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# CALCULATION PROGRESSION POLICY 2017

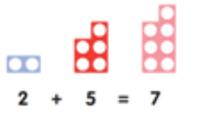
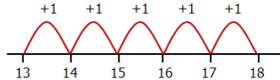
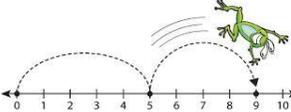
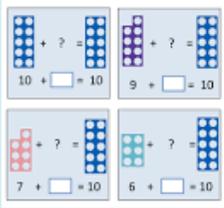
# The Craylands Calculation Progression Policy

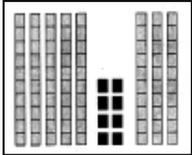
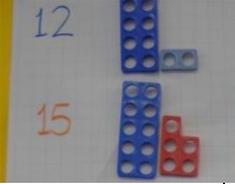
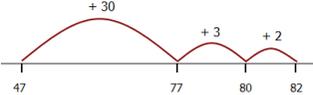
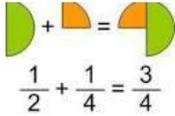
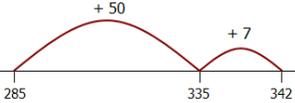
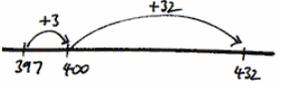
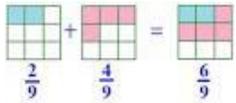
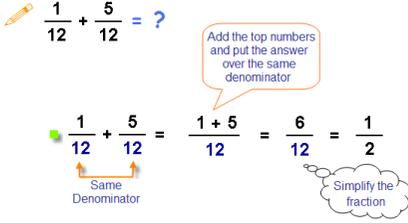
## PART 1: ADDITION R-yr6

STATUTORY EXPECTATIONS (NC 2014)

Rapid Recall/Mental Calculations

Non-statutory guidance

Y R	<p>Count ... from 1-20 ... and say which no. is 1 more than a given no. Using quantities objects, + two U nos and count on to find the answer. [Expected] Estimate no. of objects; check quantities by counting up to 20. [Exceeding]</p>	<p>Practical (sometimes recorded using ICT or by adults).</p> <p>Hannah ... listed how many girls and how many boys were outside. [She] was able to say that "There are 5 girls and 4 boys. That's 9 altogether".</p> <p>When playing in the shop Christopher used his shopping list to add 2 amounts. He said "the beans are 5 pence and the bananas are 3 pence, altogether that is 8 pence."</p> <p><a href="#">[EYFS Profile exemplifications, STA]</a></p>	<p>Pictures/Objects</p>  <p>Bead strings</p> <p>I eat 2 cakes and my friend eats 3. How many cakes did we eat altogether?</p>  <div style="border: 1px solid black; padding: 5px; background-color: #ffe4c4;"> <p><b>ADULTS MODEL ALL RECORDING</b> For example, the above problem might be recorded as: <math>2 + 3 = 5</math></p> </div>	<p>Symbolic</p> <p>8 people are on the bus. 5 more get on at the next stop. How many people are on the bus now</p>  <p><b>[Might be recorded as: <math>8 + 5 = 13</math>]</b></p>	<p>Begin to learn addition facts for each number to 5, extend to 10 if ready.</p> 	 <p>Children use concrete objects, including Numicon pegs to count and add.</p>		
Y 1	<p>Add one-digit and two-digit numbers to 20 (<math>9 + 9</math>), including zero</p> <p>Read/write/interpret statements involving addition (+) and equals (=) signs.</p>	<p><b>Pupils use concrete objects and pictorial representations</b> (e.g.: Numicon, Base 10, Unifix)</p> <p><b>Problems should include terms: put together, add, altogether, total, take away, distance between, more than and less than, so pupils develop concept of +/- and use operations flexibly.</b></p>	<p>Use cubes/counters and numberlines on the Interactive Board.</p> <p>Pictures/Symbolic</p> <p>Numicon and Numicon tens number line:</p> 	<p>Visual (modelled using bead strings/Numicon number line)</p> <p><math>13 + 5 = 18</math></p>  <p>Begin by counting on in 1s to add:</p> 	<p>Progress to bigger, efficient jumps and use Numicon and number line (Concrete)</p> <p><math>5 + 4 = 9</math></p>  <p>[jumps may be in 1s at first]</p> <p>Bridging ten- apply number bond to ten knowledge:</p> <p><math>8 + 7 =</math></p> 	<p>Use known facts/partitioning</p> <p><math>8 + 5 + 13</math></p> <p><math>8 + 2 = 10</math> <math>10 + 3 = 13</math></p> <p>Partition practically:</p> 	<p>Represent/use number bonds (and related subtraction facts) within 20.</p> <p>Missing number problems (eg <math>16 = ? + 9</math>)</p> 	<p>Memorise/reason with bonds to 10/20 in several forms (eg <math>9 + 7 = 16</math>; <math>16 - 7 = 9</math>; <math>7 = 16 - 9</math>).</p> <p>Pupils should realise the effect of adding or subtracting zero - establishes +/- as related operations.</p> <p>Pupils combine and increase numbers, counting forwards and backwards.</p>

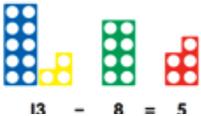
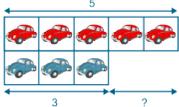
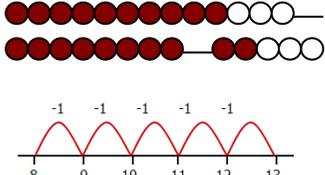
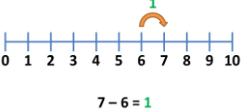
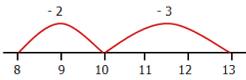
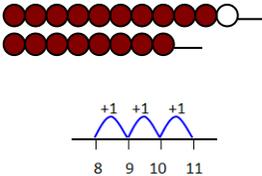
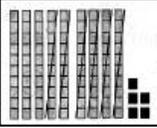
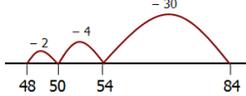
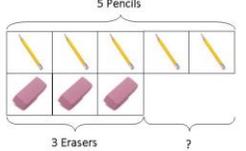
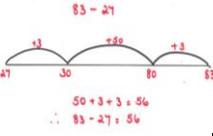
Y 2	<p><b>TO + O</b> <b>TO + tens</b> <b>TO + TO</b> <b>O + O + O</b></p> <p>[Show addition of two numbers can be done in any order.]</p>	<p>Recognise/use inverse relationship between +/- and use to check calcs and missing number problems.</p> <p>Pupils use concrete objects, pictorial representations and mental strategies. (eg place value boards and Base 10, Numicon)</p>	<p>Visual images and Practical: <math>58 + 30 = 88</math> Base ten:</p>  <p><math>12 + 15 = 27</math> Numicon:</p> 	<p>Visual (efficient jumps)</p> <p><math>35 + 47 = 82</math></p> <p>Also using Numicon and Numicon number lines.</p>  <p>[Also jumps can be in 10s and then 1s]</p>	<p>Informal mental jottings: No number line</p> <p><math>35 + 47 = 82</math></p> <p><math>47 + 30 = 77</math> <math>77 + 3 = 80</math> <math>80 + 2 = 82</math></p> <p>Partitioning</p> <p><math>35 + 47 = 82</math></p> <p><math>40 + 30 = 70</math> <math>7 + 5 = 12</math></p>	<p>Adding fractions: Use visual images and Fraction Pies/walls. Also use Numicon.</p>  <p><math>\frac{1}{2} + \frac{1}{4} = \frac{3}{4}</math></p>	<p>expanded written method (vertical) <i>Recording addition in columns supports place value and prepares for formal written methods with larger numbers.</i></p> <p><math>47 + 35 = 82</math></p> $\begin{array}{r} 40 + 7 \\ 30 + 5 \\ \hline 70 + 12 \end{array}$	<p>Recall and use addition facts to 20 fluently. Derive and use related facts up to 100.</p> <p>Solve problems by applying increasing knowledge of mental methods.</p>	<p><i>Pupils extend understanding of the language of + to include sum.</i></p> <p><i>Practise + to 20 to derive facts such as using <math>3 + 7 = 10</math> to calculate <math>30 + 70 = 100</math>, <math>100 - 70 = 30</math> and <math>70 = 100 - 30</math>. Check calculations, including by adding numbers in a different order to check addition. Establishes commutativity and associativity of addition.</i></p>
Y 3	<p>Use formal written methods of <b>columnar addition</b>.</p> <p><b>TO + TO</b> <b>HTO + TO</b> <b>HTO + HTO</b></p> <p>Add fractions with the same denominator.</p>	<p>Draw/use Number lines: <math>57 + 285 = 342</math></p>  <p><math>397 + 35 = 432</math></p> 	<p>No number line (jottings)</p> <p><math>57 + 285 = 342</math></p> <p><math>285 + 50 = 335</math></p> <p><math>335 + 7 = 342</math></p>	<p><b>Expanded</b> Vertical (used for selected children, if needed)</p> <p><math>300 + 70 + 4</math> <math>+200 + 40 + 8</math> <math>\hline 600 + 110 + 12 = 622</math></p> <p>All children use base 10 and place value charts/ Numicon to introduce/support.</p>	<p><b>Column</b></p> $\begin{array}{r} 374 \\ + 248 \\ \hline 622 \end{array}$ <p>All children use base 10 and place value charts/ Numicon to introduce/support.</p> <p><b>Estimate answers and use inverse to check.</b></p>	<p>Add fractions:</p>  <p><math>\frac{2}{9} + \frac{4}{9} = \frac{6}{9}</math></p>	<p>HTO + O; HTO + tens HTO + hundreds</p> <p>Use number facts and place value to solve problems.</p> <p><i>For mental calculations with TO nos, answers could be &gt;100.</i></p>	<p><i>If children are taught to add TO and HTO by using columnar formal method FIRST, they may not be able to add mentally two digit numbers which is a year 2 and beyond requirement. Formal methods are most efficient for adding and subtracting larger numbers and decimal numbers.</i></p>	
Y 4	<p>Use formal written methods of <b>columnar addition</b>.</p> <p><b>HTO + HTO</b> <b>ThHTO + HTO</b> <b>ThHTO + ThHTO</b></p> <p><b>Solve problems involving fractions</b></p>	<p><b>Estimate and use inverse operations to check answers to a calculation.</b></p> <p>Estimate, compare and calculate different measures, including money in pounds and pence.</p>	<p><b>Expanded vertical</b> (only for lower attainers/AEN)</p> <p><math>789 + 642 = 1431</math></p> <p><math>700 + 80 + 9</math> <math>+600 + 40 + 2</math> <math>\hline 1300 + 120 + 12 = 1431</math></p> <p>All children- concrete- use base 10 and place value charts.</p>	<p><b>Column</b></p> <p><math>789 + 642 = 1431</math></p> $\begin{array}{r} 789 \\ + 642 \\ \hline 1431 \end{array}$	<p>ADD FRACTIONS</p> <p><math>\frac{1}{12} + \frac{5}{12} = ?</math></p>  <p>Same Denominator</p> <p>Simplify the fraction</p> <p><small>fractions-math.blogspot.com</small></p>	<p><b>Solve addition two-step problems in contexts, deciding which operations and methods to use &amp; why.</b></p> <p>Solve simple measure and money problems involving fractions and decimals to 2dp</p>	<p><i>Pupils continue to practise both mental methods and columnar addition and subtraction with increasingly large numbers to aid fluency.</i></p>	<p><i>Pupils build on their understanding of place value and decimal notation to record metric measures, including money.</i></p>	

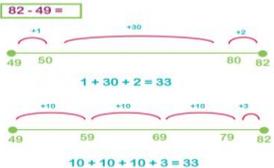
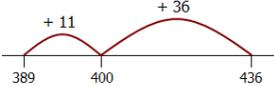
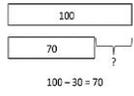
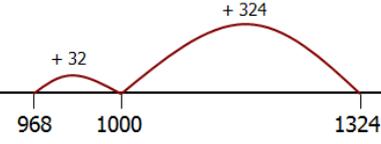
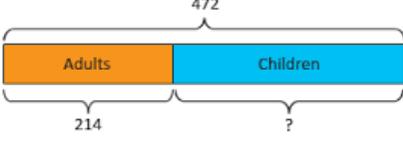
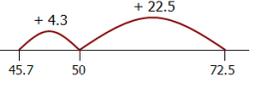
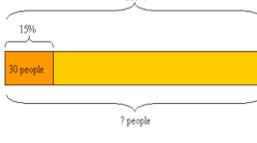
Y 5	<p>Add whole numbers &gt;4 digits, including using <b>formal</b> written methods (<b>columnar addition</b>).</p> <p>Decimals up to 2dp (eg 72.5 + 45.7)</p>	<p><b>Solve problems involving number up to 3dp.</b></p> <p><b>Solve problems involving converting between units of time. [Measurement]</b></p> <p><b>Use all four operations to solve problems involving measure [eg length, mass, volume, money] using decimal notation including scaling. [Measurement]</b></p>		<p>Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.</p> <p>Solve addition multi-step problems in contexts, deciding which operations and methods to use and why.</p> <p>Add fractions with different denominators (see year 6).</p>	<p><b>Column</b> vertical</p> $\begin{array}{r} 124.9 \\ + 117.25 \\ \hline 242.15 \\ \hline \end{array}$ $\begin{array}{r} 23.70 \\ + 48.56 \\ \hline 72.26 \\ \hline \end{array}$ <p>1 1</p>	<p><i>Pupils practise adding decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1.</i></p> <p><b>Partitioning and recombining:</b> Either partition both numbers and recombine or partition the second number only e.g.  <math>35.8 + 7.3 = 35.8 + 7 + 0.3</math>  <math>= 42.8 + 0.3</math>  <math>= 43.1</math></p> 	<p>Add numbers mentally with increasingly large numbers (eg 12462 + 2300 = 14762).</p> <p><i>Pupils mentally add tenths, and one-digit whole numbers and tenths.</i></p>	<p><i>They extend their knowledge of fractions to thousandths and connect to decimals and measures. Pupils should go beyond the measurement and money models of decimals (eg by solving puzzles).</i></p>
Y 6	<p>Solve multi-step problems in contexts, deciding which operations/methods to use and why. Decimals up to 3dp (Context: Measures)</p>	<p>Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.</p>	<p>Use knowledge of the order of operations to carry out calculations involving subtraction.</p>	<p><b>Solve problems which require answers to be rounded to specified degrees of accuracy. [Fractions]</b></p> <p><b>Solve problems involving the calculation and conversion of units of measure, using decimal notation to 3dp where appropriate. [Measurement]</b></p> <p><b>Column</b> vertical</p> $\begin{array}{r} 3.243 \\ + 18.070 \\ \hline 21.313 \\ \hline \end{array}$ <p>1 1</p>	<p><b>Add fractions with different denominators:</b></p>  $\frac{2}{15} + \frac{3}{5} = ?$ $\frac{2}{15} + \frac{3 \times 3}{5 \times 3}$ $\frac{2}{15} + \frac{9}{15} = \frac{2 + 9}{15} = \frac{11}{15}$ <p>Same</p> <p>• fractions-math.blogspot.com</p>	<p>Perform mental calculations, including with mixed operations and large numbers. <i>Using the number line, pupils add positive and negative integers for measures such as temperature.</i></p>	<p><i>Pupils develop skills of rounding/estimating to predict/check order of magnitude of ans to decimal calcs. Includes rounding answers to a degree of accuracy &amp; checking reasonableness.</i></p>	

## PART 2: SUBTRACTION R-Yr6

STATUTORY EXPECTATIONS NC 2014

Rapid Recall/Mental Calculations    Non-statutory guidance

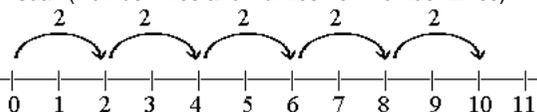
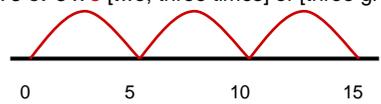
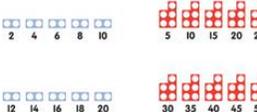
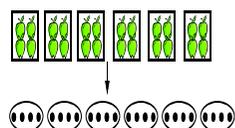
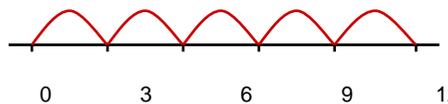
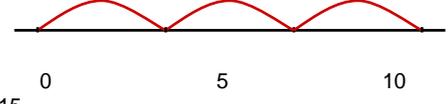
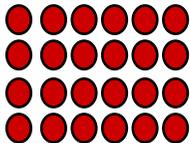
<b>YR</b>	<p>Count ... from 1-20 ... and say which no. is 1 less than a given no. Using quantities objects, subtract two U nos and count back to find the answer. [Expected] Estimate no. of objects; check quantities by counting up to 20. [Exceeding]</p>	<p>Practical (sometimes recorded using ICT or by adults).</p> <p>Chloe was playing in the maths area. "I need three more" she said as she added some cubes to the circle. She then realised she had more than her friend. "Oh, I have too many". She removed one. "Now we have the same".</p> <p>During a game of skittles outdoors Joseph knocked three numbered skittles down. He was able to calculate his score in his head.</p> <p><a href="#">[EYFS Profile exemplifications. STA]</a></p>	<p>Pictures/Objects</p> <p>I have five cakes. I eat two of them. How many do I have left?</p>  <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">             Might be recorded as: <math>5 - 2 = 3</math> </div>	<p>Symbolic</p> <p>Mum baked 9 biscuits. I ate 5. How many were left?</p>  <p style="background-color: #fde9d9; padding: 2px; display: inline-block;">[Might be recorded as: <math>9 - 5 = 4</math>]</p>	<p>Begin to learn subtraction facts for each number to 5, extend to 10 if ready.</p>	<p>Children use Numicon/concrete objects:</p> 			
<b>Y1</b>	<p>Subtract (and add) one-digit and two-digit numbers to 20 (<math>9 + 9</math>, <math>18 - 9</math>), including zero</p> <p>Read/write/interpret statements involving addition (+), subtraction (-) and equals (=) signs</p>	<p><b>Pupils use concrete objects and pictorial representations</b> (eg: unifix cubes, counters, Numicon and Numicon number lines, base 10, unifix)</p> <p>Introduce <b>Bar Method:</b></p> 	<p><b>Taking away</b> – jumps of 1 (modelled using bead strings and numberlines)</p> $13 - 5 = 8$  <p>Also start to count on to subtract from smallest to largest number:</p> 	<p><b>Taking away</b></p> <p>Progress to more efficient jumps <math>13 - 5 = 8</math></p>  <p>No number line:  <math>13 - 3 = 10</math>  <math>10 - 2 = 8</math>.</p>	<p><b>Counting on</b> – jumps of 1 (modelled using bead strings/numberlines)</p> $11 - 8 = 3$ 	<p><b>Counting on</b> (efficient jumps)</p> <p>Bridge 10:  <math>14 - 8 = 6</math>  <math>8 + 2 + 4 = 6</math></p> <p>With, or without, number line</p> $10 - 2 = 8 + 2 = 10$ $11 - 1 = 10 + 1 = 11$	<p>Represent/use number bonds and related subtraction facts within 20.</p> <p><i>Problems should include terms: put together, add, altogether, total, take away, distance between, more than and less than, so pupils develop concept of +/- and use operations flexibly.</i></p> <p>Missing number problems (eg <math>7 = ? - 9</math>)</p>	<p><i>Memorise/reason with bonds to 10/20 in several forms (eg <math>9 + 7 = 16</math>; <math>16 - 7 = 9</math>; <math>7 = 16 - 9</math>). Pupils should realise the effect of adding or subtracting zero - establishes +/- as related operations.</i></p> <p><i>Pupils combine and increase numbers, counting forwards and backwards.</i></p>	
<b>Y2</b>	<p><b>TO - O</b> <b>TO - tens</b> <b>TO - TO</b></p> <p>[Show subtraction of two numbers cannot be done in any order.]</p>	<p>Recognise/use relationship betw. +/- to check calcs and missing number problems.</p> <p><b>Pupils use concrete objects and pictorial representations and mental strategies</b> (eg place value counters, Dienes)</p>	<p>Practical/visual images</p> $95 - 60 = 35$  <p>Use Base Ten and Numicon and numberlines.</p>	<p><b>Taking away</b> <math>84 - 36 = 48</math></p>  <p>[Also jumps can be in 10s/1s]</p> <p>Use <b>Bar Method:</b></p> 	<p><b>Taking away</b> (no number line)</p> $84 - 36 = 48$ $84 - 30 = 54$ $54 - 4 = 50$ $50 - 2 = 48$	<p><b>Counting on 83-27</b></p> <p><b>Counting on using a blank number line:</b></p>  <p>[Also jumps can be in 10s/1s]</p>	<p><i>Recording subtraction in columns supports place value and prepares for formal written methods with larger numbers.</i></p> <p><b>Expanded vertical:</b></p> $\begin{array}{r} 98 - 35 = 63 \\ 90 \text{ and } 8 \\ 30 \text{ and } 5 \\ \hline 60 \text{ and } 3 \end{array}$	<p>Recall and use subtraction facts to 20 fluently. Derive and use related facts up to 100.</p> <p>Solve problems by applying increasing knowledge of mental methods.</p>	<p><i>Pupils extend understanding of the language of subtraction to include difference.</i></p> <p><i>Practise subtraction to 20 to derive facts such as using <math>3 + 7 = 10</math>, <math>10 - 7 = 3</math> and <math>7 = 10 - 3</math> to calculate <math>30 + 70 = 100</math>, <math>100 - 70 = 30</math> and <math>70 = 100 - 30</math>. Check calculations, including by adding to check subtraction.</i></p>

Y3	<p>Use formal written methods of <b>columnar addition</b></p> <p><b>TO - TO</b> <b>HTO - TO</b> <b>HTO - HTO</b></p>	<p><b>Counting on</b></p>  <p>Progress to <math>436 - 389 = 47</math></p> 	<p><b>Taking away</b> (no number line)</p> <p><b>Partitioning.:</b></p> $83 - 42 =$ $\begin{array}{r} 80 \text{ and } 3 \\ - 40 \text{ and } 2 \\ \hline 40 \text{ and } 1 = 41 \end{array}$ <p><math>326 - 178 = 148</math></p> <p><math>326 - 100 = 226</math> <math>226 - 70 = 156</math> <math>156 - 8 = 148</math></p>	<p><math>874 - 523 = 351</math></p> $\begin{array}{r} 874 \\ - 523 \\ \hline 351 \end{array}$ <p>(no decomposition)</p>	<p><b>Expanded vertical</b></p> <p>Some children taught this method. Most use blank number lines and then move straight to columnar.</p> <p>See guidance for example.</p>	<p><b>Column</b></p>  <p><math>932 - 457 = 475</math></p>	<p><b>Estimate answers and use inverse to check.</b></p> <p>Use <b>Bar Method:</b></p> 	<p>HTU - U HTU - tens HTU - hundreds</p> <p>Use number facts and place value to solve problems.</p>	<p><b>Expanded Vertical:</b></p> $\begin{array}{r} 700 + 20 + 1 \\ - 200 + 20 + 7 \\ \hline 500 + 10 + 4 = 514 \end{array}$
Y4	<p>Use formal written methods of <b>columnar subtraction</b>.</p> <p><b>HTO - HTO</b> <b>ThHTO - TO</b> <b>ThHTO - HTO</b> <b>ThHTO - ThHTO</b></p>	<p><b>Counting on</b> <math>1324 - 968 = 356</math></p>  <p>Use <b>Bar Method:</b></p> 	<p><b>1000 and 300 and 70 and 4</b> <b>900 and 60 and 8</b></p> <p><b>1300 and 60 and 14</b> <b>900 and 60 and 8</b> <b>400 and 0 and 6</b></p> <p><b>Decomposition: <math>1374 - 968 = 406</math></b></p>	<p><math>1374 - 968 =</math></p> $\begin{array}{r} 1374 \\ - 968 \\ \hline 406 \end{array}$ <p><b>406</b></p>	<p><b>Solve subtraction two-step problems in contexts, deciding which operations and methods to use and why.</b></p> <p>Solve simple measure and money problems involving fractions and decimals to 2dp.</p>	<p><b>Estimate and use inverse operations to check.</b></p> <p>Estimate, compare and calculate different measures, including money in pounds and pence.</p>	<p><i>Pupils continue to practise both mental methods and columnar addition and subtraction with increasingly large numbers to aid fluency.</i></p>	<p><i>Pupils build on their understanding of place value and decimal notation to record metric measures, including money.</i></p>	
Y5	<p>Subtract whole numbers &gt;4 digits, including using <b>formal methods (columnar subtraction)</b>.</p> <p>Decimals up to 2dp (eg <math>72.5 - 45.7</math>)</p>	<p>Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.</p> <p>Solve multi-step problems in contexts, deciding which operations/methods to use and why.</p>	<p>Solve problems involving number up to 3dp. [<i>Fractions</i>]</p> <p>Solve problems involving converting betw. units of time. [<i>Measurement</i>]</p> <p>Solve problems involving measure [eg length, mass, volume, money] using decimal notation including scalin [<i>Measurement</i>]</p>	<p><b>Counting on</b></p> <p><math>72.5 - 45.7 = 26.8</math></p>  <p><b>Bar Method:</b></p> 	<p><b>Taking away</b> (no number line)</p> <p><math>72.5 - 45.7</math></p> <p><math>72.5 - 40 = 32.5</math> <math>32.5 - 5 = 27.5</math> <math>27.5 - 0.7 = 26.8</math></p>	<p><b>Column:</b></p> <p><math>72.5 - 45.7 = 26.8</math></p> $\begin{array}{r} 72.5 \\ - 45.7 \\ \hline 26.8 \end{array}$	<p><i>Pupils practise subtracting decimals, including a mix of whole numbers and decimals, decimals with different numbers of decimal places, and complements of 1.</i></p>	<p>Subtract numbers mentally with increasingly large numbers (eg <math>12462 - 2300 = 10162</math>). <i>Pupils mentally subtract tenths, and one-digit whole numbers and tenths.</i></p>	<p><i>They extend their knowledge of fractions to thousandths and numbers and connect to decimals and measures. Pupils should go beyond the measurement and money models of decimals (eg by solving puzzles).</i></p>
Y6	<p>Solve multi-step problems in contexts, deciding which operations/methods to use and why. Decimals up to 3dp (Context: Measures)</p>	<p>Use knowledge of the order of operations to carry out calculations involving subtraction.</p> <p>Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.</p>	<p><b>Solve problems which require answers to be rounded to specified degrees of accuracy. [<i>Fractions</i>]</b></p> <p><b>Solve problems involving the calculation and conversion of units of measure, using decimal notation to 3dp where appropriate. [<i>Measurement</i>]</b></p>	<p><b>Column</b> (see above)</p> <ul style="list-style-type: none"> <li>There was 2.5 litres in the jug. Stuart drank 385 ml. How much was left?</li> <li>18.07 km - 3.243 km</li> <li>Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.</li> </ul>	<p>Perform mental calcs, incl. with mixed operations and large numbers. <i>Using the no. line, pupils subtract positive/negative integers for measures such as temperature.</i></p>	<p><i>Pupils develop skills of rounding/estimating to predict/check order of magnitude of answers to decimal calcs. Includes rounding answers to a degree of accuracy &amp; checking reasonableness.</i></p>			

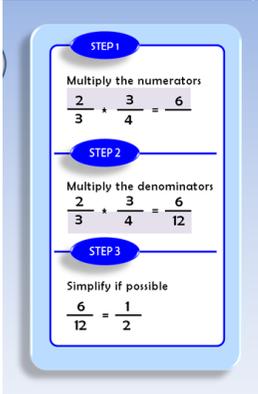
## PART 3: MULTIPLICATION R-Yr6

STATUTORY EXPECTATIONS NC 2014

Rapid Recall/Mental Calculations Non-statutory guidance

Y R	<p>Children ... solve problems, including doubling, halving and sharing. [Expected] Solve practical problems that involve combining groups of 2/5/10. [Exceeding]</p>	<p>Practical/ recorded using ICT (eg digital photos / pictures on IWB)</p> <p>How many 10p coins are here? How much money is that?</p> <p>This domino is a double 4. How many spots does it have?</p>	<p>Pictures/Objects</p> <p>How many socks in three pairs?</p> 	<p>Symbolic</p> <p>3 pairs, 2 socks in each pair:</p> 		<p>Use real objects and contexts to develop understanding.</p> 																								
Y1	<p>Solve one-step problems using concrete objects, pictorial representations and arrays (with the support of the teacher)</p>	<p>Practical/recorded Pictures/Symbolic</p> <p>There are five cakes in each bag. How many cakes are there in three bags?</p>  <p>Grouping counters and drawing pictures</p>	<p>Visual (Number lines and Numicon on Number Lines)</p>  <p>5 x 3 or 3 x 5 [two, three times] or [three groups of two]</p> 	<p>Arrays</p> <p>5 x 2 or 2 x 5</p> 	<p>Doubling numbers/quantities</p> <p>Count on/back in 2s, 5s and 10s</p>	<p>Use Numicon to aid:</p> 																								
Y2	<p>Calculate statements for multiplication within the multiplication tables and write them using the multiplication and equals signs. [Show multiplication of two numbers can be done in any order.]</p>	<p>Pictures/Symbolic</p> <p>There are four apples in each box. How many apples in six boxes?</p> 	<p>Pupils use a variety of language to describe multiplication.</p> <p>Concrete-pupils use Numicon and Numicon Number Lines.</p>	<p>Repeated addition</p> <p>5 x 3 or 3 x 5, 5+5+5 or 3+3+3+3+3</p>  	<p>Arrays</p> <p>6 x 4 or 4 x 6</p> 	<p>Recall and use multiplication facts for the 2, 5 and 10 multiplication tables, (including recognising odd and even numbers).</p> <p>Use commutativity/inverse relations to develop multiplicative reasoning (eg 4 x 5 = 20 and 20 ÷ 5 = 4).</p>	<p>Pupils ... practise to become fluent in the 2/5/10 multiplication tables and connect them to each other. They connect the 10x table to place value, and the 5x table to divisions on the clock face. They begin to use other multiplication tables and recall facts, including using related division facts to perform written and mental calculations.</p>																							
Y3	<p>Write/calculate statements using the multiplication tables that they know (progressing to formal written methods). TU x U (multiplier is 2/3/4/5/8/10)</p>	<p><b>Grid Method:</b></p> <p>36 x 4 = 144</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td> <td>30</td> <td>6</td> </tr> <tr> <td>4</td> <td style="background-color: #90EE90;">120</td> <td style="background-color: #66B3FF;">24</td> </tr> </table>	X	30	6	4	120	24	<p><b>Informal Mental Jottings:</b></p> <p>36 x 4 = 144</p> <p>30 x 4 = 120</p> <p>6 x 4 = 24</p>	<p><b>Expanded multiplication:</b></p> <p>36 x 4 = 144</p> <table style="margin-left: auto; margin-right: auto;"> <tr><td>36</td><td></td></tr> <tr><td>x 4</td><td></td></tr> <tr><td>24</td><td>(6 x 4)</td></tr> <tr><td>120</td><td>(30 x 4)</td></tr> <tr><td>144</td><td></td></tr> </table>	36		x 4		24	(6 x 4)	120	(30 x 4)	144		<p><b>Short multiplication (formal):</b></p> <p>36 x 4 = 144</p> <table style="margin-left: auto; margin-right: auto;"> <tr><td>36</td><td></td></tr> <tr><td>x 4</td><td></td></tr> <tr><td>144</td><td></td></tr> </table>	36		x 4		144		<p>Pupils develop reliable written methods for multiplication, starting with calculations of TU by U (progressing to formal written methods of short multiplication).</p>	<p>Recall and use multiplication facts for the 3, 4 and 8 multiplication tables.</p> 	<p>Through doubling, they connect the 2/4/8 multiplication tables. Pupils develop efficient mental methods, using commutativity (eg 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240) and multiplication and division facts (eg using 3 x 2 = 6, 6 ÷ 3 = 2 &amp; 2 = 6 ÷ 3) to derive related facts (30 x 2 = 60, 60 ÷ 3 = 20 &amp; 20 = 60 ÷ 3).</p>
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24	(6 x 4)																													
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Y4	Use <b>formal</b> written layout: <b>TU x U</b> <b>HTU x U</b>	43 x 6 = 258 (estimate: 40 x 6 = 240)	<b>Expanded multiplication:</b> 43 x 6 $\begin{array}{r} 43 \\ \times 6 \\ \hline 18 \quad (3 \times 6) \\ 240 \quad (40 \times 6) \\ \hline 258 \end{array}$	<b>Short multiplication (formal):</b> 24 x 6 = 144 $\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \end{array}$	<b>Grid Method:</b> 342 x 7 = 2394 $\begin{array}{ c c c } \hline \times & 300 & 40 & 2 \\ \hline 7 & 2100 & 280 & 14 \\ \hline \end{array}$	<b>Expanded multiplication:</b> 237 x 4 (estimate: 250 x 4 = 1000) $\begin{array}{r} 237 \\ \times 4 \\ \hline 28 \\ 120 \\ 800 \\ \hline 948 \end{array}$	<b>Short multiplication (formal)</b> 342 x 7 = 2394 $\begin{array}{r} 342 \\ \times 7 \\ \hline 2394 \end{array}$	Recall multiplication facts to 12 x 12. Use place value, known & derived facts to multiply mentally, including x by 0/1; x 3 numbers. Recognise/use factor pairs and commutativity in mental calculations.  Pupils use multiplication to convert from larger to smaller units.	<i>Practise mental methods and extend this to HTU numbers to derive facts, for example 200 x 3 = 600 into 600 ÷ 3 = 200. Write statements about equality of expressions [eg 39 x 7 = 30 x 7 + 9 x 7 and (2 x 3) x 4 = 2 x (3 x 4)]. Combine knowledge of facts and arithmetic rules to solve mental/written calculations (eg 2 x 6 x 5 = 10 x 6 = 60).</i>
	Convert between different units of measure [eg km to m; hr to mi]	40 x 6 = 240 3 x 6 = 18						Progress to <b>Long Multiplication</b> TO x TO when ready	

Y5	Use a <b>formal</b> written method (including long x for TU nos) <b>TU x TU</b> <b>HTU x U / HTU x TU</b> <b>ThHTU x U</b>	<b>Grid Method:</b> 47 x 36 = 1692 (estimate 50 x 40 = 2000)	<b>Multiply fractions:</b> 	<b>Short multiplication (formal)</b> 2741 x 6 = 16446 (estimate 3000 x 6 = 18000) $\begin{array}{r} 2741 \\ \times 6 \\ \hline 16446 \end{array}$	24 x 16 = 384 $\begin{array}{r} 24 \\ \times 16 \\ \hline 144 \\ 384 \end{array}$	<b>Long Multiplication</b> 124 x 26 = 3224 $\begin{array}{r} 124 \\ \times 26 \\ \hline 744 \\ 3224 \end{array}$	<i>Pupils connect multiplication by a fraction to using fractions as operators (fractions of), and to division. This relates to scaling by simple fractions, including those &gt; 1. Find fractions of numbers and quantities, writing remainders as a fraction.</i>	Identify multiples/factors, including finding all factor pairs of a number, & common factors of two numbers. Know/use vocabulary of prime numbers, prime factors and composite (non-prime) nos. Establish if a number up to 100 is prime; recall prime numbers to 19. x nos mentally using known facts. Multiply whole numbers and those involving decimals by 10/100/1000.	<i>Pupils ... apply all the x tables frequently, commit them to memory and use them to make larger calculations. They understand the terms factor, multiple/prime, square/cube numbers &amp; use to construct equiv. statements (eg 4 x 35 = 2 x 2 x 35; 3 x 270 = 3 x 3 x 9 x 10 = 9^2 x 10).</i>
	Convert between units of measure (eg km/m; m/cm; cm/mm; kg/g; litre and ml) Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams	$\begin{array}{ c c c c } \hline \times & 40 & 7 & \\ \hline 30 & 1200 & 210 & 1410 \\ \hline 6 & 240 & 42 & 282 \\ \hline & & & 1692 \\ \hline \end{array}$			(estimate 25 x 15 = 375)	<b>see Y6</b>			

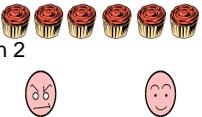
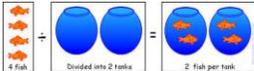
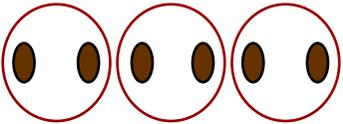
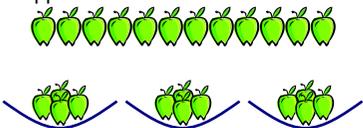
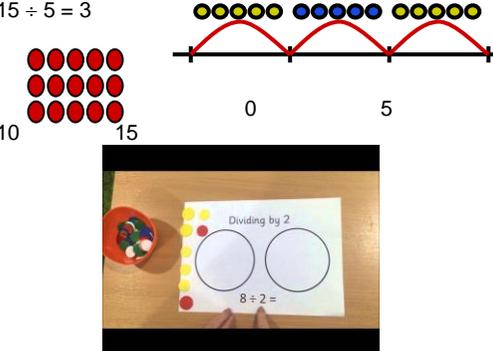
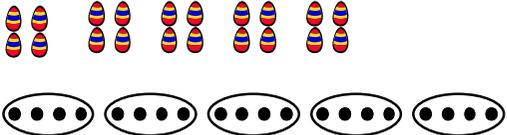
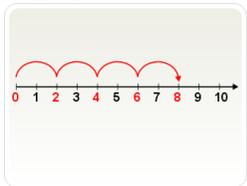
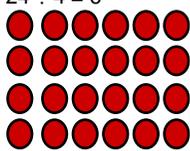
Y6	Multi-digit numbers (up to 4 digits) x TU whole number using the <b>formal</b> method of <b>long multiplication</b> .	256 x 18 = 4608 (estimate 250 x 20 = 5000) $\begin{array}{r} 256 \\ \times 18 \\ \hline 2048 \\ 4608 \\ \hline 4608 \\ \hline 1 \end{array}$	<b>Long Multiplication (formal):</b> $\begin{array}{r} 124 \\ \times 26 \\ \hline 744 \\ 3224 \\ \hline 3224 \end{array}$ 124 x 26 = 3224  <b>[NB See Y5 method]</b>	<b>Short multiplication (formal)</b> 4.7 x 8 = 37.6 (estimate 5 x 8 = 40) $\begin{array}{r} 4.7 \\ \times 8 \\ \hline 37.6 \end{array}$ 40) [Or 47 x 8, then divide the solution by 10.]	<b>Grid Method:</b> 5.65 x 9 = 50.85 (estimate 6 x 9 = 54) $\begin{array}{ c c c c } \hline \times & 5 & 0.6 & 0.05 \\ \hline 9 & 45 & 5.4 & 0.45 \\ \hline \end{array}$ [Or compute 565 x 9, then divide the solution by 100.]	<i>Use a variety of images to support understanding of x with fractions. Use understanding of relationship between unit fractions and ÷ to work backwards by x a quantity that represents a unit fraction to find the whole quantity (eg if 1/4 of a length is 36cm, whole length 36 x 4 = 144cm). x numbers with up to 2dp by U/TU whole nos (starting with simplest cases eg 0.4 x 2 = 0.8, and in practical contexts).</i>	Perform mental calculations, including with mixed operations/large numbers. Identify common factors/multiples and prime numbers. Use knowledge of order of operations to carry out calculations. Use estimation to check answers to calculations and determine an appropriate degree of accuracy. Identify value of each digit to 3dp and x nos by 10/100/1000 (ans to 3dp)	<i>Undertake mental calcs with increasingly large numbers and more complex calculations. Continue to use all x tables to calculate statements in order to maintain their fluency. Explore the order of operations using brackets. Common factors can be related to finding equivalent fractions.</i>
	Multiply one-digit numbers with up to two decimal places by whole numbers							

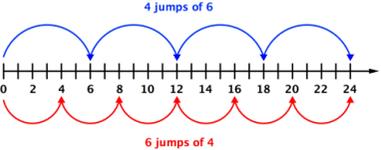
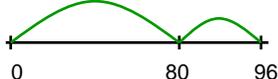
**PART 4: DIVISION R-Yr6**

STATUTORY EXPECTATIONS NC 2014

Rapid Recall/Mental Calculations

Non-statutory guidance

<p>Y R</p>	<p>Children ... solve problems, including doubling, halving and sharing. [Expected] They solve practical problems that involve sharing into equal groups. [Exceeding]</p>	<p>Practical / recorded using ICT (eg digital photos/pictures on IWB)</p>	<p>Pictures/ real objects 6 cakes shared between 2  6 cakes put into groups of 2 </p>	<p>Symbolic 6 cakes shared between 2  </p>	<p>There are 8 raisins. Take half of them. How many do you have?  Share the 10 grapes between 2 people.</p>		<p>Ensure the children have lots of practical experience of sharing/ division (not worksheets)</p>	
<p>Y 1</p>	<p>Solve one-step problems using concrete objects, pictorial representations and arrays (with the support of the teacher)</p>	<p>There are 14 people on the bus. Half of them get off. How many remain on the bus?  There are 20 people in the class. One quarter are boys. How many boys are there? </p>	<p>Pictures/Symbolic How many apples in each bowl if I share 12 apples between 3 bowls? </p>	<p>Visual and Concrete (modelled using Numicon and Number lines/ beads/ counters/objects) <math>15 \div 5 = 3</math> </p>	<p>Recognise/find/name <math>\frac{1}{2}</math> as one of two equal parts of an object, shape or quantity. Recognise/find/name <math>\frac{1}{4}</math> as one of four equal parts of an object, shape or quantity.</p>	<p>Find simple fractions of objects, numbers and quantities  Count on/back in 2s, 5s and 10s</p>		
<p>Y 2</p>	<p>Calculate statements within the multiplication tables and write them using the division and equals signs. [Show division of two numbers <u>cannot</u> be done in any order.] Find <math>\frac{1}{3}</math>, <math>\frac{1}{4}</math>, <math>\frac{2}{4}</math>, <math>\frac{3}{4}</math> of a length/object/quantity. Write simple fractions eg <math>\frac{1}{2}</math> of 6 = 3</p>	<p>Pictures/Symbolic Four eggs fit in a box. How many boxes would you need to pack 20 eggs? </p>	<p>Pupils use a variety of language to describe division.</p>	<p>Visual / Concrete (modelled using Numicon and Numberline)  Skip counting: <math>19 \div 2 = 4</math> </p>	<p>Arrays Find <math>\frac{1}{4}</math> of 24 <math>24 \div 4 = 6</math> </p>	<p>Partitioning <math>32 \div 2 = 16</math> <math>20 \div 2 = 10</math> <math>12 \div 2 = 6</math></p>	<p>Recall &amp; use division facts for the 2, 5 and 10 multiplication tables, Recognise/find/name/write fractions <math>\frac{1}{3}</math>, <math>\frac{1}{4}</math>, <math>\frac{2}{4}</math>, <math>\frac{3}{4}</math> of a (length, shape), set of objects or quantity. Write simple fractions eg <math>\frac{1}{2}</math> of 6 = 3 and recognise equivalence of two quarters and one half.  Use commutativity/inverse relations to develop multiplicative reasoning (eg <math>4 \times 5 = 20</math> and <math>20 \div 5 = 4</math>).</p>	<p>Begin to use other multiplication tables/recall facts, including related division facts to perform written/mental calculations. Work with materials/context s where division relate to grouping/sharing quantities. They begin to relate these to fractions/measures (eg <math>40 \div 2 = 20</math>, 20 is a half of 40). They connect unit fractions to equal sharing and grouping, to numbers and to measures</p>

Y 3	<p>Write/calculate statements using the tables that they know (progressing to <b>formal</b> written methods).</p> <p><b>TU ÷ U</b> (divisor is 2/3/4/5/8/10)</p>	<p>Revise skip counting: <math>24 \div 4</math> or <math>24 \div 6 =</math></p>  <p>Progress to chunking on a numberline (start at 0)</p> <p><math>96 \div 4 = 24</math> <math>20 \times 4</math>      <math>4 \times 4</math></p> 	<p>Multiples of the divisor</p> <p><math>85 \div 5 = 17</math></p> <p><math>10 \times 5 = 50</math> <math>7 \times 5 = 35</math></p>	<p>Written (Chunking)</p> <p><math>51 \div 3 = 17</math></p> $\begin{array}{r} 51 \\ 30 \text{ (3 x 10)} \\ \hline 21 \\ 21 \text{ (3 x 7)} \\ \hline 0 \end{array}$	<p>Short Division (formal)</p> $\begin{array}{r} 17 \\ 3 \overline{) 51} \\ 30 \\ \hline 21 \\ 21 \\ \hline 0 \end{array}$	<p><i>Pupils develop reliable written methods for division, starting with calculations of TU by U numbers (progressing to formal written methods of short division).</i></p>	<p>Recall and use division facts for the 3, 4 and 8 multiplication tables.</p>	<p><i>Pupils develop efficient mental methods, using commutativity (eg <math>4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240</math>) and multiplication and division facts (eg using <math>3 \times 2 = 6</math>, <math>6 \div 3 = 2</math> &amp; <math>2 \times 3 = 6 \div 2 = 3</math>) to derive related facts (<math>30 \times 2 = 60</math>, <math>60 \div 3 = 20</math> &amp; <math>20 = 60 \div 3</math>).</i></p>
Y 4	<p><i>Pupils practise to become fluent in the formal written method of short division with exact answers [NS]</i></p> <p><b>TU ÷ U; HTU ÷ U</b></p>	<p>Chunking on a number line.</p> <p>Multiples of the divisor</p> <p><math>98 \div 7 = 14</math></p> <p><math>10 \times 7 = 70</math> <math>4 \times 7 = 28</math></p>	<p>Short Division (formal)</p> <p><math>98 \div 7 =</math></p> $\begin{array}{r} 14 \\ 7 \overline{) 98} \\ 70 \\ \hline 28 \\ 28 \\ \hline 0 \end{array}$	<p>Multiples of the divisor</p> <p><math>252 \div 7 = 36</math></p> <p><math>30 \times 7 = 210</math> <math>6 \times 7 = 42</math></p>	<p>Written (Chunking)</p> <p><math>252 \div 7 =</math></p> $\begin{array}{r} 252 \\ 210 \text{ (7 x 30)} \\ \hline 42 \\ 42 \text{ (7 x 6)} \\ \hline 0 \end{array}$	<p>Short Division (formal)</p> <p><math>252 \div 7 =</math></p> $\begin{array}{r} 36 \\ 7 \overline{) 252} \\ 210 \\ \hline 42 \\ 42 \\ \hline 0 \end{array}$	<p>Recall division facts to <math>12 \times 12</math>. Use place value, known/derived facts to ÷ mentally, including ÷ by 1. Find effect of dividing U/TU by 10/100, identifying the value of the digits in the answer as units/tenths/hundredths.</p>	<p><i>Practise mental methods and extend this to HTU numbers to derive facts, for example <math>200 \times 3 = 600</math> into <math>600 \div 3 = 200</math>. Relates decimal notation to division of whole number by 10 and later 100.</i></p>

<p>Y 5</p>	<p>Use the <b>formal</b> written method of <b>short division</b> (interpret remainders appropriately for the context). <b>HTU ÷ U</b> <b>ThHTU ÷ U</b></p> <p>Convert between units of measure (eg km/m; m/cm; cm/mm; kg/g; litre and ml)</p>	<p>Written (Chunking)</p> $346 \div 8 = 43 \text{ r}2 \text{ (estimate } >40, <50)$ $\begin{array}{r} 346 \div 8 \\ \text{(estimate: } 400 \div 8 = 50) \\ 8 \overline{)346} \\ \underline{-320} \quad (8 \times 40) \\ 26 \\ \underline{-24} \quad (8 \times 3) \\ 2 \end{array}$ <p>Use <b>Bar Method</b> to solve division, fraction and ratio problems:</p> <p>sharing a quantity in a given ratio when you are told one side of the ratio, not the whole amount</p> <p>tom and mary share some money in the ratio 3 : 2. tom gets £12. how much does mary get?</p>  <p>draw bar model showing ratio 3:2 and tom getting £12 find 1 part is £4 mary gets £8</p>	$291 \div 3 = 97$ <p>(estimate: <math>270 \div 3 = 90</math>)</p> $\begin{array}{r} 90 + 7 \\ 3 \overline{)290 + 1} = 3 \overline{)270 + 21} \\ \underline{270} \\ 20 \\ \underline{18} \\ 21 \\ \underline{21} \\ 0 \end{array}$ <p>This is then shortened to:</p> $\begin{array}{r} 97 \\ 3 \overline{)291} \\ \underline{27} \\ 21 \\ \underline{21} \\ 0 \end{array}$	<p>Short Division (formal)</p> $432 \div 5 = 86 \text{ r}2$ $\begin{array}{r} 86 \text{ r}2 \\ 5 \overline{)432} \\ \underline{40} \\ 32 \\ \underline{30} \\ 2 \end{array}$ <p>(estimate: <math>400 \div 5 = 80</math>)</p>	<p>Short Division (formal)</p> $8520 \div 6 = 1420$ $\begin{array}{r} 1420 \\ 6 \overline{)8520} \\ \underline{12} \\ 21 \\ \underline{18} \\ 32 \\ \underline{30} \\ 20 \\ \underline{18} \\ 20 \\ \underline{18} \\ 20 \\ \underline{18} \\ 20 \end{array}$	<p><i>Pupils connect x by a fraction to using fractions as operators (fractions of), and to ÷. This relates to scaling by simple fractions, incl. those &gt; 1. Find fractions of numbers and quantities, writing remainders as a fraction.</i></p>	<p>Identify multiples/factors, including finding all factor pairs of a number, &amp; common factors of two numbers. Know/use vocabulary of prime numbers, prime factors and composite (non-prime) nos. Establish if a number up to 100 is prime; recall prime numbers to 19. ÷ nos mentally using known facts. Divide whole numbers and those involving decimals by 10/100/1000.</p>	<p>Pupils ... apply all the ÷ facts frequently, commit them to memory and use them to make larger calculations. They understand the terms factor, multiple/prime, square/cube numbers &amp; use to construct equivalent statements [eg <math>120 \div 15 = (30 \times 4) \div 15 = 2 \times 4 = 8</math>]</p>
<p>Y 6</p>	<p>Divide numbers (up to 4 digits) by TU whole number using the <b>formal</b> method of <b>short/long division</b> (interpret as approp. for the context). Use written division methods in cases where the ans has up to 2dp.</p> <p>[Divide numbers up to 2dp by U/TU whole numbers.]</p>	$43.4 \div 7 = 6.2$ <p>(estimate <math>42 \div 7 = 6</math>)</p> $6 \times 7 = 42$ $0.2 \times 7 = 1.4$ $25.6 \div 7 = 3.2$ <p>(estimate <math>&gt;3, &lt;4</math>)</p> <p>Use <b>Bar Method</b> to solve division and ratio problems:</p>	<p>Short Division (formal)</p> $43.68 \div 7 = 6.24$ <p>(estimate: <math>42 \div 7 = 6</math>)</p> <p>[Or compute <math>4368 \div 7</math>, then divide the solution by 100.]</p> $\begin{array}{r} 6.24 \\ 7 \overline{)43.68} \\ \underline{28} \\ 13 \\ \underline{14} \\ 28 \\ \underline{21} \\ 68 \\ \underline{63} \\ 58 \\ \underline{56} \\ 8 \end{array}$	<p>Short Division (by TU)</p> $496 \div 11$ <p>(estimate <math>500 \div 10 = 50</math>)</p> $\begin{array}{r} 45 \text{ r}1 \\ 11 \overline{)496} \\ \underline{44} \\ 56 \\ \underline{55} \\ 1 \end{array}$ <p>Answer: <math>45 \frac{1}{11}</math></p>	<p>Long division (NC 2014) <math>432 \div 15 =</math></p> $\begin{array}{r} 28 \\ 15 \overline{)432} \\ \underline{30} \\ 132 \\ \underline{120} \\ 120 \\ \underline{120} \\ 0 \end{array}$ <p><math>\frac{12}{15} = \frac{4}{5}</math></p> <p>Answer: <math>28 \frac{4}{5}</math></p> <p>Long division involving decimals (NC 2014) <math>432 \div 15 = 28.8</math></p> $\begin{array}{r} 28.8 \\ 15 \overline{)432.0} \\ \underline{30} \\ 132 \\ \underline{120} \\ 120 \\ \underline{120} \\ 0 \end{array}$	<p>Perform mental calculations, including with mixed operations/large numbers. Identify common factors/multiples and prime numbers. Use knowledge of order of operations to carry out calculations. Use estimation to check answers to calculations and determine an appropriate degree of accuracy. Identify value of each digit to 3dp and ÷ nos by 10/100/1000 (ans to 3dp)</p>	<p>Undertake mental calcs with increasingly large numbers and more complex calculations. Continue to use all table facts to calculate statements in order to maintain their fluency. Explore the order of operations using brackets. Common factors can be related to finding equivalent fractions.</p>	