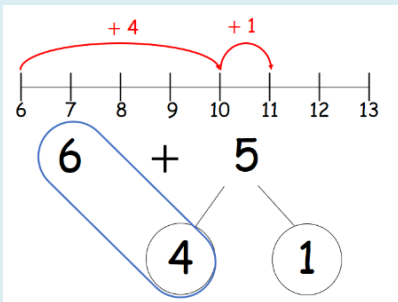
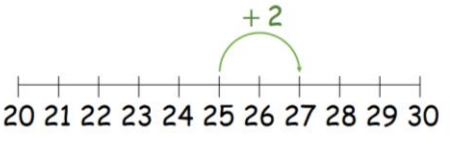
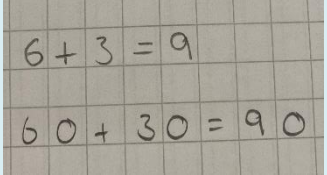
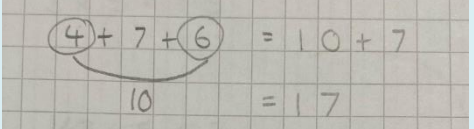
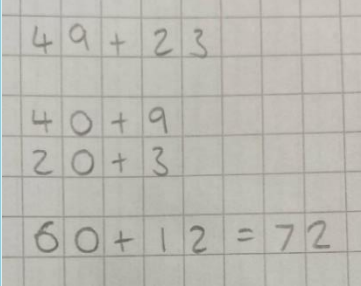
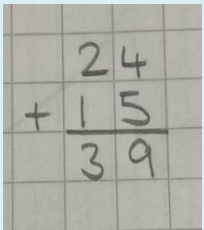


Finding number bonds to 20



Addition with bar models



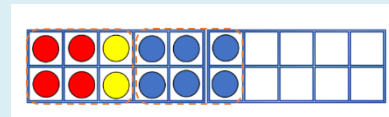
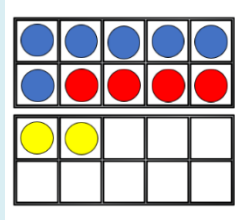
Year 2	Concrete	Pictorial	Abstract
<ul style="list-style-type: none"> To know and recall addition facts to 20 fluently To know that addition of two numbers can be done in any order (commutative) To know that there is a relationship between addition and we call this the inverse To use addition facts to 20 to derive related facts up to 100 To add and subtract numbers using concrete objects, pictorial representations, and mentally, including: <ul style="list-style-type: none"> a two-digit number and ones a two-digit number and tens two two-digit numbers adding three one-digit numbers To show that addition of two numbers can be done in any order 	<p>Using multilink cubes</p>  <p>Using number bonds to make 10 and then add on.</p>  	<p>Adding two, 1-digit numbers</p>  <p>Adding by partitioning</p>  <p>Adding on a number line</p> 	<p>Using addition facts to derive related facts up to 100</p>  <p>Addition using number bonds</p>  <p>Addition by partitioning</p>  <p>Record addition in columns</p> 

- To solve problems with addition and subtraction using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- To apply their increasing knowledge of mental and written methods
- To record addition in columns

Vocabulary

- Add
- More
- Plus
- Make
- Altogether
- Total
- Equal to
- Equals
- Count on
- Number line
- Sum
- Partition
- Addition
- Column
- Partition

Adding across ten



Year 3

Objectives

- To know the formal written methods of columnar addition.
- To solve number problems and practical problems involving place value
- To add numbers mentally, including:
 - a three-digit number and ones
 - a three-digit number and tens
 - a three-digit number and hundreds

Vocabulary

- Addition
- Add
- More
- Make
- Sum
- Total
- Altogether
- Regrouping
- Exchanging

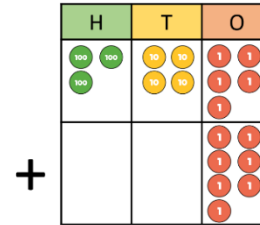
Concrete

Place value chart addition with counters

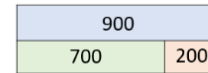


Pictorial

Partitioning numbers to complete addition



Bar model



$$700 + 200 = 900 \quad 900 - 200 = 700$$

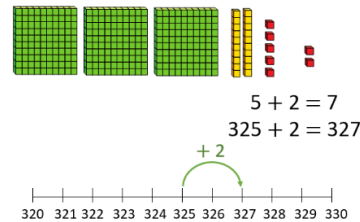
$$200 + 700 = 900 \quad 900 - 700 = 200$$

$$900 = 700 + 200 \quad 700 = 900 - 200$$

$$900 = 200 + 700 \quad 200 = 900 - 700$$

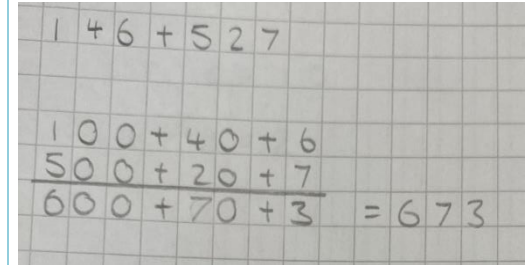
Using diene representations and number lines

Calculate $325 + 2$

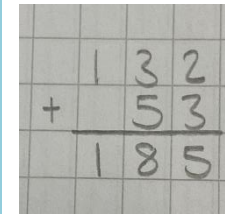


Abstract

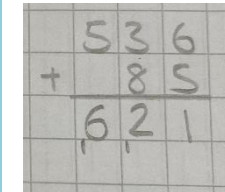
Adding by partitioning


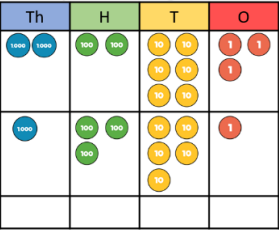
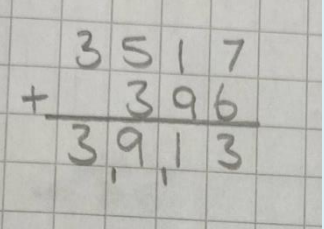
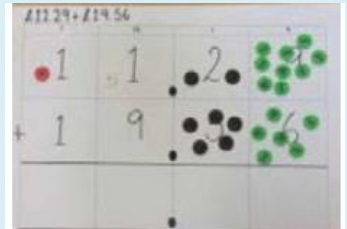
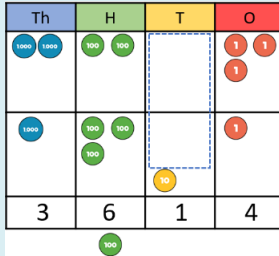
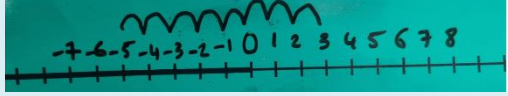
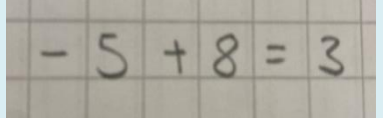
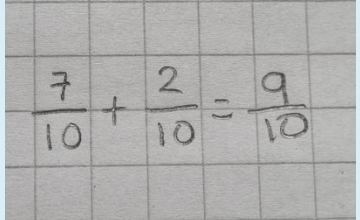


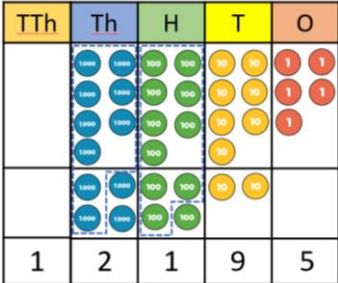
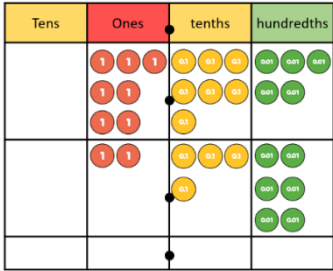
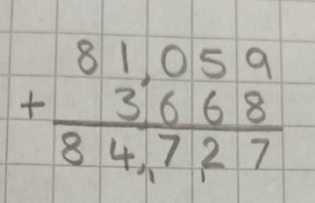
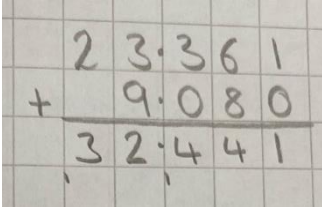
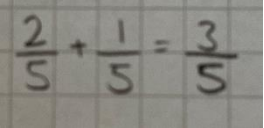
Formal written method



With exchanging



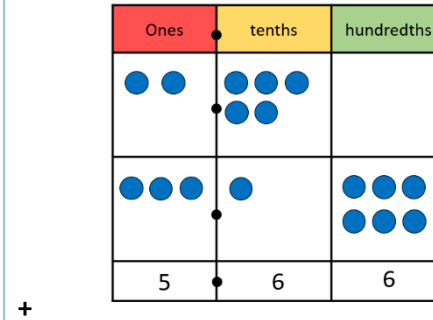
Year 4			
Objectives	Concrete	Pictorial	Abstract
<ul style="list-style-type: none"> To find 1000 more than a given number To add numbers with up to 4 digits using the formal written methods of columnar addition where appropriate To estimate and use inverse operations to check answers to a calculation To solve addition two-step problems in contexts To add fractions with the same denominator 	Place value chart with counters for addition 	Adding with exchanging 	Column addition – formal written method 
	Including decimal addition 		Adding negative numbers 
Vocabulary <ul style="list-style-type: none"> Addition Add More Make Sum Total Altogether Regrouping Exchanging Decimal point 			Adding negative numbers 
			Adding fractions with the same denominator 

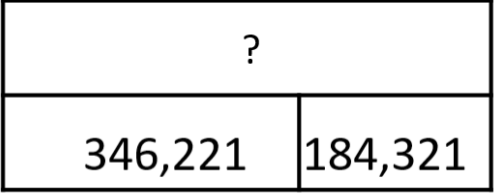
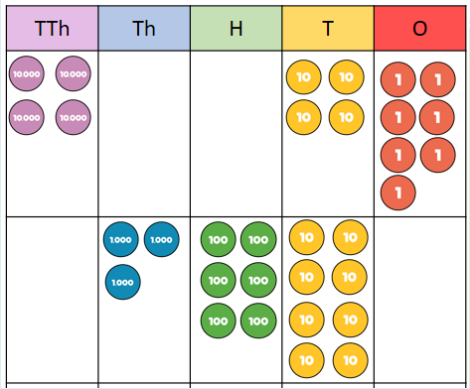
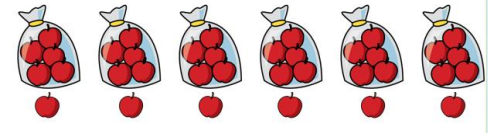
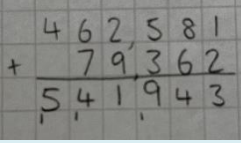
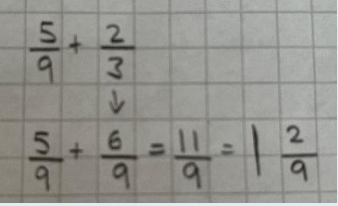
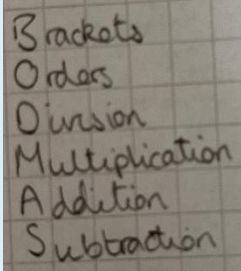
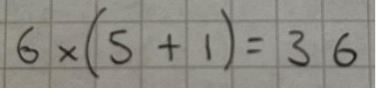
Year 5			
Objectives	Concrete	Pictorial	Abstract
<ul style="list-style-type: none"> To count forwards with positive and negative whole numbers, including through zero To add numbers mentally with increasingly large numbers To add whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) To add fractions with the same denominator and multiples of the same number To use all four operations to solve problems involving measure (e.g. length, mass, volume, money) using decimal notation including scaling. 		<p>Large numbers addition with exchanging</p>  <p>Adding decimals with the same number of decimal places</p> 	<p>Adding larger numbers</p>  <p>Adding decimals</p>  <p>Adding fractions with the same denominator</p> 
Vocabulary			

- *Addition*
- *Add*
- *More*
- *Make*
- *Sum*
- *Total*
- *Altogether*
- *Regrouping*
- *Exchanging*
- *Decimal point*

Adding decimals with a different number of decimal places

$$2.5 + 3.16 =$$



Year 6			
Objectives	Concrete	Pictorial	Abstract
<ul style="list-style-type: none"> To perform mental calculations, including with mixed operations and large numbers To use their knowledge of the order of operations to carry out calculations involving the four operations To use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy To solve addition multi-step problems in contexts To explore the order of operations using brackets To add fractions with different denominators and mixed numbers, using the concept of equivalent fractions 		<p>Bar model</p>  <p>Adding large numbers</p>  <p>BODMAS</p> 	<p>Adding larger numbers</p>  <p>Adding fractions where one denominator is a factor of the other</p>  <p>BODMAS</p>  
Vocabulary			
<ul style="list-style-type: none"> Addition Add More Make 			

- | | | | |
|--|--|--|--|
| <ul style="list-style-type: none">• <i>Sum</i>• <i>Total</i>• <i>Altogether</i>• <i>Regrouping</i>• <i>Exchanging</i>• <i>Decimal point</i>• <i>BODMAS</i> | | | |
|--|--|--|--|

Subtraction

EYFS

Objectives

- Subtraction involves removing items from a group or counting back
- To know the number bonds up to 10
- Can count on or back to find the answer when adding or subtracting.
- They can solve subtraction problems for numbers to 20 using practical apparatus.

Vocabulary

- Number
- Less
- Take away

Concrete

Use toys and general classroom resources for children to physically manipulate.

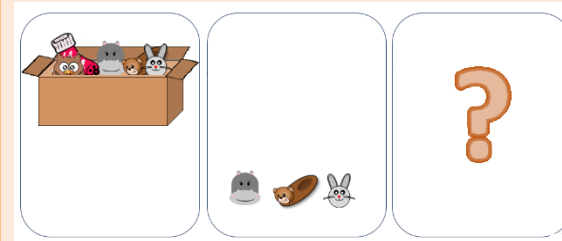


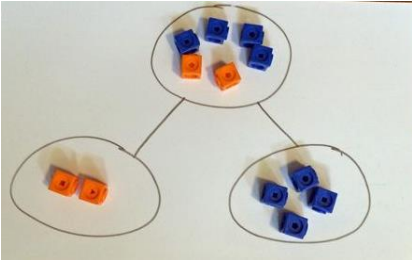
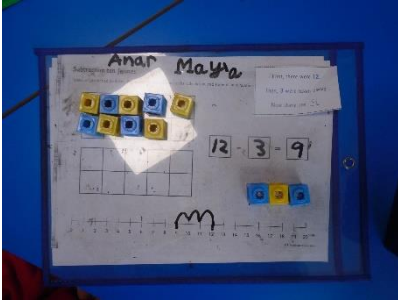

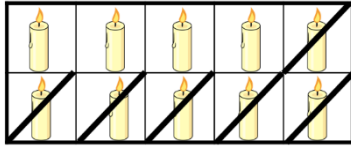
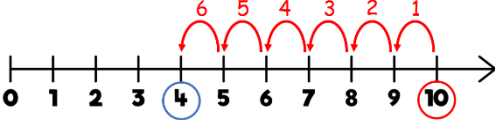


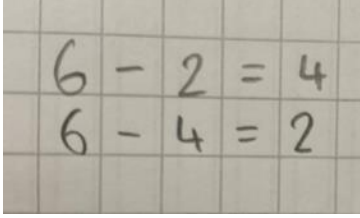
Use specific maths resources such as counters, connecting cubes, Numicon etc.



Pictorial

Subtracting


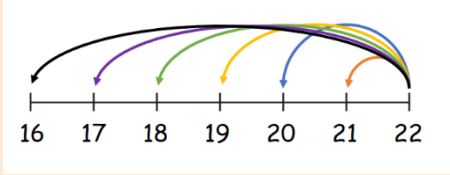
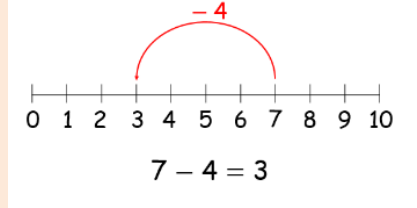
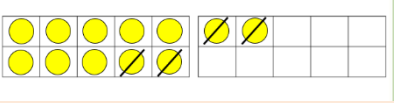

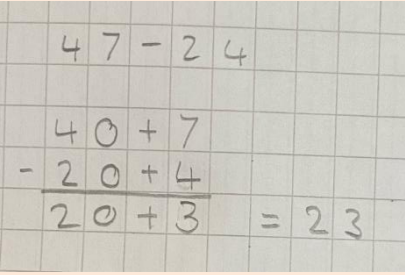


Year 1	Concrete	Pictorial	Abstract
<p>Objectives</p> <ul style="list-style-type: none"> To know that subtraction means taking away to find how many are left. To know the mathematical symbols for subtraction (-) and equals (=) signs To know that subtracting a zero has no effect on the answer To know different terminology for subtractions such as take away, distance between, difference between and less than To use number bonds and related subtraction facts within 20 To subtract one-digit and two-digit numbers to 20, including zero To read, write and interpret mathematical statements involving the subtraction (-) and equals (=) signs To solve one-step problems that involve subtraction, using concrete objects and pictorial 	<p>Concrete</p> <p>Part whole model</p>  <p>Tens frame</p> 	<p>Pictorial</p> <p>Subtraction by crossing out – how many left?</p>  <p>First there were 9 cupcakes. Then Chase ate 2 cupcakes. Now there are 7 cupcakes.</p>  <p>Subtraction by counting back How many more to make 10? (link with addition)</p>  <p>Finding the difference</p> <p>Annie</p>  <p>Jack</p> 	<p>Abstract</p> <p>Subtract 1-digit numbers</p>  <p>We also teach that calculations represented as $6 = 4 - 2$ will lead to the same answer.</p>

representations, and
missing number problems
such as $7 = \square - 9$

Vocabulary

- Subtraction
- Take away
- Difference between
- Less
- Less than
- Fewer
- Fewer than
- Minus

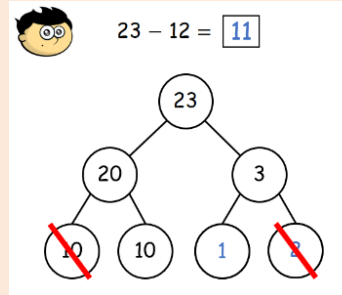
Year 2			
Objectives	Concrete	Pictorial	Abstract
<ul style="list-style-type: none"> To know and recall addition subtraction facts to 20 fluently To know that subtraction is not commutative To know that there is a relationship between subtraction and we call this the inverse To know that when we subtract using columns, the place value of digits need to be lined up To use subtraction facts to 20 to derive related facts up to 100 To subtract numbers using concrete To show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot To use the inverse relationship between addition and subtraction to check calculations and solve missing number problems. 	<p>Subtracting cubes</p> 	<p>Subtracting ones</p>   <p>Subtracting across tens</p>  	<p>Subtraction by partitioning</p> 
		<p>Subtracting a two digit number from a two digit number</p>	

- To solve problems with addition and subtraction using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- To apply their increasing knowledge of mental and written methods
- To record subtraction in columns

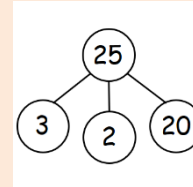
Vocabulary

- Subtraction
- Take away
- Difference between
- Less
- Less than
- Fewer
- Fewer than
- Minus
- Count backwards

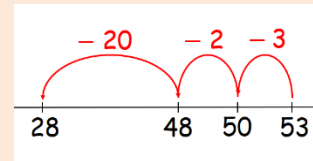
Part-whole model

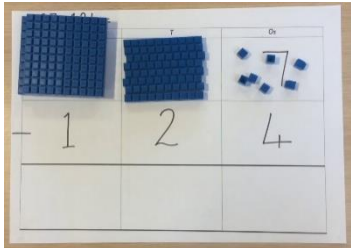
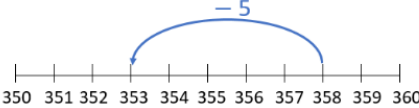
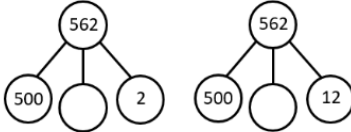
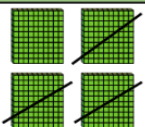
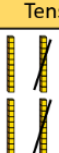

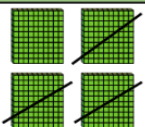
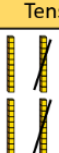

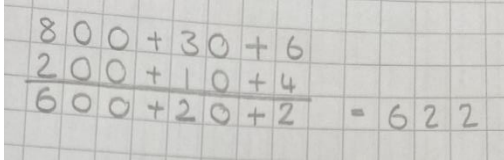
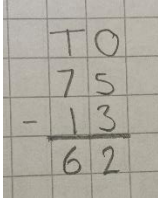
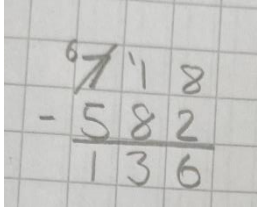
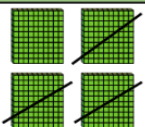
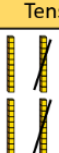



Partitioning for subtraction



Using a number line



Year 3									
Objectives	Concrete	Pictorial	Abstract						
<ul style="list-style-type: none"> To know the formal written methods of columnar subtraction To subtract numbers mentally, including: <ul style="list-style-type: none"> a three-digit number and ones a three-digit number and tens a three-digit number and hundreds To subtract numbers with up to three digits, using formal written methods of columnar subtraction 	<p>Using base 10 resources in formal column method</p> 	<p>Using number lines for subtraction</p> $358 - 5 = 353$  <p>Part-whole models</p>  <p>Place value chart for subtraction</p> <table border="1" data-bbox="1093 896 1576 1066"> <thead> <tr> <th>Hundreds</th> <th>Tens</th> <th>Ones</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Hundreds	Tens	Ones				<p>Subtraction with partitioning</p>  <p>Formal standard written method</p>  <p>Formal written method with exchanging</p> 
Hundreds	Tens	Ones							
									
Vocabulary									
<ul style="list-style-type: none"> Hundreds Thousands Less Less than Fewer Fewer than Take away Subtract Column Count on Partition 									

Year 4

Objectives

- To find 1000 more or less than a given number
- To count backwards through zero to include negative numbers
- To subtract numbers with up to 4 digits using the formal written methods of columnar subtraction where appropriate
- To estimate and use inverse operations to check answers to a calculation
- To solve subtraction two-step problems in contexts, deciding which operations and methods to use and why
- To subtract fractions with the same denominator

Vocabulary

- Less than /Fewer than
- Subtract
- Column
- Count on
- Partition
- Exchanging
- Decimal

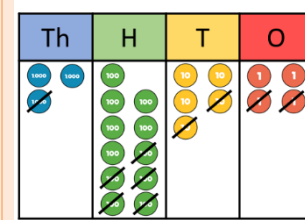
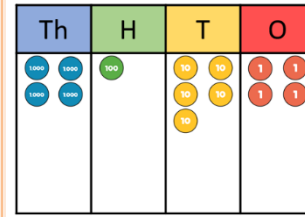
Concrete

Place value chart with counters for subtraction

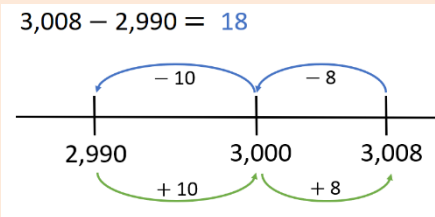


Pictorial

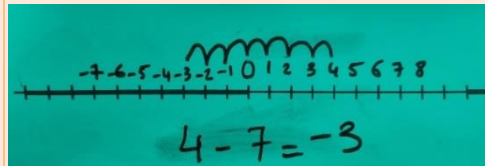
Subtracting with exchanging



Counting on or counting back

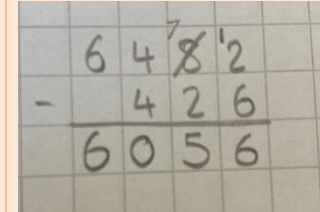


Subtracting negative numbers

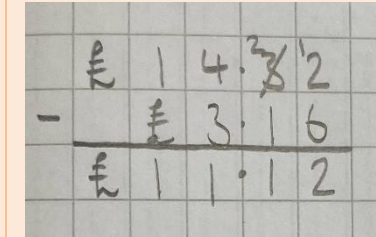


Abstract

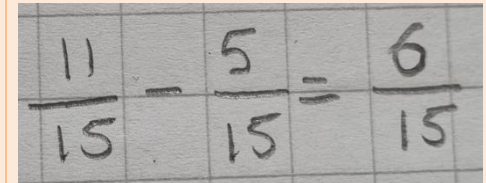
Formal written method

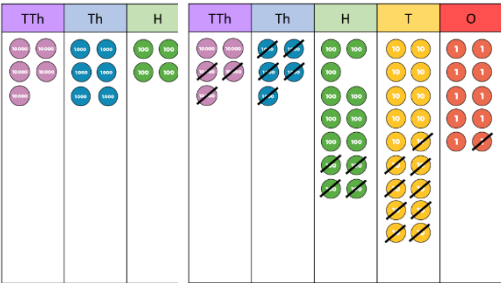
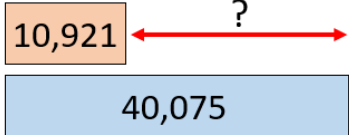
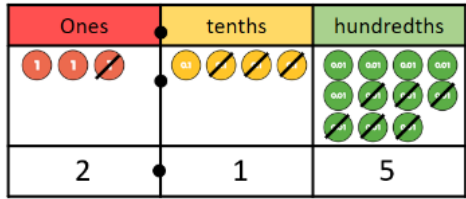
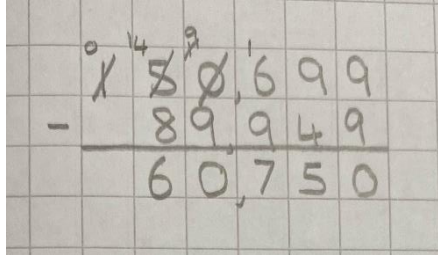
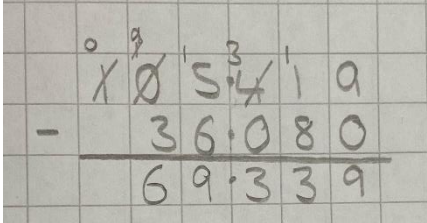
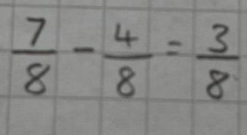


Subtraction with decimals - money



Subtracting fractions with the same denominator

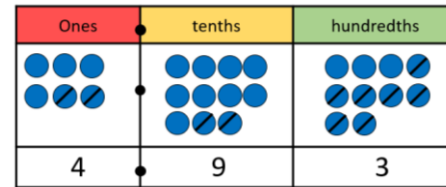
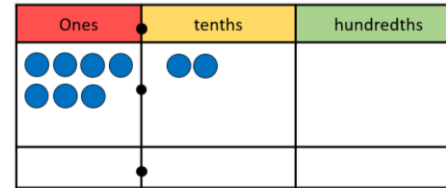


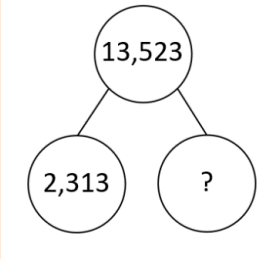
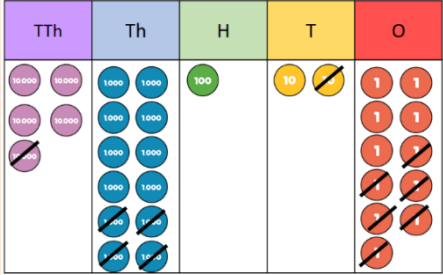
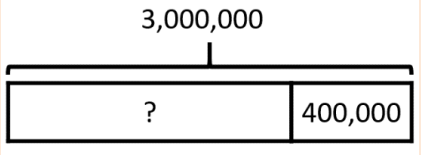
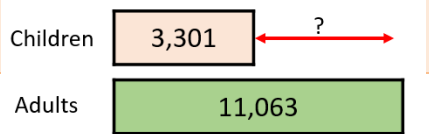
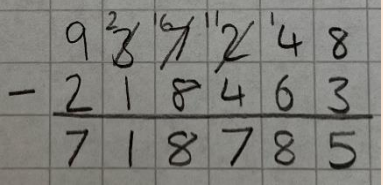
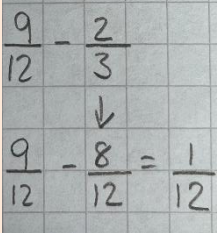
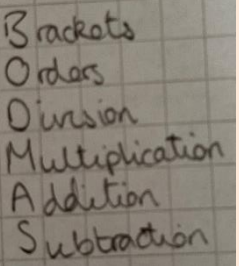
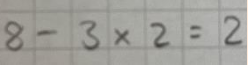
Year 5			
Objectives	Concrete	Pictorial	Abstract
<ul style="list-style-type: none"> To count backwards with positive and negative whole numbers, including through zero To subtract numbers mentally with increasingly large numbers To subtract whole numbers with more than 4 digits, including using formal written methods (columnar subtraction) To use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy To solve subtraction multi-step problems in contexts, deciding which operations and methods to use and why To subtract fractions with the same denominator and multiples of the same number 		<p>Subtraction with exchanging</p>  <p>Visualising subtraction</p>  <p>Subtracting decimals with the same number of decimal places.</p> $3.51 - 1.36 = 2.15$ 	<p>Subtracting larger numbers</p>  <p>Subtracting decimals</p>  <p>Subtracting fractions with the same denominator</p> 
Vocabulary			
<ul style="list-style-type: none"> Hundreds Thousands 			

- *Less*
- *Less than*
- *Fewer*
- *Fewer than*
- *Take away*
- *Subtract*
- *Column*
- *Count on*
- *Partition*
- *Exchanging*
- *Decimal*

Subtracting decimals with a different number of decimal places.

$$7.2 - 2.27 = 4.93$$



Year 6			
Objectives	Concrete	Pictorial	Abstract
<ul style="list-style-type: none"> To subtract numbers mentally with increasingly large numbers To subtract whole numbers with more than 4 digits, including using formal written methods (columnar subtraction) To use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy To solve subtraction multi-step problems in contexts, deciding which operations and methods to use and why To subtract fractions with the same denominator and multiples of the same number To know the order of operations (BODMAS) to carry out calculations involving the four operations To perform mental calculations, including with 		<p>Part whole model</p>  <p>Subtracting large numbers with exchanging</p>  <p>Bar model subtractions</p>  <p>Finding the difference</p> 	<p>Subtracting larger numbers</p>  <p>Subtracting fractions where one denominator is a factor of the other</p>  <p>BODMAS</p>  

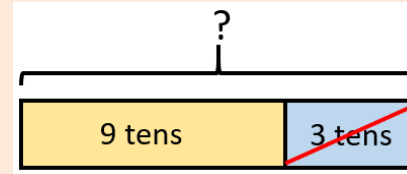
mixed operations and large numbers

- To use their knowledge of the order of operations to carry out calculations involving the four operations
- To use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy
- To solve subtraction multi-step problems in contexts
- To subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions

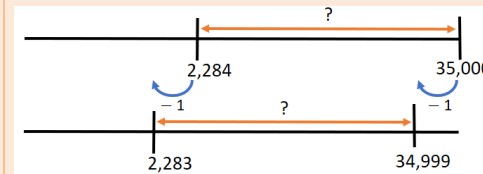
Vocabulary

- Less / Less than
- Fewer/ Fewer than
- Take away
- Subtract
- Column
- Count on
- Partition
- Exchanging
- Decimal
- BODMAS

Finding missing numbers



Number line for subtraction



Multiplication

EYFS

Objectives

- Doubling involves combining two equal groups
- They can double numbers to 10.
- Can solve simple problems using apparatus that involve doubling

Vocabulary

- Double
- Groups

Concrete

Doubling one - eyes



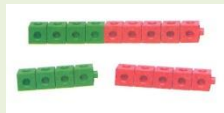
Doubling with fingers



Use toys and general classroom resources for children to physically manipulate.

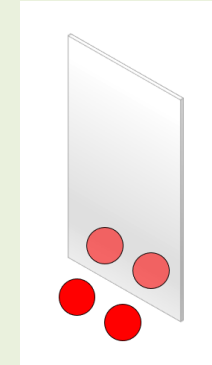
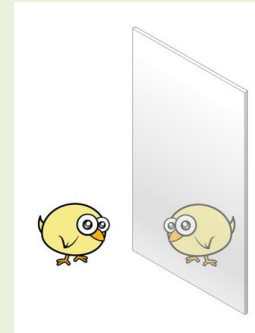














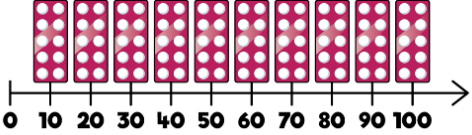










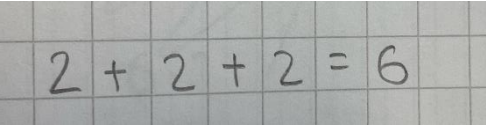











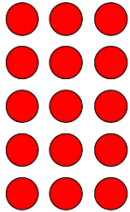
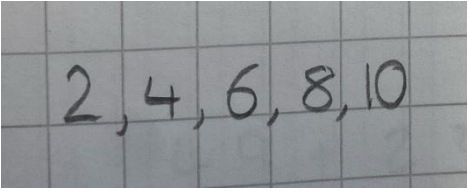
Use specific maths resources such as counters, connecting cubes, Numicon etc.

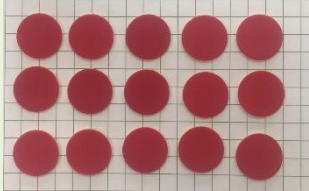
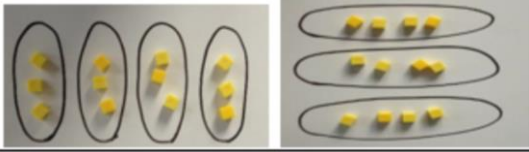
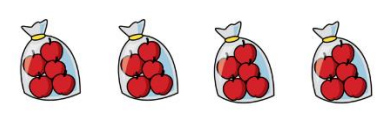
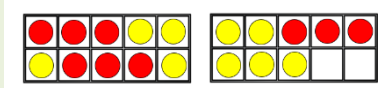
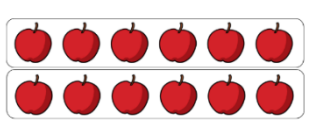
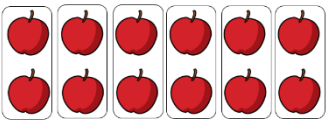

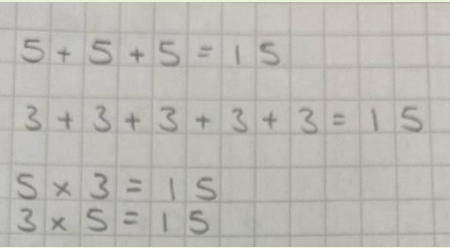


Pictorial

Doubling



Year 1																																																																																																																	
Objectives	Concrete	Pictorial	Abstract																																																																																																														
<ul style="list-style-type: none"> To know that even numbers are numbers ending in 2,4,6,8 and 0 To know that odd numbers are numbers ending in 1,3,5,7 and 9 To know the twos, fives and ten times tables To know that multiplication is repeated addition To count in multiples of twos, fives and tens To solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher 	<p>Counting in multiples</p>  	<p>Counting in 10s</p> <table border="1" data-bbox="1131 335 1527 657"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td></td></tr> <tr><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td></td></tr> <tr><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td></td></tr> <tr><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td><td></td></tr> <tr><td>41</td><td>42</td><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td><td>49</td><td>50</td><td></td></tr> <tr><td>51</td><td>52</td><td>53</td><td>54</td><td>55</td><td>56</td><td>57</td><td>58</td><td>59</td><td>60</td><td></td></tr> <tr><td>61</td><td>62</td><td>63</td><td>64</td><td>65</td><td>66</td><td>67</td><td>68</td><td>69</td><td>70</td><td></td></tr> <tr><td>71</td><td>72</td><td>73</td><td>74</td><td>75</td><td>76</td><td>77</td><td>78</td><td>79</td><td>80</td><td></td></tr> <tr><td>81</td><td>82</td><td>83</td><td>84</td><td>85</td><td>86</td><td>87</td><td>88</td><td>89</td><td>90</td><td></td></tr> <tr><td>91</td><td>92</td><td>93</td><td>94</td><td>95</td><td>96</td><td>97</td><td>98</td><td>99</td><td>100</td><td></td></tr> </table> 	1	2	3	4	5	6	7	8	9	10		11	12	13	14	15	16	17	18	19	20		21	22	23	24	25	26	27	28	29	30		31	32	33	34	35	36	37	38	39	40		41	42	43	44	45	46	47	48	49	50		51	52	53	54	55	56	57	58	59	60		61	62	63	64	65	66	67	68	69	70		71	72	73	74	75	76	77	78	79	80		81	82	83	84	85	86	87	88	89	90		91	92	93	94	95	96	97	98	99	100		<p>Repeated addition</p> 
	1	2	3	4	5	6	7	8	9	10																																																																																																							
11	12	13	14	15	16	17	18	19	20																																																																																																								
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<p>Vocabulary</p> <ul style="list-style-type: none"> Even Odd Twos, Fives, Tens Times Multiply Groups of Lots of Array 	<p>Repeated addition</p> 	<p>Using arrays</p> 	<p>Counting in twos</p> 																																																																																																														

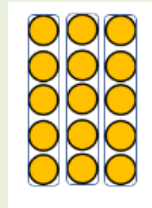
Year 2			
Objectives	Concrete	Pictorial	Abstract
<ul style="list-style-type: none"> To recall multiplication facts for the two, five and ten multiplication tables, including recognising odd and even numbers To know that multiplication of two numbers can be done in any order (commutative) To know the multiplication (\times) To know that an array is an arrangement of objects, numbers or pictures in equal columns or rows To know that multiplication are the inverse of each other (for example, $4 \times 5 = 20$ and $20 \div 5 = 4$) To use multiplication facts for the 2, 5 and 10 multiplication tables To show that multiplication of two numbers can be done in any order (commutative) To calculate mathematical statements for multiplication within the 	<p>Counters for arrays</p>  <p>Counters to show that multiplication is commutative</p> 	<p>Groups of</p>  <p>Counting in groups</p>  <p>Arrays</p>   <p>Multiplying by 2</p>  <p>Multiplying by 5</p>	<p>Repeated addition</p> 

multiplication tables and write them using the multiplication (\times), and equals (=) signs

- *and equals (=) signs*
- *To solve problems involving multiplication, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts*
- *To connect the 5 multiplication table to the divisions on the clock face*
- *To relate multiplication to grouping and sharing discrete and continuous quantities, to arrays and to repeated addition*

Vocabulary

- *Lots of*
- *Groups of*
- *Times*
- *Multiply*
- *Multiplied by multiple of*
- *Repeated addition*
- *Array*
- *Row*
- *Column*
- *Commutative*



Multiplying by 10 – repeated addition

30		
10	10	10

Year 3

Objectives

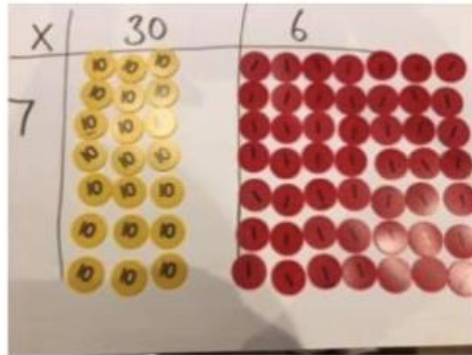
- To recall multiplication facts for the 3, 4 and 8 multiplication tables
- To know the formal written method for multiplication
- To use multiplication facts for the 3, 4 and 8 multiplication tables
- To write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
- To solve problems, including missing number problems, involving multiplication

Vocabulary

- Multiply
- Repeated addition
- Product
- Equation
- Inverse
- Commutative

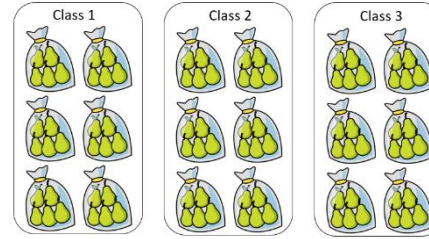
Concrete

Place value counters









Pictorial

Arrays



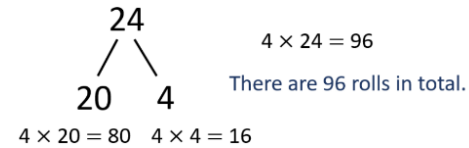
Place value chart to support formal written method

3×31

T	O
	
	
	

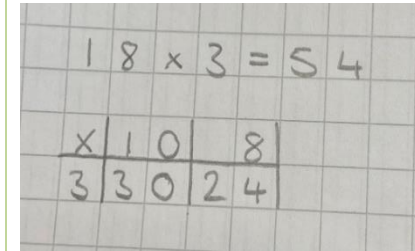
	T	O
	3	1
x	3	
	9	3

Partitioning



Abstract

Multiplication with partitioning



Year 4

Objectives

- To recall multiplication facts for multiplication tables up to 12×12 including the six, seven and nine times tables
- To know that commutativity is when 2 numbers can be added or multiplied & the same answer will be found no matter what order they are in
- To know the formal written method for multiplication
- To know that when you multiply by zero, the answer is zero
- To know that multiplying a number by a group of numbers is the same as doing each multiplication separately (distributed law)
- To use place value, known and derived facts to multiply and divide mentally, including multiplying by 0 and 1;

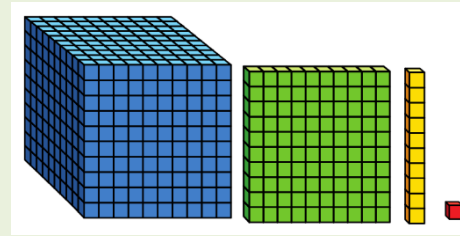
Concrete

Multiplication square

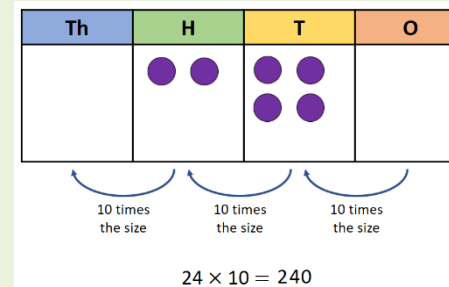
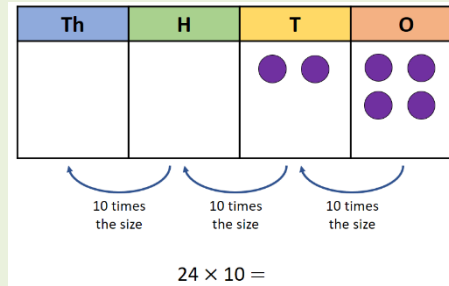
×	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

Pictorial

Getting ten times bigger

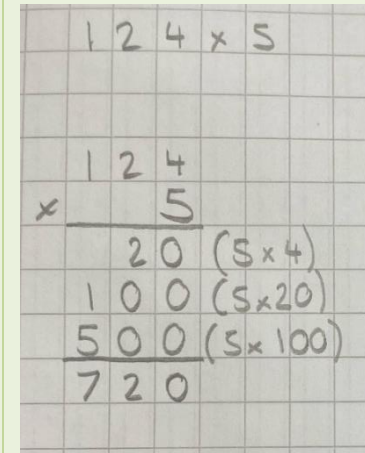


Multiplying by 10

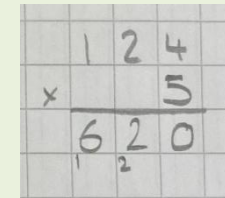


Abstract

Expanded written method



Formal written method



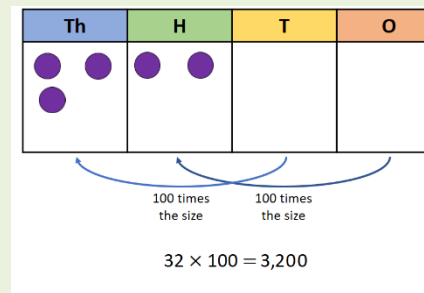
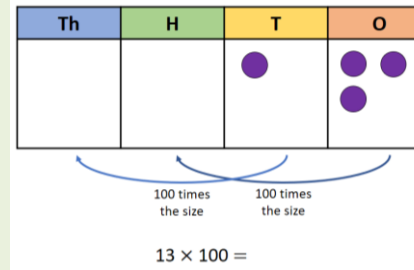
dividing by 1; multiplying together three numbers

- To use factor pairs and commutativity in mental calculations
- To multiply two-digit and three-digit numbers by a one-digit number using formal written layout
- To estimate and use inverse operations to check answers to a calculation
- Use mental methods and extend this to three-digit numbers to derive facts, (for e.g. $600 \div 3 = 200$ can be derived from $2 \times 3 = 6$)
- To use knowledge of number facts and rules of arithmetic to solve mental and written calculations e.g. $2 \times 6 \times 5 = 10 \times 6 = 60$

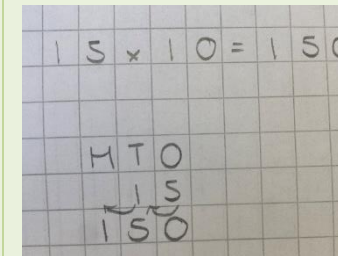
Vocabulary

- Groups of
- Lots of
- Factor
- Multiple
- Distributive
- Repeated addition
- Array

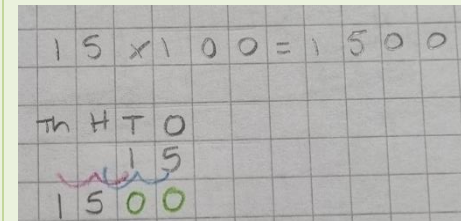
Multiplying by 100



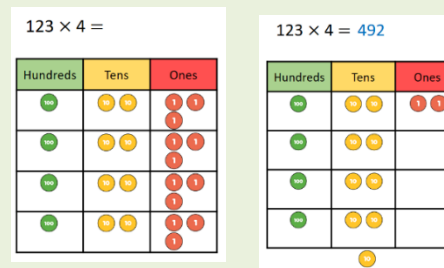
Multiplying by 10


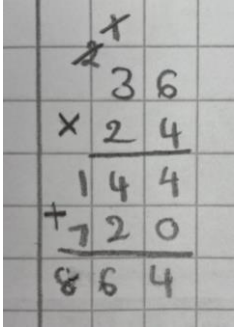
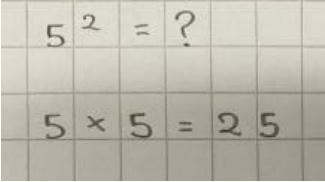
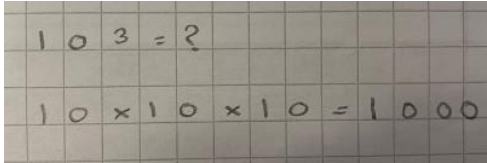


Multiplying by 100



Multiplying 3-digits by 1-digit



Year 5																																														
Objectives	Concrete	Pictorial	Abstract																																											
<ul style="list-style-type: none"> To count forwards in steps of powers of 10 for any given number up to 1000 000 To know the formal written method of long multiplication To know that factors are numbers that divide exactly into another number. To know that a multiple is the product result of one number multiplied by another number. To know that prime numbers are numbers which only have two factors To recall prime numbers up to 19 To know that squaring a number means multiplying it by itself and it is notated as (2) To know that cubing a number is multiplying it by itself three times it is notated as (3) 	<p>100 square with counters to find prime numbers</p> 	<p>Multiplying by 10, 100 & 1000</p> <table border="1" data-bbox="1249 373 1583 475"> <tr><th>Th</th><th>H</th><th>T</th><th>O</th></tr> <tr><td></td><td></td><td>7</td><td>8</td></tr> </table> <table border="1" data-bbox="1249 491 1583 593"> <tr><th>Th</th><th>H</th><th>T</th><th>O</th></tr> <tr><td></td><td>7</td><td>8</td><td>0</td></tr> </table> <table border="1" data-bbox="1249 609 1583 711"> <tr><th>Th</th><th>H</th><th>T</th><th>O</th></tr> <tr><td>7</td><td>8</td><td>0</td><td>0</td></tr> </table> <table border="1" data-bbox="1160 743 1583 836"> <tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr> <tr><td>7</td><td>8</td><td>0</td><td>0</td><td>0</td></tr> </table> <p>Multiplying 2-digits by 2-digits</p> <p style="text-align: center;">23×31</p> <table border="1" data-bbox="1106 1027 1442 1257"> <tr><th>\times</th><th>20</th><th>3</th></tr> <tr><th>30</th><td>600</td><td>90</td></tr> <tr><th>1</th><td>20</td><td>3</td></tr> </table> <p>$600 + 90 + 20 + 3 = 713$</p>	Th	H	T	O			7	8	Th	H	T	O		7	8	0	Th	H	T	O	7	8	0	0	TTh	Th	H	T	O	7	8	0	0	0	\times	20	3	30	600	90	1	20	3	<p>Multiplying 2-digits by 2-digits</p>  <p>Square numbers</p>  <p>Cube numbers</p> 
Th	H	T	O																																											
		7	8																																											
Th	H	T	O																																											
	7	8	0																																											
Th	H	T	O																																											
7	8	0	0																																											
TTh	Th	H	T	O																																										
7	8	0	0	0																																										
\times	20	3																																												
30	600	90																																												
1	20	3																																												

- To multiply numbers mentally drawing upon known facts
- To multiply whole numbers and those involving decimals by 10, 100 and 1000
- To 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
- To identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers.
- To establish whether a number up to 100 is prime and
- To work out square numbers and cube numbers
- To solve problems involving multiplication including using their knowledge of factors and multiples, squares and cubes

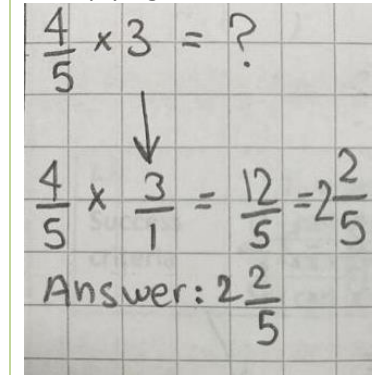
Multiplying 4-digits by 2-digits

$$2,313 \times 32 =$$

×	2,000	300	10	3
30	60,000	9,000	300	90
2	4,000	600	20	6

$$60,000 + 9,000 + 4,000 + 600 + 300 + 90 + 20 + 6 =$$

Multiplying fractions with whole numbers



Handwritten work on grid paper showing the multiplication of a fraction by a whole number:

$$\frac{4}{5} \times 3 = ?$$

An arrow points down to the next step:



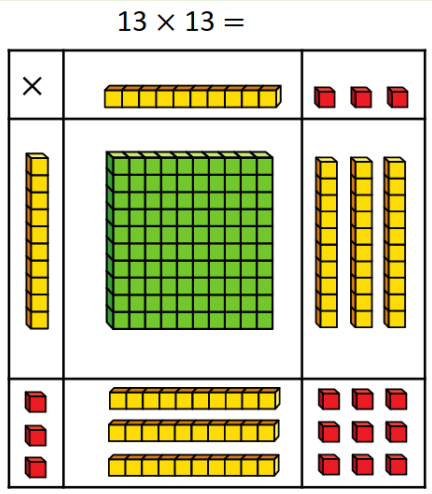
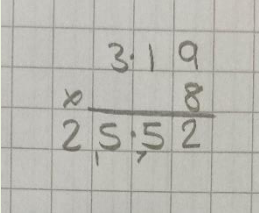
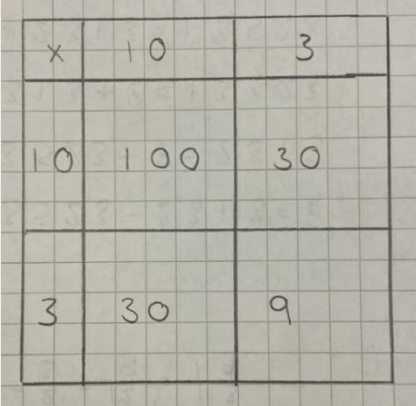
$$\frac{4}{5} \times \frac{3}{1} = \frac{12}{5} = 2\frac{2}{5}$$

Answer: $2\frac{2}{5}$

- *To solve problems involving multiplication including scaling by simple fractions and problems involving simple rates*
- *To multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams*

Vocabulary

- *Factor*
- *Multiple*
- *Square number*
- *Prime number*
- *Repeated addition*
- *Inverse*
- *Factor pairs*
- *Composite numbers*
- *Prime number*
- *Squared*
- *Cubed*

Year 6																			
Objectives	Concrete	Pictorial	Abstract																
<ul style="list-style-type: none"> To know the order of operations (BODMAS) to carry out calculations involving the four operations To know that orders show how many times a number or letter has been multiplied by itself To perform mental calculations, including with mixed operations and large numbers To explore the order of operations using brackets To multiply and divide numbers mentally drawing upon known facts To multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 To multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication 	<p>Multilink cubes to investigate square numbers:</p>  <p>Multilink cubes to investigate cube numbers</p> 	<p>Repeated addition</p> <table border="1" data-bbox="1093 328 1554 635"> <thead> <tr> <th>Thousands</th> <th>Hundreds</th> <th>Tens</th> <th>Ones</th> </tr> </thead> <tbody> <tr> <td>1000 1000</td> <td>100</td> <td>10 10</td> <td>1 1 1</td> </tr> <tr> <td>1000 1000</td> <td>100</td> <td>10 10</td> <td>1 1 1</td> </tr> <tr> <td>1000 1000</td> <td>100</td> <td>10 10</td> <td>1 1 1</td> </tr> </tbody> </table> <p>Multiplying two digits by two digits.</p> <p>$13 \times 13 =$</p> 	Thousands	Hundreds	Tens	Ones	1000 1000	100	10 10	1 1 1	1000 1000	100	10 10	1 1 1	1000 1000	100	10 10	1 1 1	<p>Formal written method for multiplying decimals</p>  <p>Multiplication square</p> 
Thousands	Hundreds	Tens	Ones																
1000 1000	100	10 10	1 1 1																
1000 1000	100	10 10	1 1 1																
1000 1000	100	10 10	1 1 1																

- To identify common factors, common multiples and prime numbers
- To use their knowledge of the order of operations to carry out calculations involving the four operations
- To use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy
- To multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$)
- To multiply one-digit numbers with up to two decimal places by whole numbers
- To multiply one-digit numbers with up to two decimal places by whole numbers
- To multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places
- To multiply and divide numbers with up to two

Multiplying by 10, 100 and 1000.

100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

$3.12 \times 10 =$

Th	H	T	O	tth	hth
			•••	•	••
			•		
			3	•	1
					2

decimal places by one-digit and two-digit whole numbers

- *To multiply decimals by whole numbers, starting with the simplest cases, such as $0.4 \times 2 = 0.8$, and in practical contexts, such as measures and money*

Vocabulary

- *Factor*
- *Multiple*
- *Square number*
- *Prime number*
- *Repeated addition*
- *Inverse*
- *Factor pairs*
- *Composite numbers*
- *Prime number*
- *Squared*
- *Cubed*
- *Prime factor*
- *Discount*
- *Profit*
- *BODMAS*

Division

EYFS

Objectives

- Halving involves splitting something into two equal groups or pieces
- Sharing mathematically involves being fair and giving an equal amount to each group
- They can halve numbers to 20.
- Can solve simple problems using apparatus that involve halving
- They can share out an amount in a fair, mathematical way.

Vocabulary

- Half
- Share
- Fair

Concrete

Physical items halved

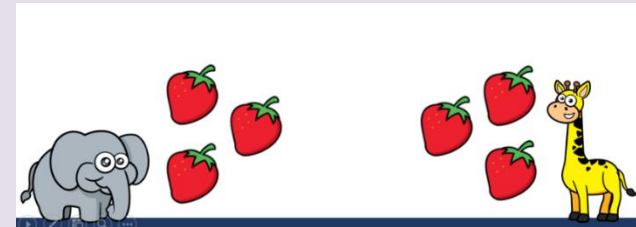
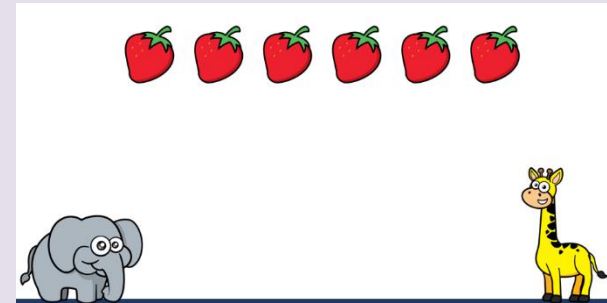


Sharing physical objects

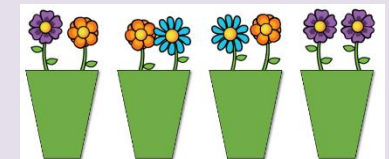



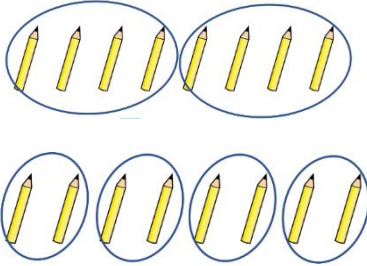
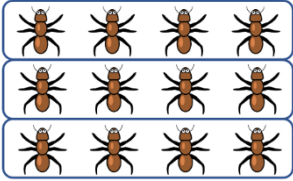
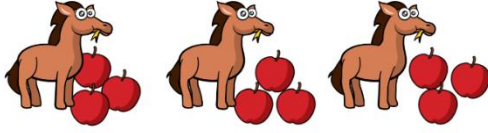
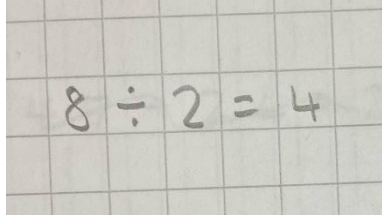
Pictorial

Sharing



Grouping

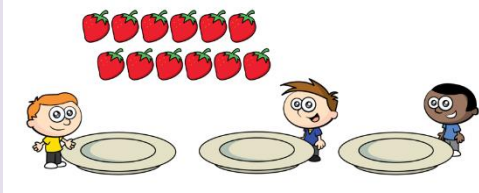
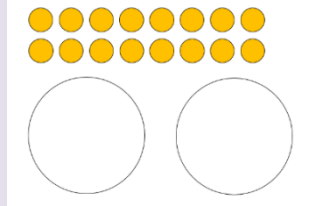
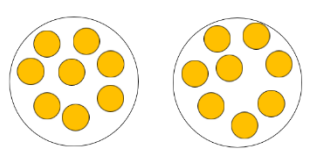
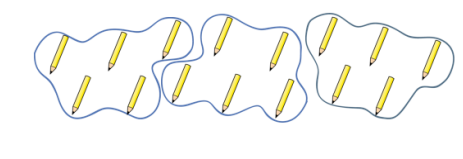
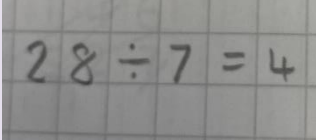


Year 1			
Objectives	Concrete	Pictorial	Abstract
<ul style="list-style-type: none"> To know that division is breaking a number up into equal parts, and finding out how many equal parts can be made To know different terminology for division such as sharing, grouping To know that a half is one of two equal parts of an object, shape or quantity To know that a quarter is one of four equal parts of an object, shape or quantity To know that a fractions is splitting a whole (number/shape etc) into parts To solve one-step problems involving division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher To find and name quarter of an object, shape or quantity 	<p>Share into equal groups</p> 	<p>Making equal groups</p>   <p>Sharing</p>  <p>9 apples shared equally between 3 horses is <input type="text"/></p>	<p>Notation for division</p> 

- *To find half a length, quantity, set of objects or shape*

Vocabulary

- *Groups*
- *Share*
- *Equal*
- *Half*
- *Quarter*
- *Array*

Year 2			
Objectives	Concrete	Pictorial	Abstract
<ul style="list-style-type: none"> To recall and division facts for the two, five and ten multiplication tables, including recognising odd and even numbers To know that division is not commutative To know that an array is an arrangement of objects, numbers or pictures in equal columns or rows To know that division are the inverse of each other (for example, $4 \times 5 = 20$ and $20 \div 5 = 4$) To know that a fractions is splitting a whole (number/shape etc.) into parts To use division facts for the 2, 5 and 10 multiplication tables To show that of two numbers can be done in any order (commutative) and division of one number by another cannot To calculate mathematical statements for division within the multiplication 		<p>Sharing</p>    <p>Grouping</p> 	<p>Notation of division facts</p> 

tables and write them using the multiplication (\times), division (\div) and equals ($=$) signs

- To solve problems involving division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts
- To relate division to grouping and sharing discrete and continuous quantities, to arrays and to repeated addition

Vocabulary

- Share
- Share equally
- Group
- Groups of
- Lots of
- Array
- Divide
- Divided by
- Divided into
- Division
- Grouping
- Left
- Left over

Dividing by 2



Dividing by 5

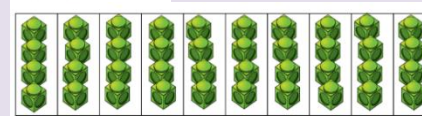
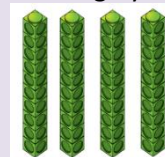
Here are 15 conkers.


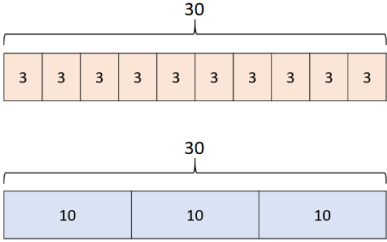
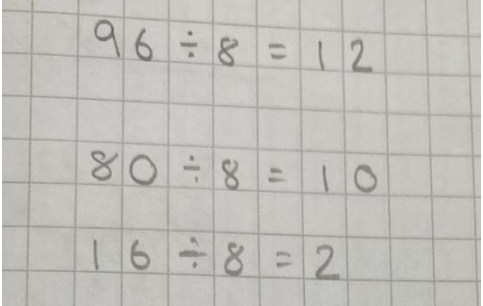
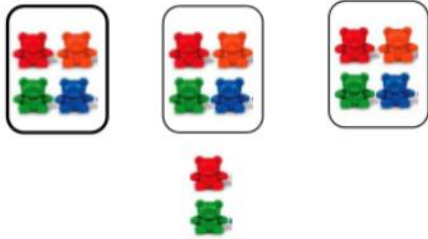
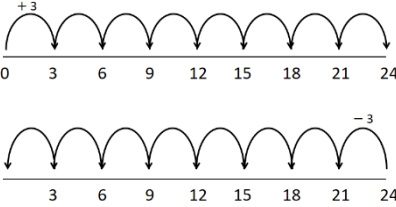
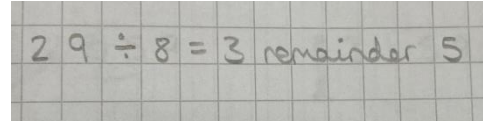
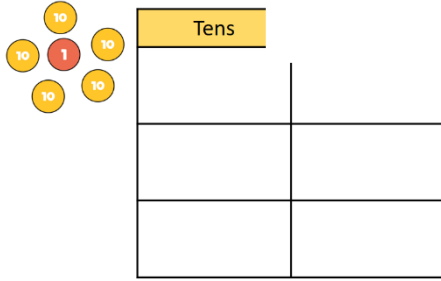


The conkers are shared into 5 equal groups.

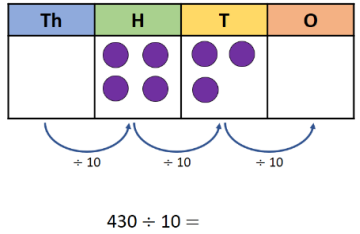
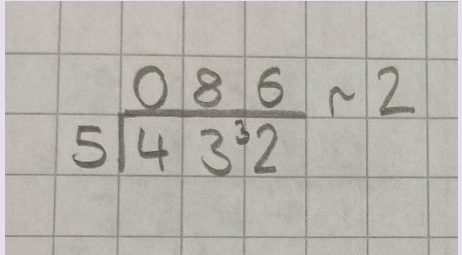
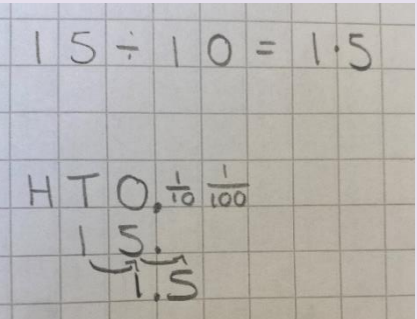
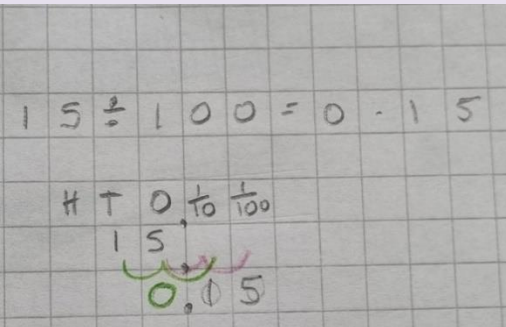
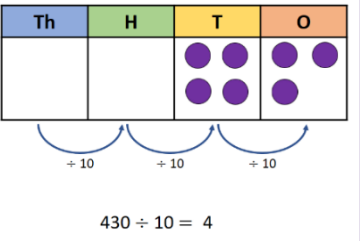
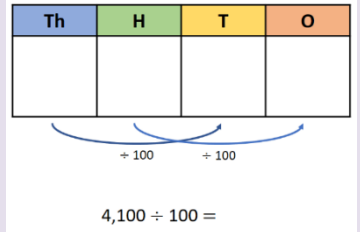
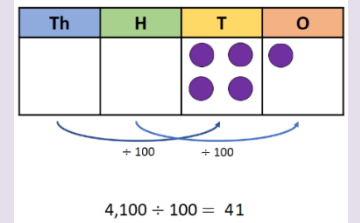


Dividing by 10



Year 3			
Objectives	Concrete	Pictorial	Abstract
<ul style="list-style-type: none"> To know that tenths arise from dividing an object into 10 equal parts and in dividing one – digit numbers or quantities by 10. To use division facts for the 3, 4 and 8 multiplication tables To 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 To solve problems, including missing number problems, involving division 	<p>Arrays</p> 	<p>Different ways of dividing by 3/4/8 etc</p> 	<p>Dividing with partitioning</p> 
	<p>Dividing with remainders</p> $14 \div 3 = 4r2$ 	<p>Dividing by counting up or back</p> 	<p>Dividing with remainders</p> 
<p>Vocabulary</p> <ul style="list-style-type: none"> Remainder Equation Share Share equally Group Groups of Lots of 		<p>Dividing 2-digits by 1-digit</p> $51 \div 3$ 	

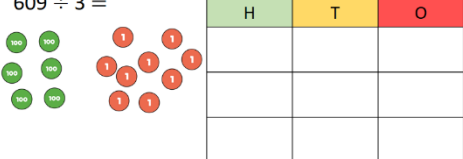
- *Array*
- *Divide*
- *Divided by*
- *Divided into*
- *Left*
- *Left over*

Year 4				
Objectives	Concrete	Pictorial	Abstract	
<ul style="list-style-type: none"> To recall division facts for multiplication tables up to 12×12 including the six, seven and nine times tables To know that when you divide by 1, the answer is the same To know the formal written method of division To know that hundredths arise when dividing an object by one hundred and dividing tenths by ten To 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 		<p>Dividing by 10</p>  <p>430 ÷ 10 =</p>	<p>Formal written method with remainders</p>  <p>Dividing by 10</p>  <p>Dividing by 100</p> 	
		 <p>430 ÷ 10 = 4</p>		<p>Dividing by 100</p>  <p>4,100 ÷ 100 =</p>
		 <p>4,100 ÷ 100 = 41</p>		
Vocabulary				
<ul style="list-style-type: none"> Quotient Divisor Dividend Divisible by Inverse Remainder Equation 				

- Share
- Share equally
- Group
- Groups of
- Lots of
- Array
- Divide
- Divided by
- Divided into
- Left
- Left over

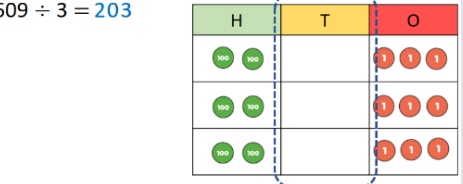
Diving 3-digits by 2-digits

$609 \div 3 =$

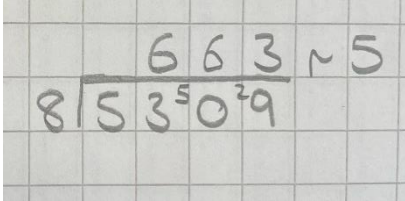


H	T	O

$609 \div 3 = 203$



H	T	O
100 100		1 1 1
100 100		1 1 1
100 100		1 1 1

Year 5																																																			
Objectives	Concrete	Pictorial	Abstract																																																
<ul style="list-style-type: none"> To know the formal written method of division To know that factors are numbers that divide exactly into another number. To recall prime numbers up to 19 To multiply and divide numbers mentally drawing upon known facts To multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 To 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 To identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. To establish whether a number up to 100 is prime 		<p>Dividing by 10, 100 & 1000</p> <table border="1" data-bbox="1115 331 1424 405"> <tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr> <tr><td>4</td><td>7</td><td>0</td><td>0</td><td>0</td></tr> </table> <table border="1" data-bbox="1115 434 1424 507"> <tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr> <tr><td></td><td>4</td><td>7</td><td>0</td><td>0</td></tr> </table> <table border="1" data-bbox="1115 536 1424 609"> <tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr> <tr><td></td><td></td><td>4</td><td>7</td><td>0</td></tr> </table> <table border="1" data-bbox="1115 638 1424 711"> <tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr> <tr><td></td><td></td><td></td><td>4</td><td>7</td></tr> </table> <p>Dividing 4-digits by 1-digit</p> <p>9306 ÷ 3</p> <table border="1" data-bbox="1102 874 1460 1120"> <thead> <tr> <th>Thousands</th> <th>Hundreds</th> <th>Tens</th> <th>Ones</th> </tr> </thead> <tbody> <tr> <td>1000 1000 1000 1000 1000 1000 1000 1000 1000</td> <td>100 100 100</td> <td></td> <td>1 1 1 1 1 1</td> </tr> </tbody> </table>	TTh	Th	H	T	O	4	7	0	0	0	TTh	Th	H	T	O		4	7	0	0	TTh	Th	H	T	O			4	7	0	TTh	Th	H	T	O				4	7	Thousands	Hundreds	Tens	Ones	1000 1000 1000 1000 1000 1000 1000 1000 1000	100 100 100		1 1 1 1 1 1	<p>Short division with remainders</p> 
TTh	Th	H	T	O																																															
4	7	0	0	0																																															
TTh	Th	H	T	O																																															
	4	7	0	0																																															
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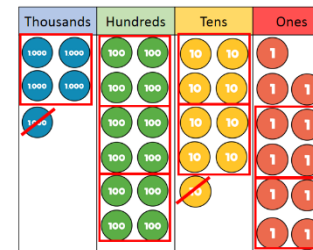
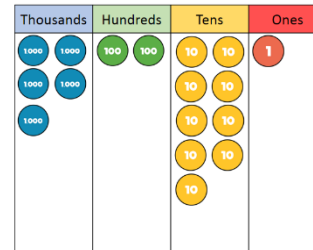
- To solve problems involving division including using their knowledge of factors and multiples, squares and cubes
- To solve problems involving division, including scaling by simple fractions and problems involving simple rates
- To interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding

Vocabulary

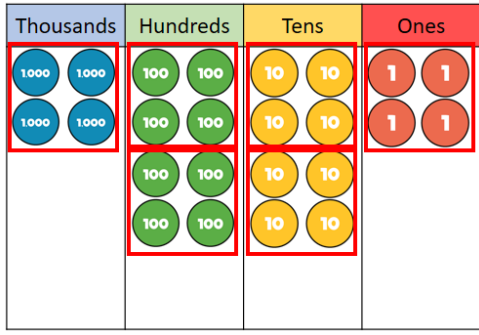
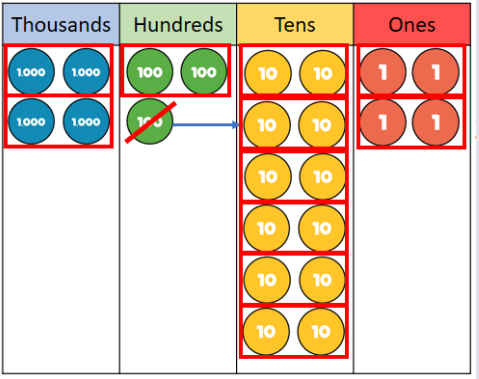
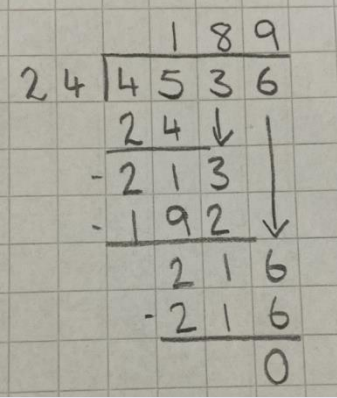
- Quotient
- Divisor
- Dividend
- Divisible by
- Inverse
- Remainder
- Equation
- Share
- Share equally
- Group
- Groups of
- Lots of

Dividing with remainders

$$5,291 \div 4 = 1,322 \text{ r}3$$



- *Array*
- *Divide*
- *Divided by*
- *Divided into*
- *Left*
- *Left over*

Year 6			
Objectives	Concrete	Pictorial	Abstract
<ul style="list-style-type: none"> To know the order of operations (BODMAS) to carry out calculations involving the four operations To know that fractions are a result of division To explore the order of operations using brackets To multiply and divide numbers mentally drawing upon known facts To multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 To divide numbers up to 4-digits by a two-digit whole number using the formal written method of short division where appropriate for the context divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division To interpret remainders as whole number remainders, fractions, or by rounding, 		<p>Dividing a 4-digit number by 1-digit number</p>  <p>With remainders</p> 	<p>Long division</p> 

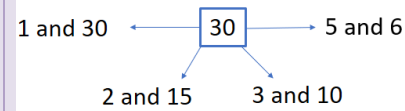
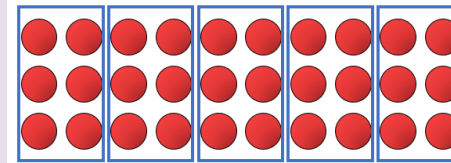
as appropriate for the context

- To use written division methods in cases where the answer has up to two decimal places
- To identify common factors, common multiples and prime numbers
- To use their knowledge of the order of operations to carry out calculations involving the four operations
- To use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy

Vocabulary

- Quotient
- Divisor
- Dividend
- Divisible by
- Inverse
- Remainder
- Equation
- Share
- Share equally
- Group
- Groups of

Finding factors



- | | | | |
|--|--|--|--|
| <ul style="list-style-type: none">• <i>Lots of</i>• <i>Array</i>• <i>Divide</i>• <i>Divided by</i>• <i>Divided into</i>• <i>Left</i>• <i>Left over</i>• <i>BODMAS</i> | | | |
|--|--|--|--|

Written – May 2024

Next Review – May 2026