

# Tenacres First School



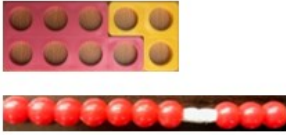
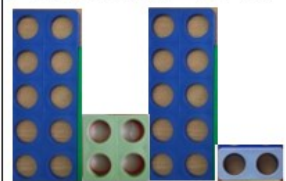
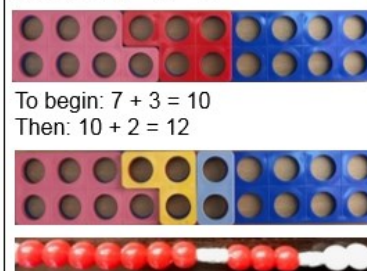

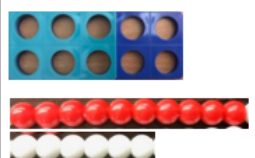


## Calculation Policy

## Mental strategies for addition and subtraction

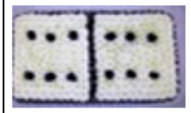
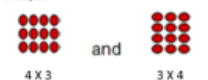


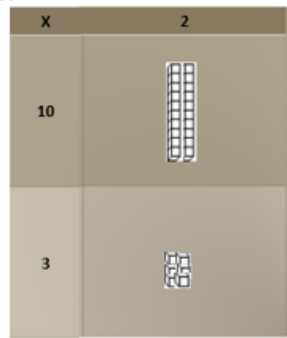

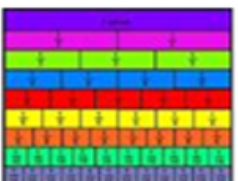

This calculation policy relies heavily upon children having a good understanding and knowledge of mental strategies.

Children are introduced to the processes of calculation through practical, oral and mental activities. As they begin to understand the underlying ideas, they develop ways of recording to support their thinking and calculation methods, so that they develop both **conceptual understanding** and **fluency** in the fundamentals of mathematics. Whilst interpreting signs and symbols involved with calculation, orally in the first instance, children use models and images to support their mental and written methods of calculation. As children's mental methods are strengthened and refined they begin to work more efficiently, which will support them with using succinct written calculation strategies as they are developed.


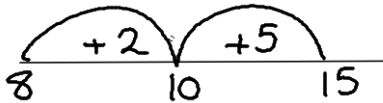
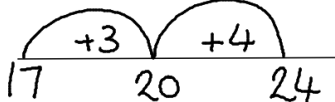
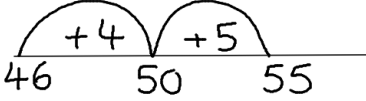
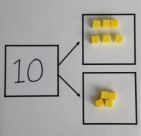

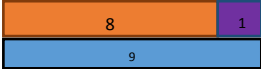
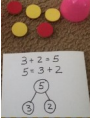
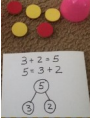



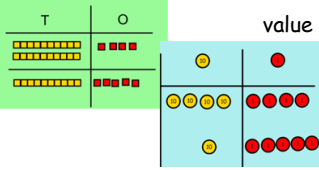
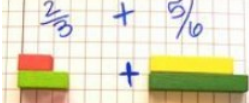
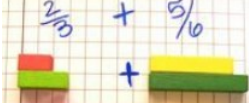
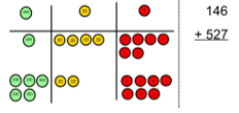

It is important to note that while a mastery curriculum highlights the importance of all children completing the same activities, please do remember that children are all at different stages of their mathematical learning. This should be taken into account when planning and delivering your lessons. As this is a progressive calculation policy e.g. each new strategy relies on the children having a good understanding of the previous strategies, you may choose to allow some children to continue to build on their previous skills and knowledge before moving them on.

<b>Doubles:</b> $8 + 8 = 16$  $8 + 8$ is connected to $8 \times 2$	<b>Near doubles:</b> $6 + 7 = 13$  $6 + 7$ is commutative with $7 + 6$	<b>Number bonds:</b> $7 + 3 = 10$ 
<b>Partitioning:</b> $14 + 12 = 26$ 	<b>Bridging:</b> $7 + 5 = 12$ To begin: $7 + 3 = 10$ Then: $10 + 2 = 12$ 	<b>Adjusting:</b> $16 + 9 = 25$ To begin: $16 + 10 = 26$ Then: $26 - 1 = 25$ 
<b>Finding the difference:</b> $10 - 6 = 4$  David has 10 sweets, whilst Chloe has six sweets. How many more does David have than Chloe?	<b>Reordering:</b> $8 + 7 + 2 = 17$ e.g. calculating numbers in a different order To begin: $8 + 2 = 10$ Then: $10 + 7 = 17$ 	



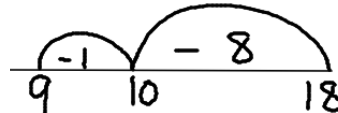
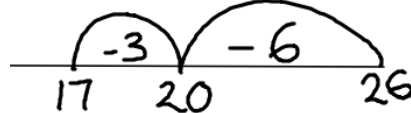
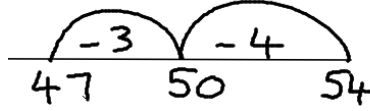
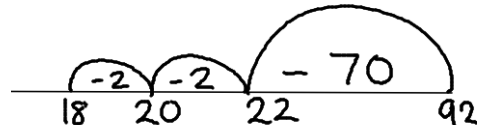
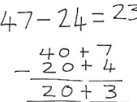
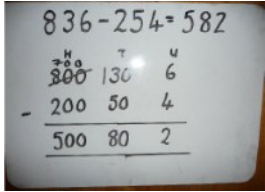

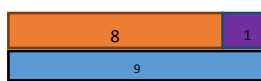
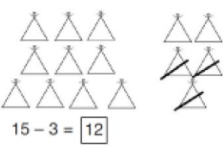
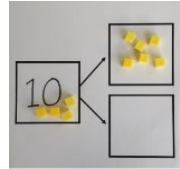

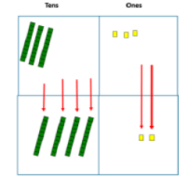
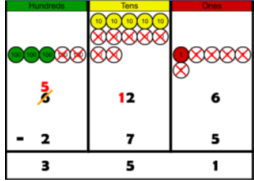
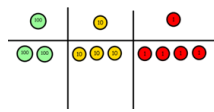
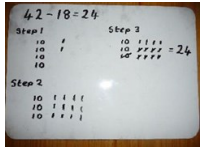
## Mental strategies for multiplication and division

<b>Doubling and halving:</b> Double six is 12... Double five is ten...  Double 16 can be calculated by working out... Double ten → 20 Double six → 12 With links to finding four-times a given value and finding a quarter of a value.	<b>Knowing multiplication and division facts to 12 X 12:</b> Arrays:  Number lines:  Scaling:  Three times longer	<b>Multiplying a teen number by one-digit number:</b> 						
<b>Multiplying and dividing by multiples of ten:</b> $20 \times 10 = 200$ <table border="1"> <thead> <tr> <th>Hundreds</th> <th>Tens</th> <th>Ones</th> </tr> </thead> <tbody> <tr> <td></td> <td>2</td> <td>0</td> </tr> </tbody> </table>  'Add a place value holder'	Hundreds	Tens	Ones		2	0	<b>Identifying fractions, decimals and percentages:</b> 	<b>Milk the maths...</b>  ...by allowing children to make connections between number facts.
Hundreds	Tens	Ones						
	2	0						

Addition


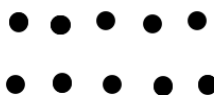
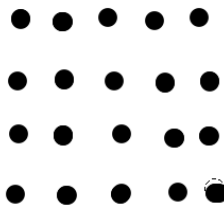
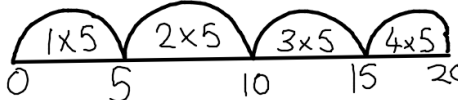


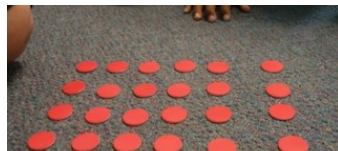

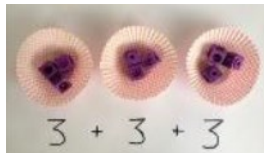
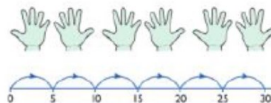

	Year 1	Year 2	Year 3	Year 4
Year Group Objectives	<ul style="list-style-type: none"><li>◆ given a number, identify one more.</li><li>◆ Read, write and interpret mathematical statements involving addition (+) and equals (=)</li><li>◆ Add one-digit and two-digit numbers within 20, including 0</li><li>◆ Solve missing number problems e.g. <math>10 + \underline{\hspace{1cm}} = 16</math></li></ul>	<ul style="list-style-type: none"><li>◆ Add numbers using concrete objects and pictorial representations and mentally, including:<ul style="list-style-type: none"><li>• A two-digit number add 1s</li><li>• A two-digit number add 10s</li><li>• 2 two-digit numbers</li><li>• 3 one-digit numbers</li></ul></li></ul>	<ul style="list-style-type: none"><li>◆ Add numbers with <u>up to three digits</u>, using formal written method of columnar addition.</li></ul>	<ul style="list-style-type: none"><li>◆ Add numbers with <u>up to 4 digits</u> using the formal written method of columnar addition.</li></ul>
Teaching Sequence	<ul style="list-style-type: none"><li>• Counting on- practical (including the use of Numicon) </li><li>• <u>Mentally recalling</u> all addition number facts to 10 E.g. <math>5 + 4 = 9</math></li><li>• <u>Mentally recalling</u> all addition number facts to 20 E.g. <math>5 + 4 = 9</math> so <math>15 + 4 = 19</math></li><li>• Partitioning on a blank numberline (finding the 10) <math>8 + 7 = 15</math> </li></ul>	<ul style="list-style-type: none"><li>• Partitioning on a blank numberline, bridging 20 <math>17 + 7 = 24</math> </li><li>• Partitioning on a blank numberline, bridging any tens <math>46 + 9</math> </li><li>• <u>Mentally</u> adding multiples of 10 <math>3 + 3 = 6</math> so <math>30 + 30 = 60</math><ul style="list-style-type: none"><li>• Partitioning <math>43 + 25</math> <math>\begin{array}{r} 40 + 3 \\ + 20 + 5 \\ \hline 60 + 8 = 68 \end{array}</math></li></ul></li></ul>	<ul style="list-style-type: none"><li>• Partitioning- bridging 100 <math>85 + 63 =</math> <math>\begin{array}{r} 80 + 5 \\ + 60 + 3 \\ \hline 140 + 8 = 148 \end{array}</math></li><li>• Formal column addition <math>\begin{array}{r} 63 \\ + 32 \\ \hline 95 \end{array}</math> <math>\begin{array}{r} 563 \\ + 114 \\ \hline 677 \end{array}</math></li><li>• Formal column addition carrying tens <math>\begin{array}{r} 858 \\ + 221 \\ \hline 806 \\ 1 \end{array}</math></li></ul>	<ul style="list-style-type: none"><li>• Revisit adding up to 3 digits.</li><li>• Formal column addition-4 digits <math>\begin{array}{r} 1845 \\ + 1526 \\ \hline 3371 \\ 1 \quad 1 \end{array}</math></li></ul>
Concrete / Pictorial support	<ul style="list-style-type: none"><li>• Part, part whole model (Use cubes / Numicon to support at start) </li><li> Bead strings</li><li>• Number frames (use cubes or counters—good for bridging ten)  <math>8 + 1 = 9</math>   <math>9 - 1 = 8</math> <math>1 + 8 = 9</math>   <math>9 - 8 = 1</math></li><li>• Bar model </li><li>• Double sided counters </li></ul>	<ul style="list-style-type: none"><li>• Part, part whole model with greater numbers </li><li>• Bar model with greater numbers </li><li>• Cuisenaire <math>8 + 5</math> </li><li>• Use of dienes and place value counters </li></ul>	<ul style="list-style-type: none"><li>• Part, part whole model with greater numbers<ul style="list-style-type: none"><li>• Bar model with greater numbers </li></ul></li><li>• Cuisenaire (can link to fractions) </li></ul> <p>Make both numbers on a place value grid.</p>  <p>Add up the units and exchange 10 ones for one 10.</p> 	<ul style="list-style-type: none"><li>• Place value counters to support column</li></ul>

# Subtraction

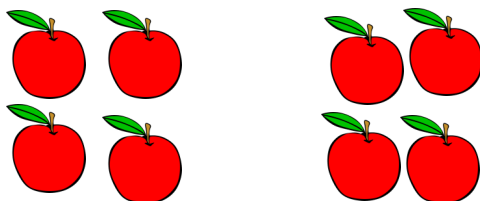
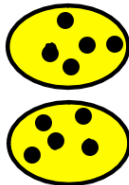
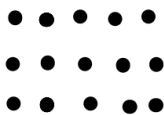

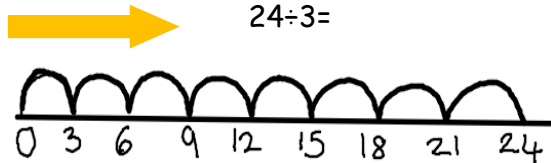
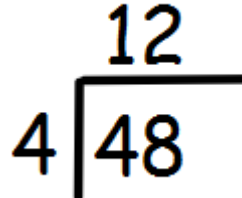
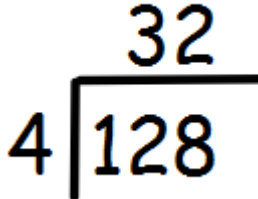
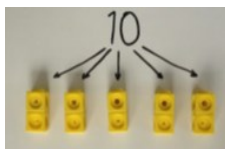
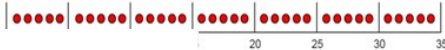

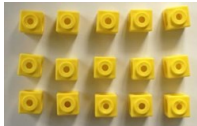

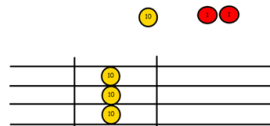
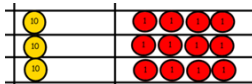
	Year 1	Year 2	Year 3	Year 4
Year Group Objectives	<ul style="list-style-type: none"><li>◆ Given a number identify one less.</li><li>◆ Read, write and interpret mathematical statements involving subtraction (-) and equals (=)</li><li>◆ Subtract one-digit and two-digit numbers within 20, including 0</li><li>◆ Solve missing number problems e.g. <math>20 - \underline{\quad} = 16</math></li></ul>	<ul style="list-style-type: none"><li>◆ Subtract numbers using concrete objects and pictorial representations and mentally, including:<ul style="list-style-type: none"><li>• A two-digit number subtract 1s</li><li>• A two-digit number subtract 10s</li><li>• 2 two-digit numbers</li></ul></li></ul>	<ul style="list-style-type: none"><li>◆ Subtract numbers with up to three digits, using formal written method of columnar subtraction</li></ul>	<ul style="list-style-type: none"><li>◆ Subtract numbers with up to 4 digits using the formal written method of columnar subtraction</li></ul>
Teaching Sequence	<ul style="list-style-type: none"><li>• Taking away- practical (including the use of Numicon) <math>9 - 5 = 4</math>  </li><li>• Mentally recalling subtraction number facts to 10 E.g. <math>7 - 5 = 2</math></li><li>• Mentally recalling subtraction number facts to 20 E.g. <math>9 - 3 = 6</math> so <math>19 - 3 = 16</math></li><li>• Partitioning on a blank numberline (finding the 10) <math>18 - 9 = 9</math> </li></ul>	<ul style="list-style-type: none"><li>• Bridging 20 on a blank numberline <math>26 - 9 =</math> </li><li>• Bridging any tens number on a blank numberline <math>54 - 7 =</math> </li><li>• Mentally subtracting multiples of 10 <math>7 - 4 = 3</math> so <math>70 - 30 = 40</math></li><li>• Partitioning on a blank numberline <math>92 - 74 = 18</math> </li></ul>	<ul style="list-style-type: none"><li>• Partitioning <math>47 - 24 = 23</math> </li><li>• Partitioning with exchange </li><li>• Formal column subtraction- without exchange <math display="block">\begin{array}{r} 148 \\ - 31 \\ \hline 117 \end{array}</math></li><li>• Formal column subtraction- with exchange <math display="block">\begin{array}{r} 174 \\ - 26 \\ \hline 148 \end{array}</math></li></ul>	<ul style="list-style-type: none"><li>• Formal column subtraction— 3 digits <math display="block">\begin{array}{r} 467 \\ - 173 \\ \hline 294 \end{array}</math></li><li>• Formal column subtraction— 4 digits <math display="block">\begin{array}{r} 4387 \\ - 2459 \\ \hline 1928 \end{array}</math></li></ul>
Concrete / Pictorial support	<ul style="list-style-type: none"><li>• Bead strings </li><li>• Bar model <math>8 + 1 = 9</math>   <math>9 - 1 = 8</math> <math>1 + 8 = 9</math>   <math>9 - 8 = 1</math> </li><li>• Cross out drawn objects to show what has been taken away.  <math>15 - 3 = 12</math></li><li>• Part, part whole model (Use cubes / Numicon to support at start) </li><li>• Cubes and tens frame e.g. Make 14 on the ten frame. Take away the four first to make 10 and then take away one more so you have taken away 5. You are left with the answer of 9. </li></ul>	<ul style="list-style-type: none"><li>• Use diennes to make the bigger number then take the smaller number away. </li><li>• Use place value counters to show how you partition numbers to subtract. Again make the larger number first. Take away the amount needed. </li><li>• If regrouping, swap hundreds for tens &amp; tens for ones.  <math display="block">\begin{array}{r} 234 \\ - 88 \\ \hline \end{array}</math> </li></ul>		



Multiplication

	Year 1	Year 2	Year 3	Year 4														
Year Group Objectives	<ul style="list-style-type: none"><li>Solve one step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher</li><li>Count in multiples of twos, fives and tens</li></ul>	<ul style="list-style-type: none"><li>Recall and use multiplication facts for the 2, 5 and 10 multiplication tables</li><li>Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (x) and equals (=) signs</li><li>Solve problems involving multiplication using materials, arrays, repeated addition, mental methods and multiplication facts</li><li>Show that multiplication of two numbers can be done in any order</li></ul>	<ul style="list-style-type: none"><li>Recall and use multiplication facts for the 3, 4 and 8 multiplication tables</li><li>Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental methods and progressing to a formal written method</li></ul>	<ul style="list-style-type: none"><li>Multiply two-digit and three-digit numbers by using formal written layout</li></ul>														
Teaching Sequence	<ul style="list-style-type: none"><li>Practical problems "There are 4 pairs of socks. How many socks altogether?"<ul style="list-style-type: none"><li>Grouping "5 groups of 2" </li></ul></li><li>Arrays  <math>2 \times 5 =</math></li></ul>	<ul style="list-style-type: none"><li>Arrays <math>4 \times 5 =</math>  Supported with repeated addition: "5+5+5+5"<ul style="list-style-type: none"><li>Blank numberline-repeated addition <math>4 \times 5 =</math> </li></ul></li></ul>	<ul style="list-style-type: none"><li>Grid method <table><tr><td>x</td><td>10</td><td>3</td></tr><tr><td>5</td><td>50</td><td>15</td></tr></table><math>50 + 15 = 65</math></li><li>Expanded formal <math display="block">\begin{array}{r} 13 \\ \times 8 \\ \hline 24 \text{ (3 \times 8)} \\ 80 \text{ (10 \times 8)} \\ \hline 104 \end{array}</math></li><li>Formal column multiplication <math display="block">\begin{array}{r} 13 \\ \times 8 \\ \hline 104 \\ 2 \end{array}</math></li></ul>	x	10	3	5	50	15	<ul style="list-style-type: none"><li>Formal column multiplication <math display="block">\begin{array}{r} 23 \\ \times 13 \\ \hline 69 \\ 230 \\ \hline 299 \end{array}</math></li></ul>								
x	10	3																
5	50	15																
Concrete / Pictorial support	<div><p>Bead strings 4 lots of 5</p></div> <div><p>Count in multiples supported by concrete objects (cubes, Numicon etc.) in equal groups.</p></div> <div><p>Create arrays using counters/ cubes to show multiplication</p></div>	<div><p>Use different objects to add equal groups.</p></div> <div><math>3 + 3 + 3</math></div> <div><p>Use a number line or pictures to continue support in counting in multiples</p></div>	<div><p>Use Diennes to move towards a more compact method</p><table><tr><td>x</td><td>T</td><td>U</td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table></div> <div><p>Calculations <math>4 \times 126</math></p></div> <div><p>Use place value counters to show how you find groups of a number. We are multiplying by 4 so we need 4 rows etc</p></div>	x	T	U												
x	T	U																

Division

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Year Group Objectives	<ul style="list-style-type: none"><li>♦ Solve one step problems involving division by calculating the answer using concrete objects and pictorial representations</li></ul>	<ul style="list-style-type: none"><li>♦ Recall and use division facts for the 2, 5 and 10 multiplication tables</li><li>♦ Calculate mathematical statements for division within the multiplication tables and write them using the division (÷) and equals (=) signs</li><li>♦ Solve problems involving division using materials, arrays, repeated subtraction, mental methods and division facts, including problems in context</li></ul>	<ul style="list-style-type: none"><li>♦ Recall and use division facts for the 3, 4 and 8 multiplication tables</li><li>♦ Write and calculate mathematical statements for division using the multiplication tables that they know, including for two-digit numbers divided by one-digit numbers, using mental methods and progressing to a formal written method</li></ul>	<ul style="list-style-type: none"><li>♦ Recall division facts from multiplication tables up to 12 x 12</li><li>♦ Use place value, known and derived facts to divide mentally</li><li>♦ Divide two-digit and three-digit numbers by a one-digit number using formal written layout</li></ul>
Teaching Sequence	<ul style="list-style-type: none"><li>• Sharing- practical "Share these 8 apples equally between 2 children. How many apples will each child have?" </li><li>• Sharing- written "Share 10 between two" </li></ul>	<ul style="list-style-type: none"><li>• Grouping using array <math>15 \div 5 =</math> </li><li>• Repeated subtraction <math>15 \div 5 =</math> </li></ul>	<ul style="list-style-type: none"><li>• Numberline—counting on  "How many 3s in 24"</li><li>• Formal written method </li></ul>	<ul style="list-style-type: none"><li>• Formal written method <math>128 \div 4 =</math> </li></ul>
Concrete / Pictorial support		 <p>Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.</p>  $96 \div 3 = 32$   <p>Link division to multiplication by creating an array and thinking about the number sentences that can be created.</p>	<p>Use place value counters to divide using the bus stop method alongside</p> <p><math>42 \div 3 =</math></p> <p>Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.</p>  <p>We exchange this ten for ten ones and then share the ones equally among the groups.</p>  <p>We look how much in 1 group so the answer is 14.</p> 	

Addition	Subtraction
<div>♦ <i>Add whole numbers with more than four digits, including using formal written methods</i></div>	<div>♦ <i>Subtract whole numbers with more than four digits, including using formal written methods</i></div>
<div><div><div>• Formal Column Addition- 5 digits</div><div><div><div>21848</div><div>+</div><div>1523</div><div>23371</div><div>11</div></div></div><div>• Formal Column Addition- with decimals</div><div><div><div>154.75</div><div>+</div><div>233.82</div><div>388.57</div><div>1</div></div></div></div></div> <div><div><div>• Formal Column Subtraction- 5 digits</div><div><div><div>47593</div><div>-</div><div>24132</div><div>23461</div></div></div><div>• Formal Column Subtraction- with decimals</div><div><div><div>466.25</div><div>-</div><div>83.72</div><div>82.53</div></div></div></div></div>	<div><div><div>• Formal written division</div><div><div><div>23</div><div>8</div><div>184</div><div>2</div></div></div><div>• Formal written division with remainders</div><div><div><div>86r2</div><div>5</div><div>432</div><div>3</div></div></div></div></div>
Multiplication	Division
<div>♦ <i>Multiply numbers with up to four digits by a one-digit or two-digit number using the formal written method, including long multiplication for two-digit numbers</i></div>	<div>♦ <i>Divide numbers up to four digits by one-digit numbers using the formal written method of short division and interpret remainders appropriately for the context</i></div>
<div><div><div>• Grid method</div><div><div><div><div>×</div><div>10</div><div>3</div></div><div><div>20</div><div>200</div><div>60</div></div><div><div>3</div><div>30</div><div>9</div></div></div><div>260 +39= 299</div></div><div>• Formal written multiplication</div><div><div><div>23</div><div>×</div><div>13</div><div>69</div><div>230</div><div>299</div></div></div></div></div> <div><div><div>• Formal written division</div><div><div><div>23</div><div>8</div><div>184</div><div>2</div></div></div><div>• Formal written division with remainders</div><div><div><div>86r2</div><div>5</div><div>432</div><div>3</div></div></div></div></div>	