



Archdiocese of
Birmingham



St Maria Goretti Catholic Academy




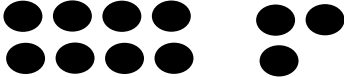
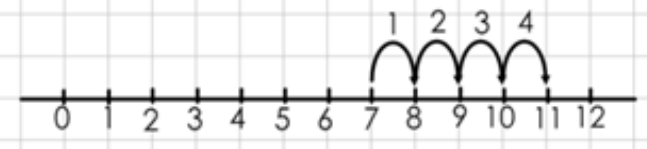
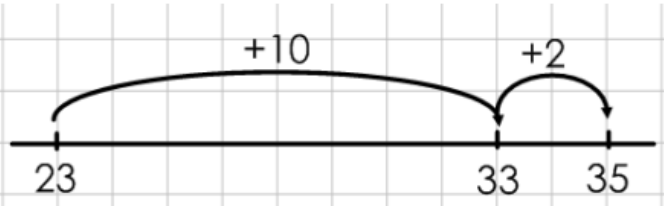
MATHS WRITTEN CALCULATION POLICY



All Saints Catholic Collegiate

Introduction


This calculation policy has been written to meet the expectations of the New National Curriculum. It is designed to give children a consistent and smooth progression in learning calculation through the school. The New Curriculum focuses on children having an in –depth understanding of Maths through the application of real life tasks. Children must become confident and secure in mental methods as well as written methods and make choices as to which method is the most efficient method to use.


 ADDITION		
Step 1	$4 + 2 = 6$ 	Pictures or objects Children use pictures or objects to help them count, and add what they need to. Add the smaller number on to the larger number.
Step 2	$8 + 3 = 11$  $8 + 3 = 11$ 	Tallies or dots Children use tallies or dots to help them be more efficient and add what they need to.
Step 3	$7 + 4 = 11$ 	Addition number line (jumping in 1s) Children 'jump' in 1s on a marked number line from one number (the largest).
Step 4	$23 + 12 = 35$ 	Addition number line (jumping in 10s and 1s) Children 'jump' in 10s and 1s from one number to help them be more efficient.
Step 5	$34 + 15$ $30 + 4$ $10 + 5$ <hr style="width: 100px; margin-left: 0;"/> $40 + 9 = 49$	Expanded column method Partition numbers that do not bridge the tens or hundreds, moving to numbers that do bridge the tens and hundreds boundaries. Children add the numbers together

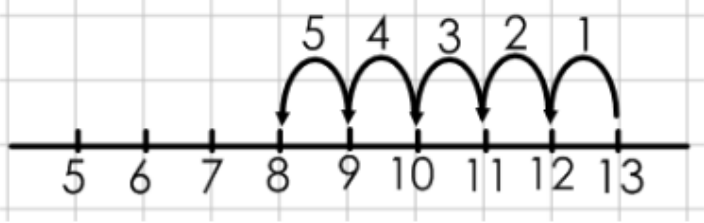
	$58 + 43$ $50 + 8$ $40 + 3$ $90 + 11 = 101$ $83 + 42 = 125$	<p>starting from the right hand side (smallest place value column), writing the answers to each column added separately.</p>
<p>Step 6</p>	$\begin{array}{r} 2469 \\ + 284 \\ \hline 2753 \\ \hline \end{array}$ <div style="border: 1px solid black; padding: 5px; display: inline-block;"> $\begin{array}{r} \text{£} 4.25 \\ + \text{£} 5.46 \\ \hline \text{£} 9.71 \\ \hline \end{array}$ </div>	<p>Column method Children add the numbers together starting from the right hand side (smallest place value column), writing the answers to each column on a single line, and 'carrying' if needed</p>
<p>Step 7</p>	$74.5 + 48.8 =$ $\begin{array}{r} 74.5 \\ + 48.8 \\ \hline 123.3 \\ \hline \end{array}$	<p>Column method Children add the numbers together starting from the right hand side (smallest place value column), writing the answers to each column on a single line, and 'carrying' if needed.</p>
<p>Step 8</p>	$19.01 + 3.65 + 0.7 =$ $\begin{array}{r} 419.01 \\ 3.65 \\ + 0.70 \\ \hline 423.36 \\ \hline \end{array}$	<p>Column method Children add numbers with decimals where zero is used to show the value of that place.</p>

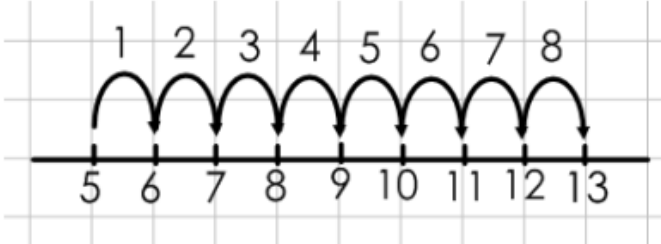
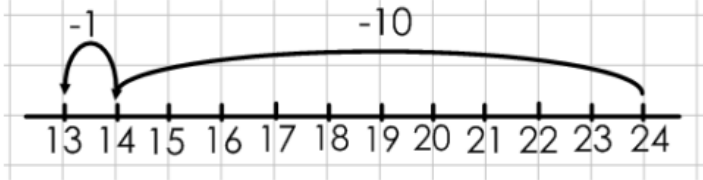
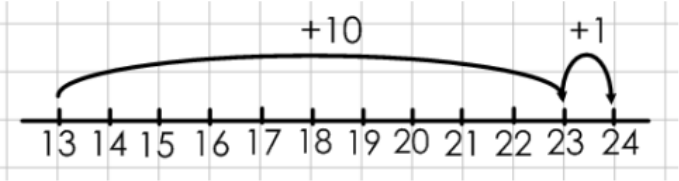
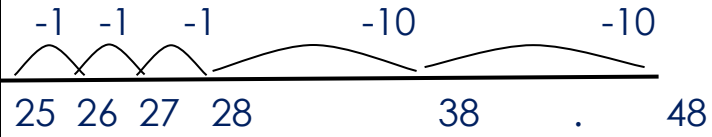
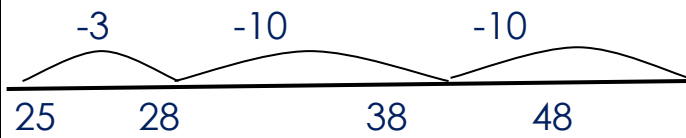
<p>Step 9</p>	$ \begin{array}{r} 26432 \\ 4681 \\ 786 \\ 42 \\ + \quad 3 \\ \hline 31944 \\ \hline \cancel{1} \cancel{1} \cancel{2} \cancel{1} \end{array} $ $124.9\text{Km} + 7.25\text{Km} + 132.1\text{Km} =$ $ \begin{array}{r} 124.90 \text{ Km} \\ + 7.25 \text{ Km} \\ \hline 132.10 \text{ Km} \\ \hline 264.25 \text{ Km} \\ \hline \cancel{1} \cancel{1} \end{array} $	<p>Column method Children add numbers with an increasing level of complexity within the number focus. Solve problems in context.</p>
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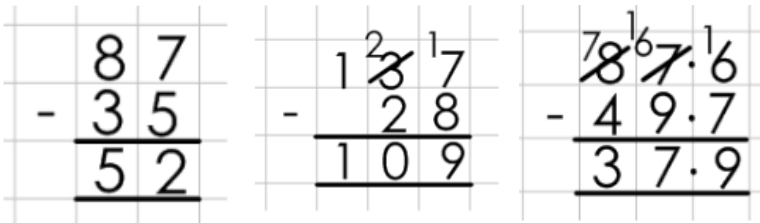
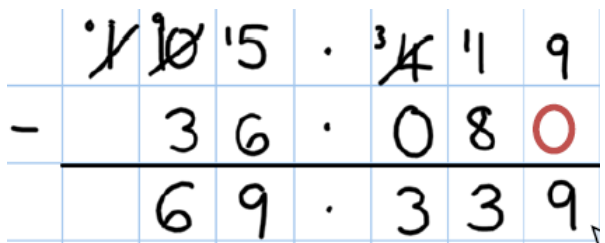
SUBTRACTION

<p>Step 1</p>	<p>$5 - 2 = 3$</p> 	<p>Pictures or objects Children use pictures or objects to help them, and take away what they need to.</p>
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<p>Step 2</p>	<p>$13 - 4 = 9$</p> 	<p>Tallies or dots Children use tallies or dots to help them be more efficient, and take away what they need to.</p>
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<p>Step 3</p>	<p>$13 - 5 = 8$ Take away:</p>  $13 - 5 = 8$	<p>Subtraction number lines (jumping in 1s) taking away to 20</p> <p>Take away: Children take away a number by 'jumping' back in 1s on a number line. Count back from the larger number in ones using a numbered line</p>
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	<p>Difference between:</p> 	<p>Difference between: Children 'jump' forwards in 1s from the smallest to the largest number.</p> <p>The language for each is very specific – <u>take away</u> or <u>difference between</u> the two numbers.</p>
<p>Step 4</p>	<p>$24 - 11 = 13$ Take away:</p>  <p>$24 - 13 = 11$ Difference between:</p> 	<p>Subtraction number lines (jumping in 10s and 1s)</p> <p>Take away: Children take away a number by 'jumping' back in 10s and 1s on a number line.</p> <p>Difference between: Children 'jump' forwards in 10s and 1s from the smallest to the largest number.</p> <p>The language for each is very specific – <u>take away</u> or <u>difference between</u> the two numbers.</p>
<p>Step 5</p>	<p>$48 - 23$</p>  <p>Can then be made more efficient, only when confident</p> 	<p>This can also be show as a jump of 20 then 3 to be more efficient.</p>

<p>Step 6</p>	<p>When confident: Introduce partitioned column subtraction</p> $89 - 35 = 54$ $\begin{array}{r} 80 + 9 \\ - 30 + 5 \\ \hline 50 + 4 \end{array}$ <p>Then introduce exchanging- model using suitable equipment e.g. bundles of ten straws (72 – 47)</p>	<p>Partitioning using column method. Including exchanging using equipment.</p>
<p>Step 7</p>	$\begin{array}{r} 400 \quad 160 \\ 500 + 60 + 3 \\ - 200 + 70 + 1 \\ \hline 200 + 90 + 2 \end{array}$	<p>Subtracting with numbers up to 4 digits using partitioning method, Ensure children are confident with exchanging practically using the base ten equipment</p>
<p>Step 8</p>	<p>87 – 35 = 52 137 – 28 = 109 87.6 – 49.7 = 37.9</p>  <p>Solve problems involving integers up to 6 digits and beyond with several exchanges</p> <p>Place a 0 in empty spaces so the children understand the value of the column</p> 	<p>Column method Column method subtracting numbers beyond 4 digits including decimals. Children take the bottom digits away from the digits above it, starting from the right hand side (smallest place value column) and 'exchanging'. (from the larger column if needed)</p>



MULTIPLICATION (1)

<p>Step 5</p>		<p>Use known table facts to show a more efficient method $12 \times 5 = 60$</p>															
<p>Step 5</p>	<p>Multiplying 2 digit numbers by 1 digit number</p> $14 \times 6 = 84$ <table border="1" style="margin-left: 20px;"> <tr><td>X</td><td>6</td><td></td></tr> <tr><td>10</td><td>60</td><td></td></tr> <tr><td>4</td><td>24</td><td></td></tr> <tr><td></td><td>84</td><td></td></tr> </table> $60 + 24 = 84$ 14 $X \quad 6$ $24 \text{ (} 6 \times 4 \text{)}$ $\underline{60} \text{ (} 6 \times 10 \text{)}$ 84	X	6		10	60		4	24			84		<p>First model using a grid, children need to be secure with partitioning Work within times tables range for year group</p> <p>Introduce the expanded method of short multiplication, children to complete x using this method</p>			
X	6																
10	60																
4	24																
	84																
<p>Step 4</p>	<p>$27 \times 6 = 162$</p> <table border="1" style="margin-left: 20px;"> <tr><td>x</td><td>6</td></tr> <tr><td>20</td><td>120</td></tr> <tr><td>7</td><td>42</td></tr> <tr><td></td><td><u>162</u></td></tr> </table> <table border="1" style="margin-left: 20px; margin-top: 10px;"> <tr><td>27</td></tr> <tr><td>x 6</td></tr> <tr><td>42</td></tr> <tr><td><u>120</u></td></tr> <tr><td><u>162</u></td></tr> </table> <div style="margin-left: 100px; margin-top: 10px;"> <table border="1" style="display: inline-table; margin-right: 20px;"> <tr><td>$7 \times 6 = 42$</td></tr> </table> <table border="1" style="display: inline-table;"> <tr><td>$20 \times 6 = 120$</td></tr> </table> </div>	x	6	20	120	7	42		<u>162</u>	27	x 6	42	<u>120</u>	<u>162</u>	$7 \times 6 = 42$	$20 \times 6 = 120$	<p>Grid method Children 'partition' the numbers into units, tens, hundreds etc. and arrange outside a grid. Each number within the grid is made by multiplying the numbers in the same row and column. The answers are then added together to give the answer. Move to expanded , formal method</p>
x	6																
20	120																
7	42																
	<u>162</u>																
27																	
x 6																	
42																	
<u>120</u>																	
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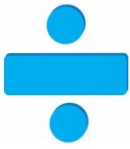


MULTIPLICATION (2)

<p>Step 5</p>	<p>$56 \times 34 = 1904$ then expanded written method</p> <div style="text-align: center;"> </div> <p>First column method</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">x</td> <td style="padding: 2px 5px;">30</td> <td style="padding: 2px 5px;">4</td> <td style="padding: 2px 5px;">+</td> <td style="padding: 2px 5px;">1680</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">50</td> <td style="padding: 2px 5px;">1500</td> <td style="padding: 2px 5px;">200</td> <td></td> <td style="padding: 2px 5px;">224</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">6</td> <td style="padding: 2px 5px;">180</td> <td style="padding: 2px 5px;">24</td> <td></td> <td style="padding: 2px 5px;">1904</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;"></td> <td style="padding: 2px 5px;"><u>1680</u></td> <td style="padding: 2px 5px;"><u>224</u></td> <td></td> <td style="padding: 2px 5px;"></td> </tr> </table> <div style="text-align: center;"> $\begin{array}{r} 56 \\ \times 34 \\ \hline 224 \\ 1680 \\ \hline 1904 \end{array}$ </div>	x	30	4	+	1680	50	1500	200		224	6	180	24		1904		<u>1680</u>	<u>224</u>			<p>Column method</p> <p>The digit(s) at the bottom are multiplied by each digit from the top number in turn, with each answer written on a new line below.</p> <p>Each of those answers is then added together to give the answer to the question.</p> <p style="text-align: center;">↓</p> <p>Expanded column method</p> <p style="text-align: center;">↓</p> <p>Long multiplication method with less steps</p>
x	30	4	+	1680																		
50	1500	200		224																		
6	180	24		1904																		
	<u>1680</u>	<u>224</u>																				
<p>Step 6</p>	<p>$56 \times 34 = 1904$ $56 \times 7.2 = 403.2$</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="padding: 2px 10px;"> $\begin{array}{r} 56 \\ \times 34 \\ \hline 224 \\ 1680 \\ \hline 1904 \end{array}$ </td> <td style="padding: 2px 10px;"> $\begin{array}{r} 56 \\ \times 7.2 \\ \hline 11.2 \\ 392.0 \\ \hline 403.2 \end{array}$ </td> </tr> </table>	$\begin{array}{r} 56 \\ \times 34 \\ \hline 224 \\ 1680 \\ \hline 1904 \end{array}$	$\begin{array}{r} 56 \\ \times 7.2 \\ \hline 11.2 \\ 392.0 \\ \hline 403.2 \end{array}$	<p>Column method</p> <p>Long multiplication with less steps</p> <p>Multiplying by a number with one decimal place.</p> <p>Multiplication of money with 2 decimal places by a single digit</p>																		
$\begin{array}{r} 56 \\ \times 34 \\ \hline 224 \\ 1680 \\ \hline 1904 \end{array}$	$\begin{array}{r} 56 \\ \times 7.2 \\ \hline 11.2 \\ 392.0 \\ \hline 403.2 \end{array}$																					



DIVISION (1)

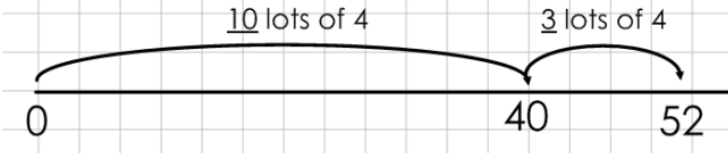


DIVISION (2)

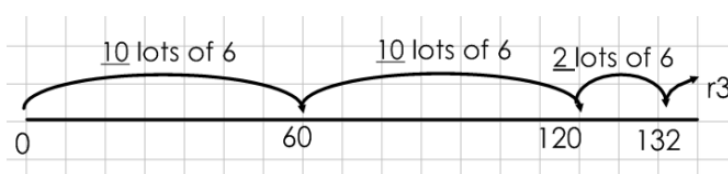
Step 4

$$52 \div 4 = 13$$

The lots of the divisor are 10 in the first jump (because 10 lots of 4 is 40) and 3 in the second jump (because 3 lots of 4 is 12), so the answer is 13.



$$135 \div 6 = 22 \text{ r } 3$$



Division number line in larger jumps of the divisor

Children 'jump' much larger steps forwards towards the 'dividend' in large multiples of the 'divisor'.

This is more efficient when dividing large numbers and the children don't have to write every multiple on their number line up to the dividend.

To find the answer, the lots of the divisor are added together

$$\begin{array}{r} 32 \\ 3 \overline{) 96} \end{array}$$

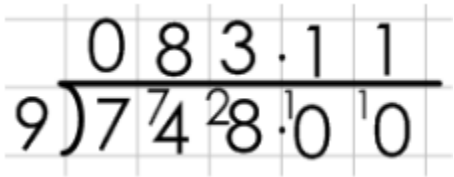
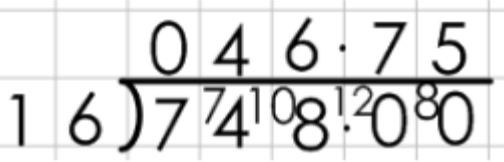
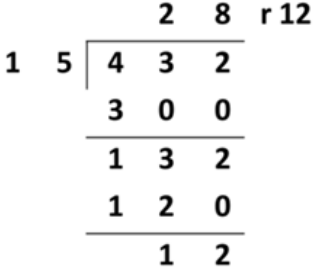
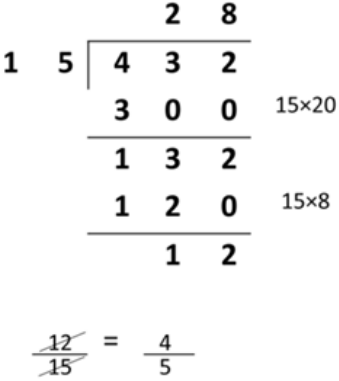
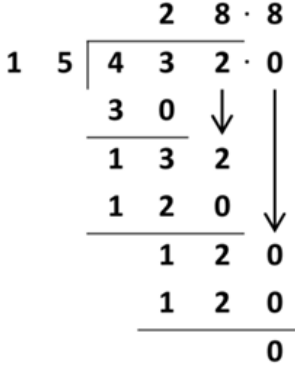
Begin with simple calculations where each digit is divisible by the divisor

$$\begin{array}{r} 12 \\ 8 \overline{) 96} \end{array}$$

$$\begin{array}{r} 218 \\ 4 \overline{) 872} \end{array}$$

Multiples may be written at the side of the calculation for support.

<p>Step 5</p>	<p>$748 \div 9 = 83 \text{ r } 1$</p> $\begin{array}{r} 083 \text{ r } 1 \\ 9 \overline{)748} \end{array}$ <p>$748 \div 16 = 46 \text{ r } 12$</p> $\begin{array}{r} 046 \text{ r } 12 \\ 16 \overline{)748} \end{array}$ <p>Children write out the multiples of the divisor that they need in their margin, to help with how many times the divisor goes</p>	<p>Short Devision method 1</p> <p>(Bus stop method)</p> <p>The dividend is under the 'bus stop', with the divisor outside to the left. The children see how many times the divisor 'goes into' each digit of the dividend, starting from the left. The number of times is written above the bus stop, and any spare digits left over are written next to the next digit of the dividend.</p>
<p>Step 6</p>	<p>$135 \div 6 = 22 \text{ r } 3$</p> $\begin{array}{r} 022 \text{ r } 3 \\ 6 \overline{)135} \end{array}$ <p>$748 \div 9 = 83 \text{ r } 1$</p> $\begin{array}{r} 083 \text{ r } 1 \\ 9 \overline{)748} \end{array}$ <p>$748 \div 16 = 46 \text{ r } 12$</p> $\begin{array}{r} 046 \text{ r } 12 \\ 16 \overline{)748} \end{array}$	<p>Short divisionmethod 2</p> <p>As above, but the children don't write the multiples of the divisor in their margin. This means they are more efficient.</p> <p>Remainders are the amount of the dividend that is 'left over'.</p>
<p>Step 6 Extension 1</p>	<p>$748 \div 9 =$</p> $\begin{array}{r} 083 \frac{1}{9} \\ 9 \overline{)748} \end{array}$ <p>$748 \div 16 =$</p> $\begin{array}{r} 046 \frac{12}{16} = \frac{3}{4} \\ 16 \overline{)748} \end{array}$ <p>The remainder above is simplified to $\frac{3}{4}$.</p>	<p>Short divisionmethod 2</p> <p>As before, but any remainders are written as <u>fractions</u> instead of writing r__.</p> <p>If there are any remainders, the children write them as a fraction of the divisor.</p> <p>They can then 'simplify' the fraction if possible.</p>

<p>Step 6</p> <p>Extension 2</p>	<p>$748 \div 9 =$</p>  <p>$748 \div 16 =$</p> 	<p>Short division method 2</p> <p>As above, but any remainders are written as <u>decimals</u> instead of fractions or writing r__.</p> <p>If there are any remainders, the children carry them to a '0' digit to the right of the dividend (beyond a decimal point that they draw for remainders), repeating as necessary – e.g. to 2 decimal places.</p>
<p>Step 7</p>	<p>Long division</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="337 1087 651 1444"> <p>432 ÷ 15 becomes</p>  <p>Answer: 28 remainder 12</p> </div> <div data-bbox="760 1087 1096 1549"> <p>432 ÷ 15 becomes</p>  <p>Answer: $28 \frac{4}{5}$</p> </div> <div data-bbox="1182 1087 1474 1549"> <p>432 ÷ 15 becomes</p>  <p>Answer: 28.8</p> </div> </div>	<p>The third example will give answers as decimals, fractions and remainders and will be taught first</p>