

**CALCULATIONS POLICY**

The rationale behind this policy is to provide a consistent and logical approach to the teaching of calculation across the whole school. By teaching a consistent approach it will allow for the progressive teaching of strategies between year groups and classes.

The importance and sound knowledge of place value is essential to the successful application of all these methods and it should be taught and revisited alongside all methods, and used in the explanation by pupil of their methods. Pupil's written responses will follow on from their knowledge of mental strategies. The common approach to teaching will help consolidate and enhance the learning of the pupils over the course of their time at Balfour Junior School.

As with all teaching, one method may not suit all pupils and in view of this a variety of strategies are taught. If a pupil develops their own strategy and is able to explain and compare it to the school's chosen strategy, the year group methods will still be taught and evidenced.

All teaching will continue to use number tracks, number lines and empty number lines to explain and support calculations where appropriate, and encourage the use of jottings. The choice of method made by the pupil will be discussed and challenged at all times in order to develop a thinking mathematician.

Each year group will teach a chosen strategy (Seen as 'Stages' on the policy) within that year. These will be the strategies that should generally be used when working as a whole class or group.

	<u>Year 3</u>	<u>Year 4</u>	<u>Year 5</u>	<u>Year 6</u>
<u>Addition</u>	3/4/5/6	4/5/6	5/6/7	5/6/7
<u>Subtraction</u>	3/4/5/6	4/5/6	6/7/8	6/7/8
<u>Multiplication</u>	3/4	4/5	5/6/7	5/6/7
<u>Division</u>	4/5/6	5/6	6/7/8	6/7/8

## **MENTAL ADDITION AND SUBTRACTION**

### **Addition**

One key method will be taught and revisited throughout the school:

- Pupils will be taught to count on from most significant number
- Pupils will be taught partitioning followed by addition of most significant to least significant number
- Pupils will be taught standard formal methods of calculation

### **Subtraction**

One key method will be taught and revisited through the school:

- Pupils will be taught to count back using a number line
- Pupils will be taught to count on for small differences
- Pupils will be taught partitioning followed by subtraction of least significant to most significant number

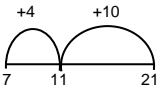

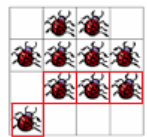


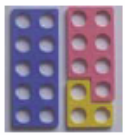
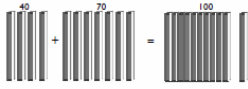
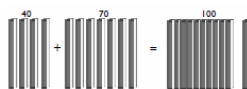
## **MENTAL MULTIPLICATION AND DIVISION**

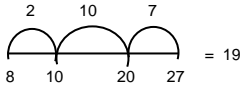
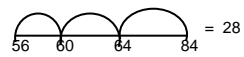
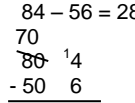

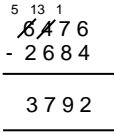
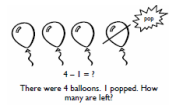
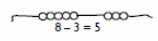
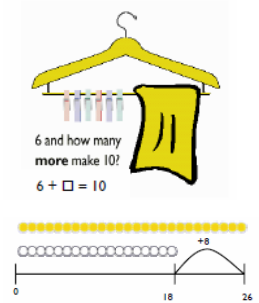
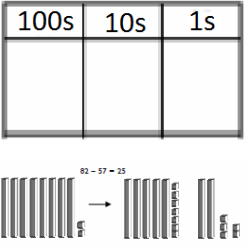
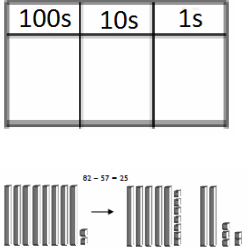
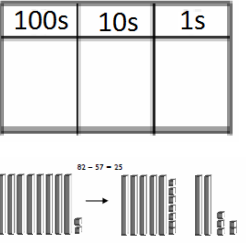
### **Multiplication**

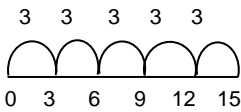
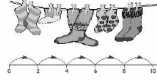
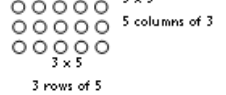

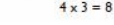
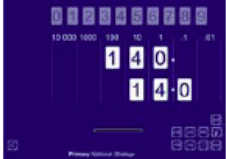
- Pupils will be taught multiplication as repeated addition
- Pupils will be taught multiplication tables in line with Primary Framework
- From knowledge of tables, pupils will be taught multiplication using partitioning, combined with multiplication of 10 or 100 (the grid method)


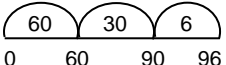
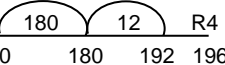
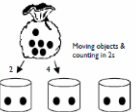

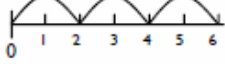
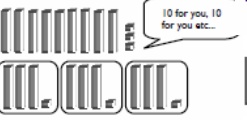



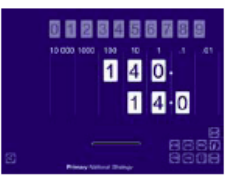
### **Division**

- Using knowledge of multiplication tables and understanding of division as the inverse of multiplication
- Division to be taught as group

	STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5	STAGE 6	STAGE 7									
<p><b>ADDITION</b></p> <p>Understanding addition &amp; subtraction</p> <p>Addition &amp; subtraction facts to 20</p> <p>Counting on &amp; back in 1's and 10's</p>	<ul style="list-style-type: none"> <li>* Practical activities and discussions e.g. using two objects, how can I make a given total?</li> <li>Finding one more than a number from 1 to 10</li> <li>Using vocabulary associated with addition</li> </ul> <p>*questions should be real life and related to children's experiences</p>	<ul style="list-style-type: none"> <li>Begin to use the + and = sign to record mental calculations</li> <li>Know by heart all number bonds to 10 and begin to know to 20</li> <li>Know that addition can be done in any order to do mental calculations more efficiently</li> <li>Begin to use horizontal addition methods.</li> </ul>	<ul style="list-style-type: none"> <li>Adding three single digit numbers mentally</li> <li>Know by heart all number bonds to 20</li> <li>Use + and = to record mental calculations</li> <li>Use a number line to make informal jottings</li> </ul>  <ul style="list-style-type: none"> <li>Use partitioning to reflect mental methods</li> </ul> $47 + 78 = 78 + 40 + 7$	<ul style="list-style-type: none"> <li>Using informal pencil and paper methods (jottings) and introducing vertical addition, most significant digit first</li> </ul> $\begin{array}{r} 80 \quad 3 \\ +40 \quad 2 \\ \hline 120 \quad 5 = 125 \end{array}$ <ul style="list-style-type: none"> <li>Adding TO and TO moving into HTO using vertical format, adding least significant digit first</li> </ul> $368 + 493 = 861$ $\begin{array}{r} 300 \quad 60 \quad 8 \\ + 400 \quad 90 \quad 3 \\ \hline 700 \quad 150 \quad 11 = 861 \end{array}$	<ul style="list-style-type: none"> <li>Vertical format, least significant digit first <b>extended to larger number</b></li> </ul> $\begin{array}{r} 368 \\ + 493 \\ \hline 861 \end{array}$ $11 = 8+3$ $150 = 60+90$ $700 = 300+400$	<ul style="list-style-type: none"> <li>Children using the compact layout, <b>involving carrying</b></li> </ul> $\begin{array}{r} 368 \\ + 491 \\ \hline 859 \\ 1 \end{array}$	<ul style="list-style-type: none"> <li>Extending to decimals</li> <li>Compact addition using regrouping for thousands, hundreds, tens and ones and decimals</li> </ul> $\begin{array}{r} 123.8 \\ + 79.4 \\ \hline 203.2 \\ 111 \end{array}$ <p>Compact addition including decimals with 0 as a place holder.</p> $\begin{array}{r} 123.8 \\ + 79.04 \\ \hline 202.84 \\ 11 \end{array}$									
<p><b>MODELS AND IMAGES TO SUPPORT</b></p>	   <p>7 + 3 = 10</p>	<p>12 + 23 = 12 + 20 + 3</p>   <p>13 + 7 = 20 7 + 13 = 20</p>	<table border="1"> <tr> <td>100s</td> <td>10s</td> <td>1s</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table> 	100s	10s	1s				<table border="1"> <tr> <td>100s</td> <td>10s</td> <td>1s</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table> 	100s	10s	1s			
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	STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5	STAGE 6	STAGE 7
<p><b>SUBTRACTION</b></p> <p>Understanding addition &amp; subtraction</p> <p>Addition &amp; subtraction facts to 20</p> <p>Counting on &amp; back in 1's and 10's</p>	<ul style="list-style-type: none"> <li>Practical activities and discussions e.g. There are 5 starfish on a rock, the tide comes in and washes one away. How many are left?</li> <li>Finding one less than a number from 1 to 10</li> <li>Using vocabulary associated with subtraction</li> <li>Begin to relate subtraction to 'taking away'</li> </ul>	<ul style="list-style-type: none"> <li>Begin to use the - and = sign to record mental calculations</li> <li>Understand all subtraction facts to 10 and begin to know to 20</li> <li>Begin to introduce horizontal subtraction alongside practical resources</li> </ul> <p>10-7=3</p> <p>10-3=7</p> <p>8 - 3 = 5</p>	<ul style="list-style-type: none"> <li>Finding a small difference by counting up 27 - 18 = 9</li> <li>Use - and = sign to record mental calculations</li> <li>Understand by heart all subtraction facts to 20</li> <li>Use number line to record difference. 27 - 8 = 19</li> <li>Use ones first 84 - 56 = 28</li> </ul>  	<ul style="list-style-type: none"> <li>Using informal pencil and paper methods (jottings) NB the difference between the numbers is bigger</li> <li>Use partitioning to reflect mental methods</li> <li>Use partitioning/expanded method</li> </ul> <p>84 - 50 = 34</p> <p>34 - 6 = 34 - 4 - 2 = 28 or</p> <p>34 - 6 = 28</p> <p>87 - 56 =</p> <p>80    7</p> <p>- 50    6</p> <p>30    1</p>	<ul style="list-style-type: none"> <li>Carrying on vertical subtraction in partitioning/expanded method</li> </ul> <p>84 - 56 = 28</p>  <p>20    8 = 28</p>	<ul style="list-style-type: none"> <li>Use number lines to illustrate the difference between decimal numbers</li> <li>Formal method of subtraction without carrying</li> </ul> <p>563 - 241 = 322</p> 	<ul style="list-style-type: none"> <li>Contracted recording of decomposition to include carrying and decimals</li> </ul> 
<p><b>MODELS AND IMAGES TO SUPPORT</b></p>							

	STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5	STAGE 6	STAGE 7
<b>MULTIPLICATION</b>  Understanding multiplication and division	<ul style="list-style-type: none"> <li>Working at a practical level to gain experience of doubling and become familiar with appropriate language e.g. counting the number of eyes, ears on faces (1 face has 2 eyes, 2 faces will have 4 eyes)</li> </ul>	<ul style="list-style-type: none"> <li>Know by heart all addition doubles to at least 5</li> <li>Experience doubles to at least 10</li> <li>Use the vocabulary associated with multiplication</li> </ul>	<ul style="list-style-type: none"> <li>Understand multiplication as repeated addition e.g. <math>3 \times 5</math> illustrated on a number line   </li> <li>Know by heart the multiplication facts for the 10 and 2 multiplication tables</li> </ul>	<ul style="list-style-type: none"> <li>Explain the effect of multiplying by 10</li> <li>Mental methods using partitioning <math>38 \times 7 = (30 \times 7) + (8 \times 7)</math></li> <li>Introduction of grid layout to show expanded working out  <math display="block">\begin{array}{r} X \quad 30 \quad 8 \\ 7 \quad \boxed{210} \quad \boxed{56} \quad 266 \end{array}</math> </li> <li>Grid method extended to bigger numbers  <math display="block">\begin{array}{r} X \quad 50 \quad 6 \\ 20 \quad \boxed{1000} \quad \boxed{120} \quad 1120 \\ 7 \quad \boxed{350} \quad \boxed{42} \quad \underline{392} \\ 1512 \end{array}</math> </li> </ul>	<ul style="list-style-type: none"> <li>Explain the effect of multiplying by 100, 1000 etc.</li> <li>Know by heart the multiplication facts up to <math>10 \times 10</math> and related division facts.</li> <li>Introduction of vertical format linked to grid method.  <math display="block">\begin{array}{r} 46 \\ X \quad 38 \\ \hline 368 \\ 1380 \\ \hline 1748 \end{array}</math> </li> <li>Grid method extended to bigger numbers  <math display="block">\begin{array}{r} X \quad 20 \quad 3 \quad 0.5 \\ 10 \quad \boxed{200} \quad \boxed{30} \quad \boxed{5} \quad 235 \\ 2 \quad \boxed{40} \quad \boxed{6} \quad \boxed{1} \quad \underline{47} \\ 282 \end{array}</math> </li> </ul>	<ul style="list-style-type: none"> <li>Moving on to more formal methods:  <math display="block">\begin{array}{r} 46 \\ X \quad 38 \\ \hline 368 \\ 1380 \\ \hline 1748 \end{array}</math> </li> <li>Remove decimals by multiplying decimal by 10/100/1000  <math display="block">\begin{array}{r} 46 \\ X \quad 38 \\ \hline 368 \\ 1380 \\ \hline 1748 \end{array}</math> </li> <li>Must then divide by what they multiplied 10/100/1000</li> </ul>	<ul style="list-style-type: none"> <li>Moving on to more formal methods:  <math display="block">\begin{array}{r} 46 \\ X \quad 38 \\ \hline 368 \\ 1380 \\ \hline 1748 \end{array}</math> </li> <li>Remove decimals by multiplying decimal by 10/100/1000  <math display="block">\begin{array}{r} 46 \\ X \quad 38 \\ \hline 368 \\ 1380 \\ \hline 1748 \end{array}</math> </li> <li>Must then divide by what they multiplied 10/100/1000</li> </ul>
<b>MODELS AND IMAGES TO SUPPORT</b>							

	STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5	STAGE 6	STAGE 7	STAGE 8
<p><b>DIVISION</b></p> <p>Understanding multiplication and division</p> <p><i>Use of remainders should be consistent throughout teaching of division</i></p>	<ul style="list-style-type: none"> <li>Working at a practical level to gain experience of sharing and to become familiar with appropriate language e.g. there are 12 cakes to be shared between 5 children, how many does each child get?</li> </ul>	<ul style="list-style-type: none"> <li>Separate a given number of objects into equal groups and record results informally</li> <li>Use the vocabulary associated with division</li> </ul>	<ul style="list-style-type: none"> <li>Understand division as grouping, repeated subtraction or sharing, and record informally</li> <li>Deduce division facts related to multiplication</li> </ul>	<ul style="list-style-type: none"> <li>Use the <math>\div</math> and <math>=</math> signs recording horizontally e.g. <math>12 \div 4</math></li> <li>How many 4's in 12? </li> <li><math>4 + 4 = 8</math> <math>4 + 4 + 4 = 12</math></li> <li>Count forwards in steps of multiple</li> <li>Present divisions including remainders</li> </ul>	<ul style="list-style-type: none"> <li>Begin to use compact method e.g. <math>96 \div 6</math> (how many 6's in 96?)</li> <li><math>10 \times 6</math> <math>5 \times 6</math> <math>1 \times 6</math> </li> <li><math>96</math> <math>-60</math> (10 lots of 6)</li> <li><math>36</math> <math>-36</math> (6 lots of 6)</li> <li>Answer = 16 (lots of 6)</li> <li><i>If children are more confident with counting up, chunking up is a more efficient strategy</i></li> </ul>	<ul style="list-style-type: none"> <li>Use compact written methods using multiples of 10, and remainders e.g. <math>196 \div 6</math></li> <li><math>30 \times 6</math> <math>2 \times 6</math> </li> <li><math>196</math> <math>-180</math> (30 lots of 6)</li> <li><math>16</math> <math>-12</math> (2 lots of 6)</li> <li><math>4</math> Answer = 32 R4</li> <li><i>If children are more confident with counting up, chunking up is a more efficient strategy</i></li> </ul>	<ul style="list-style-type: none"> <li>Use compact standard written methods</li> </ul> $179 \div 6 = 29 \text{ R } 5$ $\begin{array}{r} 29 \\ 6 \overline{)174} \\ \underline{60} = 6 \times 10 \\ 114 \\ \underline{60} = 6 \times 10 \\ 54 \\ \underline{54} = 6 \times 9 \\ 0 \quad 29 \end{array}$ $179 \div 6 = 29 \frac{5}{6}$	<ul style="list-style-type: none"> <li>Use compact standard written methods</li> </ul> $179 \div 6 = 29 \text{ R } 5$ $\begin{array}{r} 29 \text{ R } 5 \\ 6 \overline{)179} \\ \underline{12} \\ 59 \\ \underline{54} \\ 5 \end{array}$ $179 \div 6 = 29 \frac{5}{6}$ <p>Move on to calculating remainder as a fraction or decimal of divisor</p> $179 \div 6 = 29 \frac{5}{6}$ $179 \div 6 = 29.8$
<p><b>MODELS AND IMAGES TO SUPPORT</b></p>			<p>Model on a numberline</p>  <p>Division as sharing <math>93 \div 3 = 31</math></p>  <p>10 for you, 10 for you etc...</p> <p>Division as grouping (repeated subtraction)</p>  <p>First group of 3</p>	 <p>Grouping ITP</p>  <p>remainder</p>	 <p>Moving Digits ITP</p>			