

# **Winchcombe Abbey C of E Primary School**

## Calculation Policy



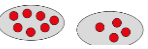

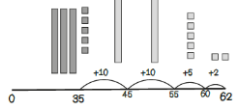
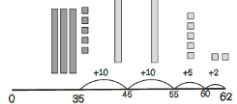
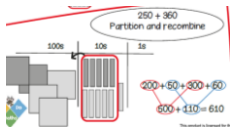
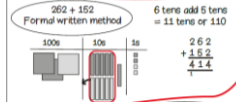
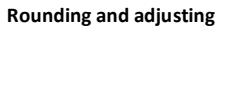
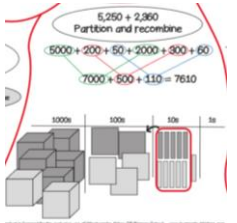
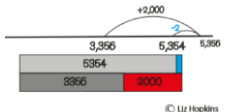
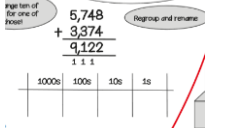
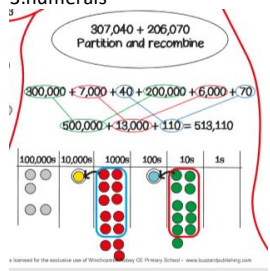
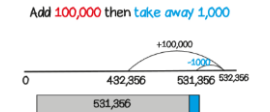
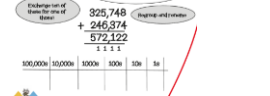
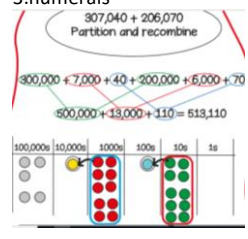
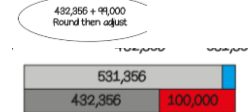
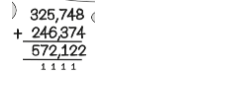
### Progression of Representations\*

*\*Draft – implementation formally beginning in the Summer term*


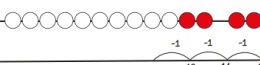
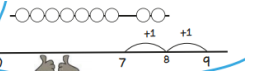
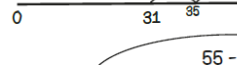


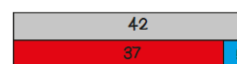
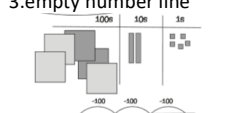

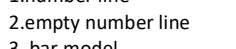

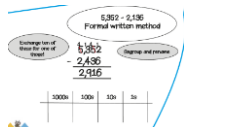
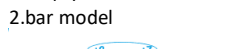
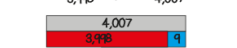
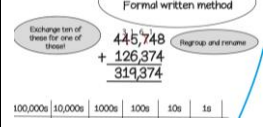

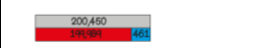
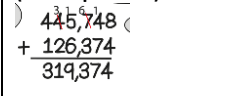
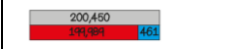
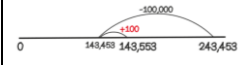
# Calculation policy: Method Progression Map



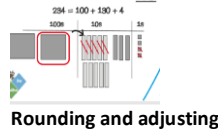
Addition  
Mental methods to be taught after visual.

Reception	Y1	Y2	Y3	Y4	Y5	Y6
<b>Counting all:</b> 1. Real-life objects 2. Pictures of real-life objects  3. Drawing using a representation and counting all  <b>Counting on in ones from a starting point:</b> 1. using a given number line to highlight the starting number and track the jumps being added 	<b>Counting all:</b> 1. mathematical objects (numicon, cubes, counters) 2. drawings  <b>Counting on in ones from a starting point:</b> 1. mathematical objects (numicon, cubes, counters) 2. given number line 	<b>Partitioning:</b> <b>Partition and recombine</b> 1. diennes 2. drawing the diennes $\begin{array}{r} 25 + 43 \\ 20 + 5 + 40 + 3 \\ 60 + 8 = 68 \end{array}$ <b>Count on in tens and then in ones (if ones present)</b> 1. diennes 2. drawing the diennes 3. given number line 4. empty number line  5. bar model 	<b>Partitioning:</b> <b>Partition and recombine</b> 1. diennes 2. place value counters 3. drawings 4. numerals  <b>Counting on in hundreds, tens and then ones</b> 1. diennes/place value counters 2. drawings 3. empty number line 4. bar model  <b>Formal written method (compact vertical)</b>  <b>Rounding and adjusting</b> 	<b>Partitioning:</b> <b>Partition and recombine</b> 1. diennes 2. place value counters 3. drawings 4. numerals  <b>Rounding and adjusting</b> 1. number line 2. bar model  <b>Formal written method (compact vertical)</b> 	<b>Partitioning:</b> <b>Partition and recombine</b> 1. place value counters 2. drawings 3. numerals  <b>Rounding and adjusting</b> 1. number line 2. bar model  <b>Formal written method (compact vertical)</b> 	<b>Partitioning:</b> <b>Partition and recombine</b> 1. place value counters 2. drawings 3. numerals  <b>Rounding and adjusting</b> 1. bar model  <b>Formal written method (compact vertical)</b> 

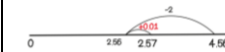
Subtraction  
Mental methods to be taught after visual.

<p><b>Counting all, followed by subtract from total:</b></p> <p>1.Real-life objects are physically removed</p> <p>2.Pictures of real-life objects where images are crossed off when they are being subtracted</p> <p>3. Drawing using a representation and crossing off to count the remaining quantity</p> <p><b>Counting back in ones from a starting point:</b></p>	<p><b>Subtract from total:</b></p> <p>1.objects</p> <p>2.drawings</p> <p></p> <p><b>Counting back in ones from a starting point:</b></p> <p></p> <p><b>Finding the difference:</b></p> <p>1.using beadstrings initially</p> <p>2.transferring this to a given number line</p> <p></p>	<p><b>Partitioning:</b></p> <p>Partition second number, counting back in tens and then ones:</p> <p>1.diennes</p> <p>2.drawing the diennes</p> <p>3.empty number line</p> <p></p> <p><b>Finding the difference</b></p> <p>1.beadstring</p> <p></p> <p>2. number line</p> <p></p> <p>3. empty number line</p> <p>4. bar model</p> <p></p>	<p><b>Partitioning:</b></p> <p>Counting back in hundreds, tens and then ones</p> <p>1.diennes</p> <p>2.drawings</p> <p>3.empty number line</p> <p></p> <p><b>Formal written method (decomposition)</b></p> <p></p> <p><b>Finding the difference</b></p> <p>1.number line</p> <p></p> <p>2.empty number line</p> <p>3. bar model</p> <p></p>	<p><b>Partitioning:</b></p> <p>Using place value to subtract</p> <p>1.diennes</p> <p>2.place value counters</p> <p>3.drawings</p> <p>4.empty number line</p> <p><b>Formal written method (decomposition)</b></p> <p></p> <p><b>Finding the difference</b></p> <p>1.empty number line</p> <p></p> <p>2.bar model</p> <p></p>	<p><b>Partitioning:</b></p> <p>Using place value to subtract</p> <p>1.diennes</p> <p>2.place value counters</p> <p>3.drawings</p> <p>4.empty number line</p> <p><b>Formal written method (decomposition)</b></p> <p></p> <p><b>Finding the difference</b></p> <p>1.empty number line</p> <p></p> <p>2.bar model</p> <p></p>	<p><b>Formal written method (decomposition)</b></p> <p></p> <p><b>Finding the difference</b></p> <p>1.bar model</p> <p></p> <p><b>Rounding and adjusting</b></p> <p>Take away 100,000 then add 100</p> <p></p>
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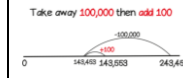
1.using a given number line to highlight the starting number and track the jumps by counting backwards



### Rounding and adjusting

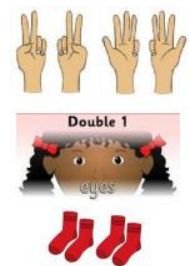


### Rounding and adjusting



### Visual doubling:

- 1.Objects
- 2.Pictures of objects to show two equal groups



3. Drawing using a representation (e.g. circles) to show two equal groups

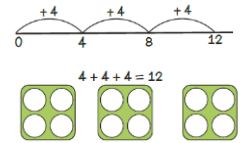
### Counting

Making groups using objects drawing equal groups and counting in ones

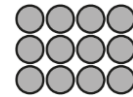


### Counting

Making equal groups and counting in multiple jumps  
1.repeated addition  
2.counting multiple groups

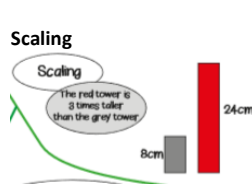


### Arrays

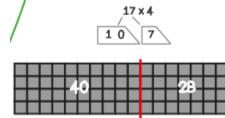


$$4 \times 3 = 12$$
$$3 \times 4 = 4 \times 3$$

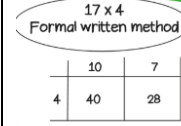
### Arrays



### Partition and recombine



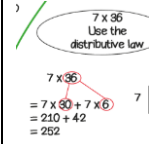
### Grid method



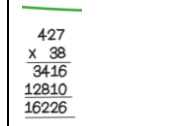
### Formal written method



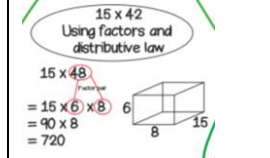
### Distributive law



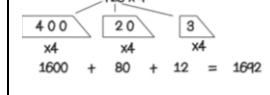
### Formal written method



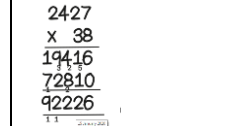
### Factors and distributive law



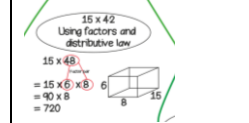
### Partition and recombine



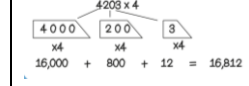
### Formal written method



### Factors and distributive law



### Partition and recombine

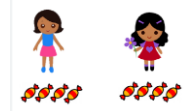


### Visual sharing:

- 1.Objects being shared into equal groups

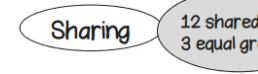


- 2.Pictures of objects being shared



### Sharing

Drawing groups and sharing equally, counting total in ones



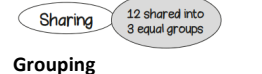
### Grouping

Drawing groups, counting up in ones, until a total is reached



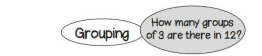
### Sharing

Drawing groups and noticing when division provides a remainder

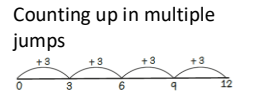


### Grouping

Drawings groups, counting up in multiple jumps, until a total is reached



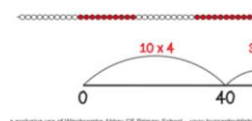
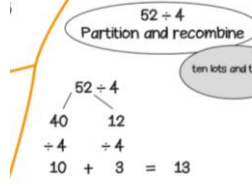
### Counting up



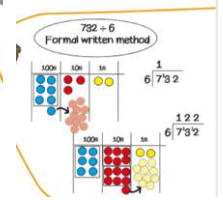
If I know  $3 \times 4 = 12$  then I know  $12 \div 3 = 4$

### Bar model

### Partition and recombine

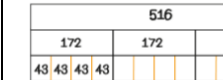


### Formal written method



### Using factors

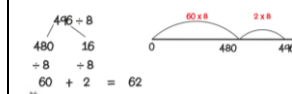
$$516 \div 3 = 172$$



### Formal written method (short division)



### Partition and recombine



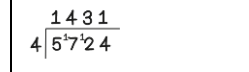
### Using factors

$$1512 \div 6 = 252$$

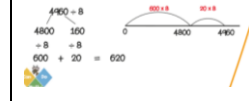


### Formal written methods:

(short division, including division by 2-digits through finding multiples)





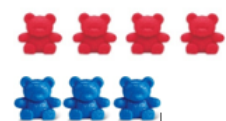

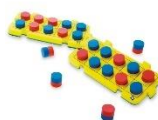
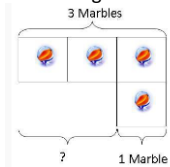
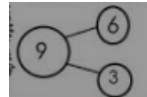
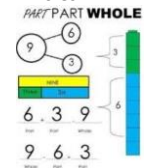
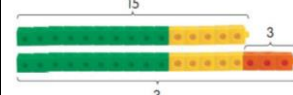
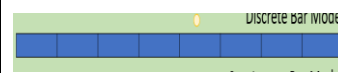
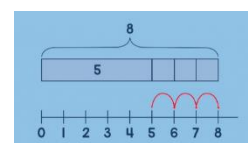
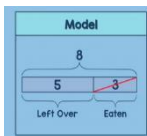
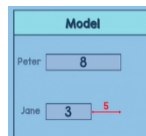
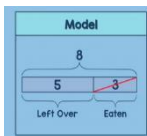
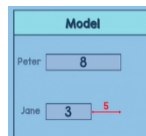
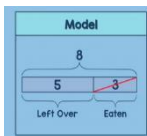
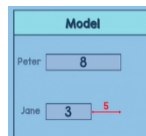
### Partition and recombine



### Using factors



			Division as fractions 				
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	EYFS	Y1	Y2										
<b>Bar Modelling</b>  <i>Bar Models will initially be used to represent one number (e.g. part-part-whole) / to compare two values before being used at the end of KS1 moving into Year 3 to represent questions/problems.</i>	<p><b>Across the year:</b></p> <ul style="list-style-type: none"><li>Discussions of ‘part-part’ e.g. “5 is made up of 2 and 3”</li><li>Representing two parts using different amounts of objects</li><li>Lining objects up accurately in a row for counting and separating the two parts</li></ul>  <ul style="list-style-type: none"><li>Numicon utilised to create different parts of a number on top of one another</li><li>Part-part-whole circle structure to be explored using objects</li></ul>  <ul style="list-style-type: none"><li>Lining up two sets of objects and comparing which has the greater amount</li></ul> 	<p><b>Autumn term, physical part-part-whole work mirroring EYFS:</b></p>  <ul style="list-style-type: none"><li>Numerals written onto templates to label what has been created using resources</li><li>Numicon utilised to represent numbers</li><li>Using tens frames to represent numbers in different ways</li></ul>  <p><b>Spring term onwards:</b></p> <ul style="list-style-type: none"><li>Objects and then pictures are used to represent the values of the bars e.g.</li></ul>  <ul style="list-style-type: none"><li>Chn are able to independently draw their own number representations for part-part-whole</li></ul> 	<ul style="list-style-type: none"><li>Numerical part-part-whole is used straight away. Cubes &gt; drawings of cubes are used in straight lines to represent these part-part-wholes</li></ul>  <ul style="list-style-type: none"><li>Counters and/or cubes are used to represent amount when comparing numbers</li></ul>  <ul style="list-style-type: none"><li>Discrete bar models only:</li></ul>  <p><b>Spring term onwards</b></p> <ul style="list-style-type: none"><li>Continuous bar models used to teach aggregation.</li><li>Augmentation will be used to model what’s happening during aggregation (referenced below)</li></ul>  <ul style="list-style-type: none"><li>Bar modelling is used to represent addition and subtraction problems (including finding the difference through comparison):</li></ul> <table><tr><th>Model</th><th>Calculations</th></tr><tr><td></td><td><math>8 - 3 = 5</math></td></tr><tr><td>Reduction</td><td></td></tr><tr><td></td><td><math>8 - 3 = 5</math></td></tr><tr><td>Comparison model</td><td></td></tr></table> <p>Concrete &gt; pictorial &gt; numeral pattern to be followed whenever used.</p>	Model	Calculations		$8 - 3 = 5$	Reduction			$8 - 3 = 5$	Comparison model	
Model	Calculations												
	$8 - 3 = 5$												
Reduction													
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Concrete > pictorial > numeral pattern to be followed whenever used.

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**DOCUMENT:**

THE BAR  
MODELLING  
REPRESENTATIO  
NS DOCUMENT  
IS CURRENTLY  
BEING ROLLED  
OUT AND  
IMPLEMENTED  
ACROSS  
SCHOOL.

<p><b>Y3-4</b></p> <p><i>Continuing as before for children who are struggling with representing using bar modelling, but to also include:</i></p> <ul style="list-style-type: none"> <li>Bar modelling used to solve addition and subtraction as per year 2 outline. This will include comparison when finding the difference.</li> <li>Bar modelling used to solve multiplication and division problems</li> </ul> <div data-bbox="47 459 495 582"> </div> <p>Sharing                      Grouping</p> <ul style="list-style-type: none"> <li>Bar modelling used to solve unit fraction problems:</li> </ul> <div data-bbox="40 724 324 857"> </div>	<p><b>Y5</b></p> <p><i>Continuing as before for children who are struggling with representing using bar modelling, but to also include:</i></p> <ul style="list-style-type: none"> <li>Bar modelling used when solving problems involving scaling e.g. “three times as much”</li> </ul> <div data-bbox="848 362 1274 531"> </div>	<p><b>Y6</b></p> <p><i>Continuing as before for children who are struggling with representing using bar modelling, but to also include:</i></p> <ul style="list-style-type: none"> <li>Bar modelling used to represent multi-step pre-algebraic problems</li> </ul> <div data-bbox="1545 362 2027 501"> </div> <ul style="list-style-type: none"> <li>Bar modelling used to represent problems involving ratio</li> <li>Bar modelling used to represent algebraic problems – only as a form of visualisation</li> </ul> <div data-bbox="1574 751 1995 981" style="border: 1px solid red; border-radius: 10px; padding: 10px;"> <p><b>Important:</b> these problems can get complex so most efficient way is to solve them algebraically. Bar model acts as a visual to explain what is happening when the equation is balanced.</p> </div>
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**DRAFT DOCUMENT:** THE BAR MODELLING REPRESENTATIONS DOCUMENT IS CURRENTLY BEING ROLLED OUT AND IMPLEMENTED ACROSS SCHOOL.