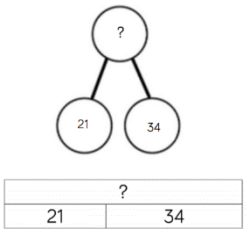
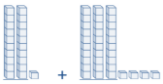
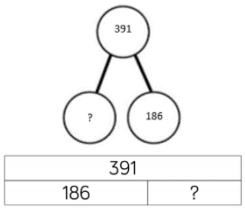
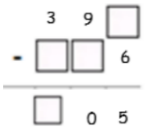
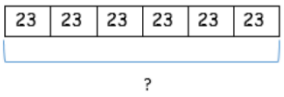
Calculation Policy

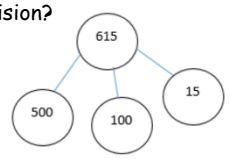
The National Curriculum for mathematics aims to ensure that all pupils become fluent in the fundamentals of mathematics, reason mathematically and can solve problems. It also states that 'by the end of Year 6, pupils should be fluent in written methods for all four operations, including long multiplication and division, and in working with fractions, decimals and percentages.' This calculation policy has been designed to develop the children's understanding gradually by using concrete, pictorial and abstract representations. We recognise that using a range of strategies, methods and resources will support the children in becoming confident mathematicians.

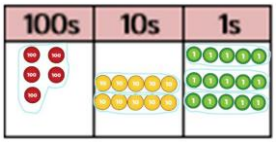
In all year groups, children will be expected to draw on methods learnt in previous years and use them when appropriate. Children are able to show their understanding of concepts through the 'Build It, Draw It, Write It, Say It' method, which they use regularly every week. We also acknowledge the importance of conceptual variation, by using examples such as:

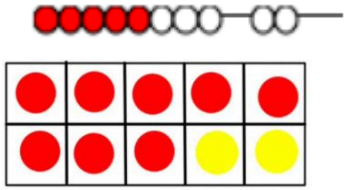
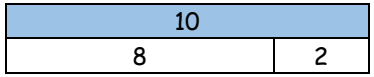
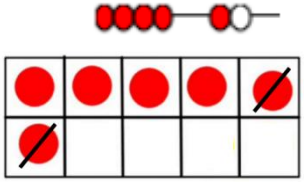
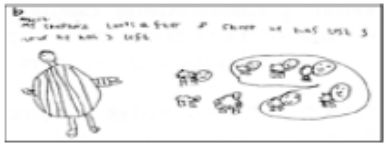
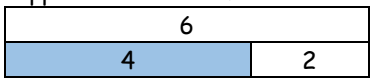
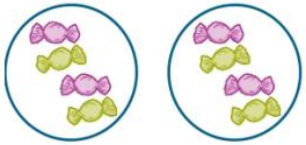
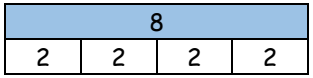
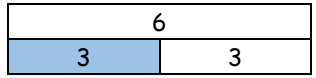
<table>
<tr><th colspan="4">21 + 34</th></tr>
<tr>
<td> 
</td>
<td>There are 21 children in Year 3 and in Year 4 there are 34 children. How many children in total?

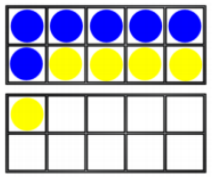
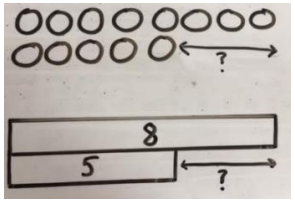
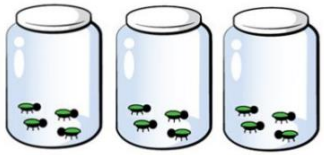
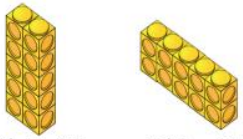
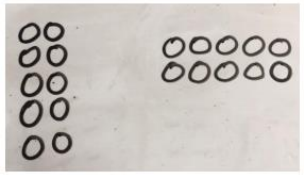
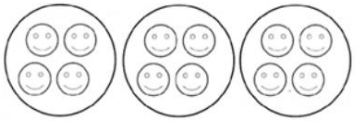
21 + 34 = 55. Prove it.</td>
<td>21
+34
____
21 + 34 =
☐ = 21 + 34</td>
<td> 
Missing digit problems:
</td>
</tr>
<tr><th colspan="4">391 - 186</th></tr>
<tr>
<td> 
</td>
<td>Raj spent £391, Timmy spent £186. How much more did Raj spend?

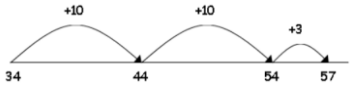
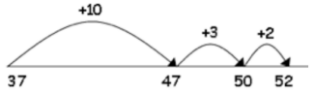
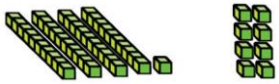
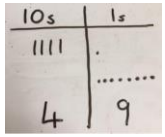
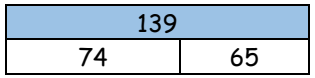
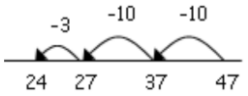
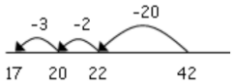
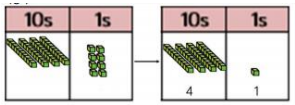
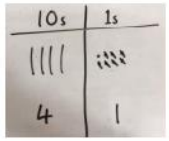
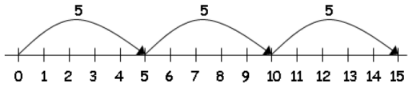
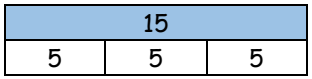
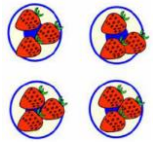
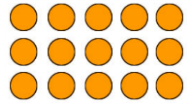
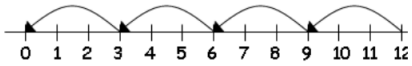
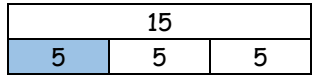
Calculate the difference between 391 and 186.</td>
<td>☐ = 391 – 186
391
-186
____</td>
<td>Missing digit calculations:
 
</td>
</tr>
<tr><th colspan="4">6 x 23</th></tr>
<tr>
<td> 
</td>
<td>Mary had to swim 23 lengths, 6 times a week.
How many lengths did she swim in one week?

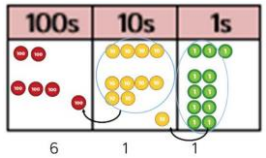
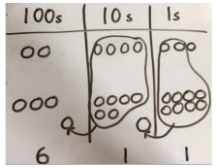
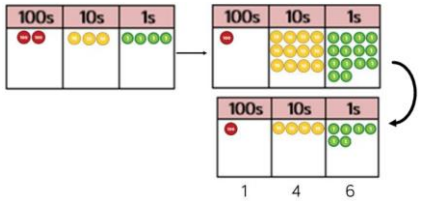
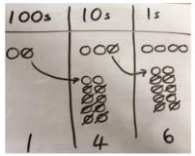
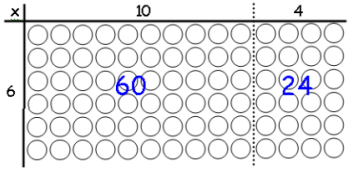
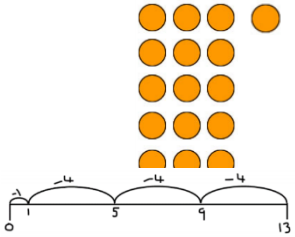
With the counters, prove that 6 x 23 = 138</td>
<td>6 × 23 =
☐ = 6 × 23
6 × 23
____
23 × 6
____</td>
<td>What is the calculation?
What is the product?
</td>
</tr>
<tr><th colspan="4">615 ÷ 5</th></tr>
<tr>
<td>Using the part whole model below, how can you divide 615 by 5 without using short division?
 
</td>
<td>I have £615 and share it equally between 5 accounts. How much would be in each account?

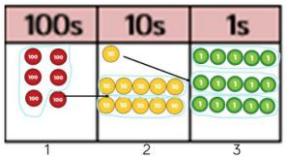
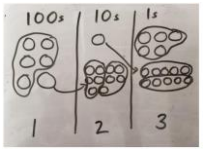
615 pupils need to be put in into 5 groups. How many pupils will be in each group?</td>
<td>5 ⟌ 615
615 ÷ 5 =
☐ = 615 ÷ 5</td>
<td>What is the calculation?
What is the answer?
 
</td>
</tr>
</table>

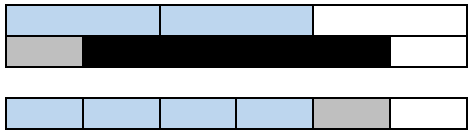
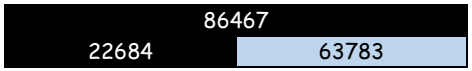
	Addition	Subtraction	Multiplication	Division
R	A range of concrete objects are used to **combine two parts to make a whole**. For example, counters, ten frame, Numicon and bead strings. e.g. 8 + 2 = 10  Children are introduced to **counting on a number line** remembering to put the largest number first. They develop pictorial ways of recording calculations. Children are introduced to Bar models to show part/part/whole and support calculations.  Children begin to learn recording calculations as number sentences.	A range of concrete objects are used to **take away and remove objects from a whole**. For example, counters, ten frame, Numicon and bead strings. e.g. 6 – 2 = 4  Children introduced to **counting back on a number line**. They develop pictorial ways of recording calculations.  Children are introduced to Bar models to support calculations.  Children begin to learn mathematical symbols and recording calculations as number sentences.	Children will experience **repeated grouping/repeated addition**. They will work on practical problem solving activities involving equal sets or groups.  Children will begin to see the Bar model being used to show equal parts totalling a whole.  	Children will experience **sharing** of objects in play and problem solving with concrete objects. Children will begin to see the Bar model being used to show a whole being split into equal parts. 

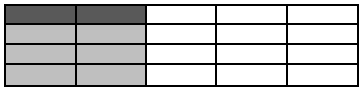
	Addition	Subtraction	Multiplication	Division
1	Children continue to use concrete objects and pictorial methods to support additions. Children use a range of methods to support their own calculations, including number squares, number lines, Numicon and ten frames. Bar models are used to show the combining of two parts to make a whole. When using objects or working on a number line, children start with the bigger number and **count on**. Children **regroup to make 10** using the ten frame. e.g.  Children develop an understanding of equality. e.g. $6 + \square = 11$ $6 + 5 = 5 + \square$ $6 + 5 = \square + 4$	Children continue to use concrete objects and pictorial methods to support subtractions. Children use a range of methods to support their own calculations, including number squares, number lines, Numicon and ten frames.  Bar models are used to show the unknown number and find the difference. Children use number lines to **count back**. The numbered line is also used to show that 6 – 3 means **the difference** between 6 and 3.	Children use concrete objects and pictorial methods to solve problems and recognise **repeated addition**. e.g. 3 x 4 4 + 4 + 4 There are 3 equal groups, with 4 in each group.  Children are introduced to arrays as a representation, both with resources and pictorially. Arrays are used to illustrate commutativity. e.g. 2 x 5 = 10   Children are exposed to Bar model examples. 10 5 | 5	Children use concrete objects and pictorial methods to solve problems related to division by **sharing**. e.g. 12 ÷ 3 = 4  Children are exposed to Bar model examples. 12 4 | 4 | 4

	Addition	Subtraction	Multiplication	Division
2	Children use empty number lines. They may start by adding the tens separately and then adding the ones, and then progress to adding the tens in one jump. e.g. 34 + 23 = 57  Bridging through ten when necessary can help children become more efficient. e.g. 37 + 15 = 52  Children will use **base 10** equipment to combine the numbers and regroup to make 10 when necessary. e.g. 41 + 8  Children will learn to represent base 10 using pictorial **sticks and dots** in a place value chart – **column method**.  Children are introduced to partitioning as a way of adding. e.g. 74 + 65 = 70 + 4 + 60 + 5 130 + 9 = 139 Children draw their own Bar models to represent additions.  	Children use empty number lines. They may start by subtracting the tens separately and then subtracting ones, and then progress to subtracting the tens in one jump. e.g. 47 – 23 = 24  Bridging through ten when necessary can help children become more efficient. e.g. 42 – 25 = 17  Children will use **base ten** equipment to subtract the numbers. e.g. 48 – 7 = 41  Children will learn to represent **base 10** using pictorial **sticks and dots** in a place value chart – **column method**.  Children will begin to learn how to regroup using base 10 equipment and through pictorial methods. e.g. 41 – 26 = 15 Children draw their own Bar models to represent subtractions.	Children consolidate understanding of arrays from Year 1 and use these to solve problems. e.g. 3 x 5 = 15 **5 x 3 = 15** **3 x 5 = 15** Children understand multiplication as **repeated addition**. e.g. 3 x 5 5 + 5 + 5 3 lots of 5 This can be shown on a number line. e.g.  Children begin to draw their own Bar models to represent multiplications.  	Objects and jottings are used to support problem solving involving **sharing**. e.g. 12 strawberries are shared between 4 people. How many do they each get? 12 ÷ 4 = 3  This also applies to **grouping**. e.g. There are 6 strawberries. If everybody gets 2 strawberries, how many people are there? 6 ÷ 2 = 3 Arrays are also used to solve such problems. e.g. 15 ÷ 5 = 3 15 ÷ 3 = 5  Children understand division as **repeated subtraction** on a number line. e.g. 12 ÷ 3 = 4  Children begin to draw their own Bar models to represent divisions. 

	Addition	Subtraction	Multiplication	Division
3	Children can continue to use number lines and previous methods to support them. Children use **partitioning**. They will add the ones first. e.g. 124 + 235 = 100 + 20 + 4 + 200 + 30 + 5 300 + 50 + 9 = 359 The **formal written method** is introduced, including regrouping when necessary. This is first shown to them using place value counters and pictorial representations, before moving onto the written method. e.g. 243 + 368=   2 4 3 + 3 6 8 6 1 1 1 1 Bar models are used as another way to demonstrate the additions, and are also used to show the addition of fractions with the same denominator. e.g. $^{5}/_{7} + {}^{1}/_{7} = {}^{6}/_{7}$ 	Children can continue to use number lines and previous methods to support them. Children build on techniques used in Year 2, using place value counters (in place of base ten) and pictorial methods to show subtractions.   **Formal written methods** are introduced, including regrouping when necessary. e.g. 234 – 88 = 1 2 1 2 3 4 - 8 8 1 4 6 Bar models are used to represent these subtractions. 234 146 | 88	Children can continue to use previous methods to support them. Children are able to model a multiplication calculation using an **array**. This understanding will lead the children to an introduction of the **grid method**. e.g. 6 x 14 =  6 x 10 = 60 6 x 4 = 24 This can also be represented as: | x | 10 | 4 | | |---|---|---|---| | 6 | 60 | 24 | = 84 | Bar models are drawn to represent their calculations. 84 14 | 14 | 14 | 14 | 14 | 14	Children build on techniques from Year 2. Concrete representations will be used to show divisions with remainders. e.g. 13 ÷ 4 = 3 r1 Lollipop sticks can be used to form whole squares as we are dividing by 4. Children can represent this pictorially through drawing arrays and number lines. e.g. 13 ÷ 4 = 3 r1  Children begin to use the short division technique known as the **'Bus Stop' method** (for dividing two-digit numbers by a one-digit number) using concrete and pictorial methods to support them. e.g. 84 ÷ 4 = Tens Ones 2 1 4 | 8 4 Bar models are used to represent their calculations, as well as finding fractions of a number. e.g. $^{1}/_{3}$ of 18 18 6 | 6 | 6

	Addition	Subtraction	Multiplication	Division
4	Children consolidate formal written method, including regrouping when necessary. They will draw on all methods previously learnt, including using resources and pictorial methods, to support their learning. e.g. 3587 + 675 = 4262 3 5 8 7 + 6 7 5 4 2 6 2 1 1 1 4262 3587 | 675	Children consolidate formal written method, with numbers up to four digits, including regrouping when necessary. They will draw on all methods previously learnt, including using resources and pictorial methods, to support their learning. e.g. 6467 – 2684 = 3783 5 13 1 6 4 6 7 - 2 6 8 4 3 7 8 3 6467 3783 | 2684	Children continue to use the grid method where they feel confident doing so. Children are introduced to the formal written method, including carrying when necessary. Multiplications are based on two and three-digit numbers by a one-digit number. e.g. 24 x 8 = We do this by starting with the **expanded method** so children can see the link from the grid method. 2 4 x 8 3 2 (8 x 4) + 1 6 0 (8 x 20) 1 9 2 Then move to **formal method**. 2 4 x 8 1 9 2 3 192 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24	Children continue to use **short division** (Bus Stop method) to divide three-digit numbers by a one-digit number, using resources and pictorial methods when needed. e.g. 615 ÷ 5 =   1 2 3 5 | 6 11 15 When necessary, children should be able to identify and interpret remainders within a context. Children will continue to use the bar model to support divisions and fractions. e.g. $^{2}/_{3}$ of 24 24 8 | 8 | 8

	Addition	Subtraction	Multiplication	Division
5	Children continue to use formal column method with increasingly large numbers and those including decimals. They will draw on all methods previously learnt, including using resources and pictorial methods, to support their learning. e.g. 26584 + 25848 = 52432 2 6 5 8 4 + 2 5 8 4 8 5 2 4 3 2 1 1 1 1 Children learn to add fractions with different denominators by finding the lowest common denominator. e.g. $^{2}/_{3} + {}^{1}/_{6}$ $^{4}/_{6} + {}^{1}/_{6} = {}^{5}/_{6}$  	Children continue to use formal column method with increasingly large numbers and those including decimals. They will draw on all methods previously learnt, including using resources and pictorial methods, to support their learning. e.g. 86467 – 22684 = 63783 5 13 1 8 6 4 6 7 - 2 2 6 8 4 6 3 7 8 3 Children continue to use the bar model to represent their calculations, either by subtracting or finding the difference.  	Children consolidate formal method and extend to multiply up to a four-digit number by a one-digit number. **Long multiplication** is introduced for multiplying a number up to four-digits by a two-digit number. e.g. 124 x 26 = 3224 1 2 4 x 2 6 7 4 4 1 2 + 2 4 8 0 3 2 2 4 1 1 Children multiply proper fractions by a whole number. e.g. $^{2}/_{3} \times 5 = {}^{10}/_{3}$ $^{10}/_{3} = 3\ {}^{1}/_{3}$ 	Children consolidate use of short division and learn to divide numbers involving decimals. e.g. 624.5 ÷ 4 = 156.2 1 5 6 . 2 4 | 6 2 2 4 . 8 Bar models and number lines are used to represent equivalent fractions, decimals and percentages. 1 Whole 0.25 | 0.25 | 0.25 | 0.25 25 % | 25 % | 25 % | 25 % $\frac{1}{4}$ | $\frac{1}{4}$ | $\frac{1}{4}$ | $\frac{1}{4}$

	Addition	Subtraction	Multiplication	Division
6	Children practise using formal methods for addition. They will draw on all methods previously learnt, including using resources and pictorial methods, to support their learning. Children will learn to estimate and develop strategies for working mentally. They will use a range of numbers, including those greater than 4 digits and those with decimals. e.g. 14.241 + 9.08 + 421.7 = 445.021 E = 14 + 9 + 421 = 444 14.241 + 9.080 421.700 445.021 1 1 1	Children practise using formal methods for subtraction. They will draw on all methods previously learnt, including using resources and pictorial methods, to support their learning. Children will learn to estimate and develop strategies for working mentally. They will use a range of numbers, including those greater than 4 digits and those with decimals. e.g. 427.08 – 15.125 = 411.955 E = 427 – 15 = 412 6 7 1 427.080 - 15.125 411.955	Children consolidate multiplying a number up to four digits by a two-digit number using the formal method. Children will learn to multiply one-digit numbers with up to 2 decimal places by whole numbers. e.g. 0.4 x 2 = 0.8 Children learn to multiply fractions. This can be done pictorially to aid understanding. e.g. $^1/_2 \times {}^2/_5 = {}^1/_5$ $^2/_5$ is shown below Each fifth is then split in half to show it has been multiplied by $\frac{1}{2}$. The dotted section shows half of $^2/_5$ which is $^2/_{10}$ of the whole. This can be simplified as $^1/_5$. 	Children should use **long division** to divide numbers up to four digits by a two-digit number. e.g. 432 ÷ 15 = 2 8 r12 15) 4 3 2 - 3 0 1 3 2 - 1 2 0 1 2 Children learn to divide fractions by whole numbers. e.g. $^2/_5 \div 4 = {}^1/_{10}$ Children develop their understanding through pictorial representations such as: When this is divided by 4, $^2/_{20}$ are now shaded, as the dark area shows.  This can be simplified as $^1/_{10}$.