



# Urchfont CE Primary School



## Maths Calculation Policy



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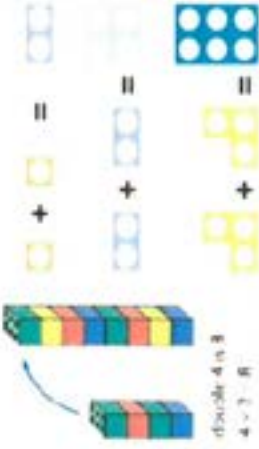



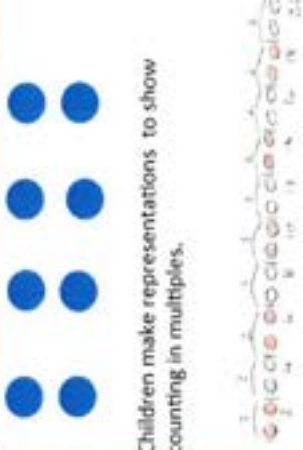




This policy is a working document and will be revised and amended as necessary.

To be reviewed: *September 2022*

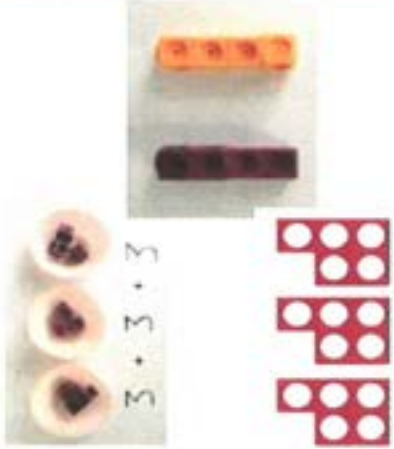
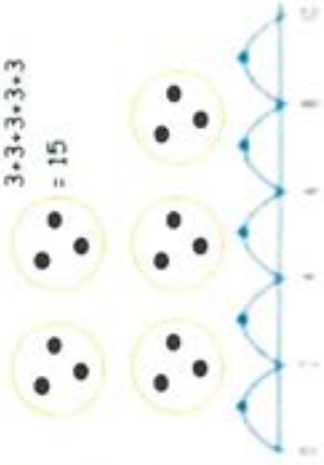



# Y1

# MULTIPLICATION X

Objective & Strategy	Concrete	Pictorial	Abstract
<p>Doubling</p>	<p>Use practical activities using manipulatives including cubes and Numicon to demonstrate doubling</p> 	<p>Draw pictures to show how to double numbers</p> <p>Double 4 is 8</p> 	<p>Partition a number and then double each part before recombining it back together.</p> 
<p>Counting in multiples</p>	<p>Count the groups as children are skip counting, children may use their fingers as they are skip counting.</p> 	<p>Children make representations to show counting in multiples.</p> 	<p>Count in multiples of a number aloud. Write sequences with multiples of numbers.</p> <p>2, 4, 6, 8, 10</p> <p>5, 10, 15, 20, 25, 30</p>
<p>Making equal groups and counting the total</p>	<p>Use manipulatives to create equal groups.</p> 	<p>Draw  to show <math>2 \times 3 = 6</math></p> <p>Draw and make representations</p>	<p><math>2 \times 4 = 8</math></p>

# Y1

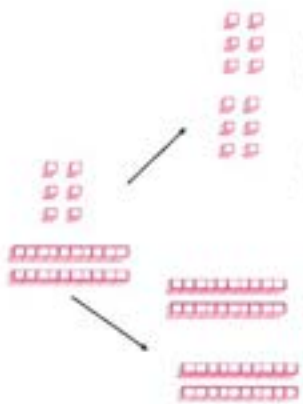
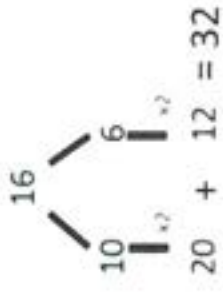
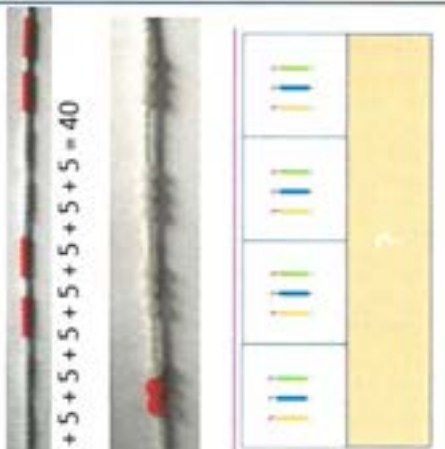

# MULTIPLICATION X

Objective & Strategy	Concrete	Pictorial	Abstract
<p>Repeated addition</p>	<p>Use different objects to add equal groups</p> 	<p>Use pictorial including number lines to solve prob</p> <p>There are 3 sweets in one bag. How many sweets are in 5 bags altogether?</p> 	<p>Write addition sentences to describe objects and pictures.</p> 
<p>Understanding arrays</p>	<p>Use objects laid out in arrays to find the answers to 2 lots 5, 3 lots of 2 etc.</p> 	<p>Draw representations of arrays to show understanding</p> 	$3 \times 2 = 6$ $2 \times 5 = 10$



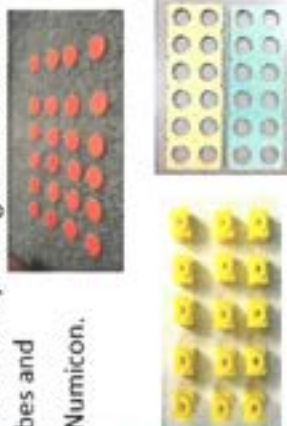

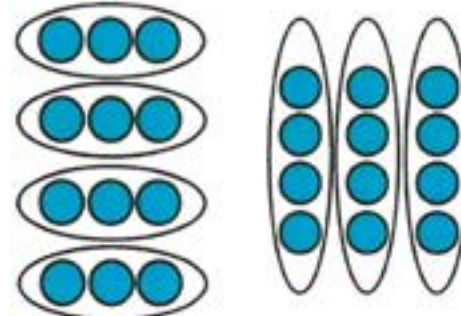


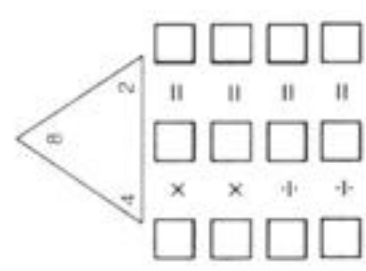
# Y2

# MULTIPLICATION X

Objective & Strategy	Concrete	Pictorial	Abstract
<p>Doubling</p>	<p>Model doubling using dienes and PV counters.</p>  <p><math>40 + 12 = 52</math></p>	<p>Draw pictures and representations to show how to double numbers</p>	<p>Partition a number and then double each part before recombining it back together.</p>  <p><math>20 + 12 = 32</math></p>
<p>Counting in multiples of 2, 3, 4, 5, 10 from 0 (repeated addition)</p>	<p>Count the groups as children are skip counting, children may use their fingers as they are skip counting. Use bar models.</p>  <p><math>5 + 5 + 5 + 5 + 5 + 5 = 40</math></p> <p><math>3 + 3 + 3 + 3 + 3 = 30</math></p>	<p>Number lines, counting sticks and bar models should be used to show representation of counting in multiples.</p>  <p>Write sequences with multiples of numbers.</p> <p>0, 2, 4, 6, 8, 10</p> <p>0, 3, 6, 9, 12, 15</p> <p>0, 5, 10, 15, 20, 25, 30</p> <p><math>4 \times 3 = \square</math></p>	<p>Count in multiples of a number aloud.</p> <p>Write sequences with multiples of numbers.</p> <p>0, 2, 4, 6, 8, 10</p> <p>0, 3, 6, 9, 12, 15</p> <p>0, 5, 10, 15, 20, 25, 30</p> <p><math>4 \times 3 = \square</math></p>

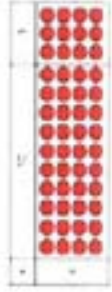
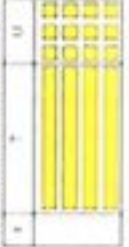
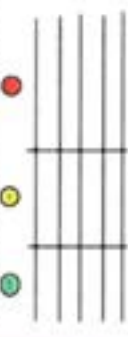
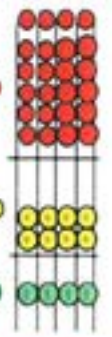
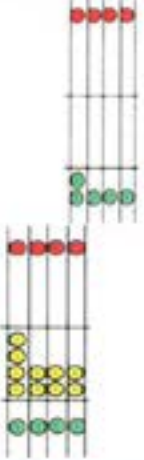
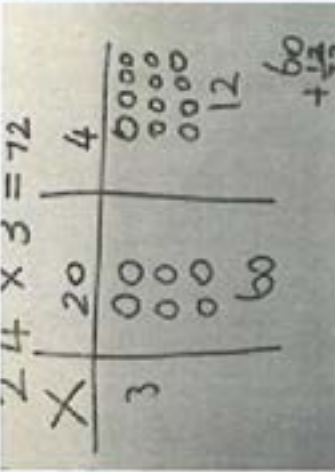

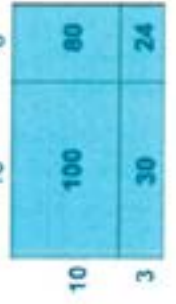
# Y2

# MULTIPLICATION X

Objective & Strategy	Concrete	Pictorial	Abstract
<p>Multiplication is commutative</p>	<p>Create arrays using counters and cubes and Numicon.</p>  <p>Pupils should understand that an array can represent different equations and that, as multiplication is commutative, the order of the multiplication does not affect the answer.</p> 	<p>Use representations of arrays to show different calculations and explore commutativity.</p> 	<p> <math>12 = 3 \times 4</math>  <math>12 = 4 \times 3</math> </p> <p>Use an array to write multiplication sentences and reinforce repeated addition</p>  <p> <math>5 + 5 + 5 = 15</math>  <math>3 + 3 + 3 + 3 + 3 = 15</math>  <math>5 \times 3 = 15</math>  <math>3 \times 5 = 15</math> </p>
<p>Using the Inverse</p> <p><i>This should be taught alongside division, so pupils learn how they work alongside each other.</i></p>			<p> <math>2 \times 4 = 8</math>  <math>4 \times 2 = 8</math>  <math>8 \div 2 = 4</math>  <math>8 \div 4 = 2</math>  <math>8 = 2 \times 4</math>  <math>8 = 4 \times 2</math>  <math>2 = 8 \div 4</math>  <math>4 = 8 \div 2</math> </p> <p>Show all 8 related fact family sentences.</p>

# Y3

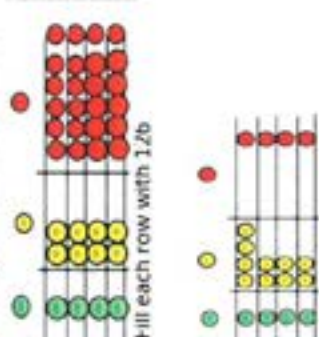
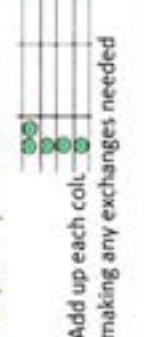
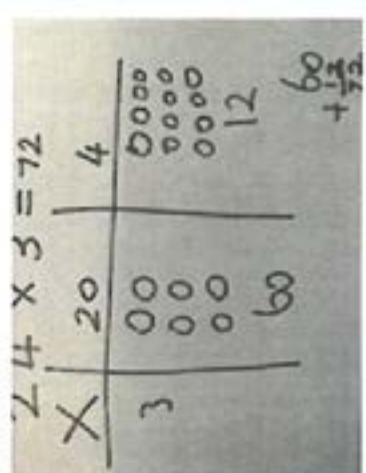

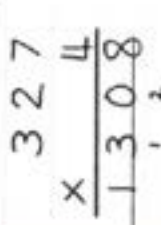
# MULTIPLICATION X

Objective & Strategy	Concrete	Pictorial	Abstract						
<p><b>Grid method</b></p> <p>Show the links with arrays to first introduce the grid method.</p>  <p>4 rows of 10 4 rows of 10 4 rows of 10</p> <p>Move onto base ten to move towards a more compact method.</p>  <p>4 rows of 10</p> <p>Move on to place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows</p>  <p>4 x 126</p> <p>Fill each row with 126</p>  <p>4 x 126</p> <p>Add up each column, starting with the ones making any exchanges needed</p>  <p>Then you have your answer.</p>	<p>Children can represent their work with place value counters in a way that they understand.</p> <p>They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking as shown below.</p>  <p>24 x 3 = 72</p> <p>Bar model are used to explore missing numbers</p> <p>4 x <input type="text"/> = 20</p> 	<p>Start with multiplying by one digit numbers and showing the clear addition alongside the grid.</p> <table border="1" data-bbox="454 190 550 504"> <tr> <td>X</td> <td>30</td> <td>5</td> </tr> <tr> <td>7</td> <td>210</td> <td>35</td> </tr> </table> <p><math>210 + 35 = 245</math></p> <p>Moving forward, multiply by a 2 digit number showing the different rows within the grid method.</p> 	X	30	5	7	210	35	<p><b>Abstract</b></p>
X	30	5							
7	210	35							



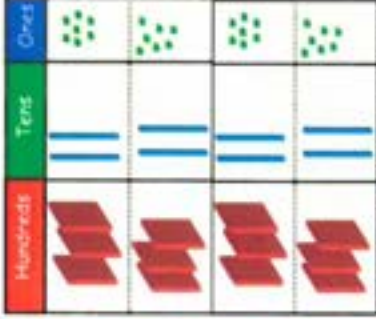




# Y4

# MULTIPLICATION X

Objective & Strategy	Concrete	Pictorial	Abstract															
<p>Grid method recap from year 3 for 2 digits x 1 digit</p> <p>Move to multiplying 3 digit numbers by 1 digit. (year 4 expectation)</p>	<p>Use place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows</p>  <p>Fill each row with 126</p>  <p>Add up each col. making any exchanges needed</p>	<p>Children can represent their work with place value counters in a way that they understand. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking as shown below.</p> 	<p>Start with multiplying by one digit numbers and showing the clear addition alongside the grid.</p> <table border="1" data-bbox="462 179 558 492"> <tr> <td>X</td> <td>30</td> <td>5</td> </tr> <tr> <td>7</td> <td>210</td> <td>35</td> </tr> </table> <p><math>210 + 35 = 245</math></p>	X	30	5	7	210	35									
X	30	5																
7	210	35																
<p>Column multiplication</p>	<p>Children can continue to be supported by place value counters at the stage of multiplication. This initially done where there is no regrouping. <math>327 \times 4 = 1308</math></p> <table border="1" data-bbox="1053 1254 1436 1568"> <thead> <tr> <th>Hundreds</th> <th>Tens</th> <th>Ones</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>2</td> <td>7</td> </tr> <tr> <td>3</td> <td>2</td> <td>7</td> </tr> <tr> <td>3</td> <td>2</td> <td>7</td> </tr> <tr> <td>3</td> <td>2</td> <td>7</td> </tr> </tbody> </table> <p>It is important at this stage that they always multiply the ones first.</p> <p>The corresponding long multiplication is modelled alongside</p>	Hundreds	Tens	Ones	3	2	7	3	2	7	3	2	7	3	2	7	<p>This can lead to the compact method for those pupils who are ready.</p>  <p>The grid method may be used to show how this relates to a formal written method.</p> <p>Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.</p>	<p>This can lead to the compact method for those pupils who are ready.</p> 
Hundreds	Tens	Ones																
3	2	7																
3	2	7																
3	2	7																
3	2	7																

# Y5-6

# MULTIPLICATION X

Objective & Strategy	Concrete	Pictorial	Abstract
<p>Column Multiplication for 3 and 4 digits x 1 digit.</p>	<p>It is important at this stage that they always multiply the ones first.</p>  <p>Children can continue to be supported by place value counters at the stage of multiplication. This initially done where there is no regrouping. <math>327 \times 4 = 1308</math></p>	 <p>This will lead to the compact method.</p> $\begin{array}{r} 327 \\ \times 4 \\ \hline 1308 \end{array}$	 <p>18 x 3 on the first row (8 x 3 = 24, carrying the 2 for 20, then 1 x 3) 18 x 10 on the 2nd row. Show multiplying by 10 by putting zero in units first</p> $\begin{array}{r} 1234 \\ \times 16 \\ \hline 7404 \\ 12340 \\ \hline 19744 \end{array}$ <p>(<math>234 \times 6</math>) (<math>1234 \times 10</math>)</p>
<p>Column multiplication</p>	<p>Manipulatives may still be used with the corresponding long multiplication modelled alongside.</p>	 <p>Continue to use bar modelling to support problem solving</p>	 <p>18 x 3 on the first row (8 x 3 = 24, carrying the 2 for 20, then 1 x 3) 18 x 10 on the 2nd row. Show multiplying by 10 by putting zero in units first</p> $\begin{array}{r} 108 \\ \times 3 \\ \hline 324 \\ 000 \\ 1000 \\ \hline 3240 \end{array}$



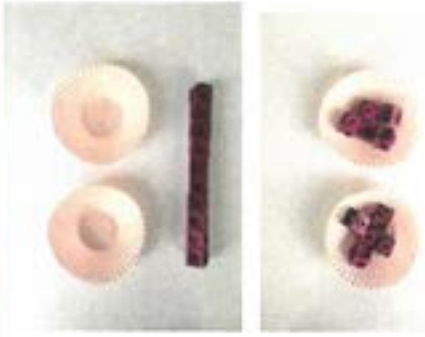
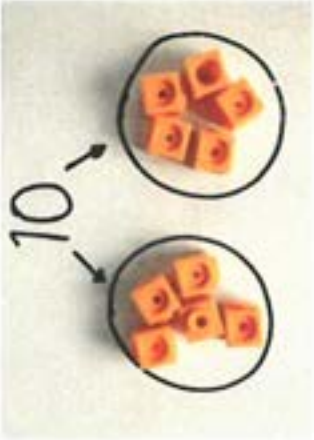

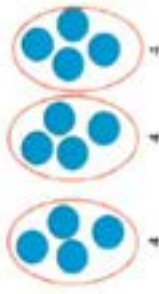
# Y6

# MULTIPLICATION X

Objective & Strategy	Concrete	Pictorial	Abstract
Multiplying decimals up to 2 decimal places by a single digit.			Remind children that the single digit belongs in the units column. Line up the decimal points in the question and the answer. $\begin{array}{r} 3.19 \\ \times 8 \\ \hline 25.52 \end{array}$

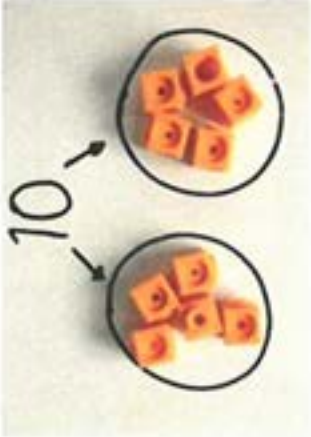


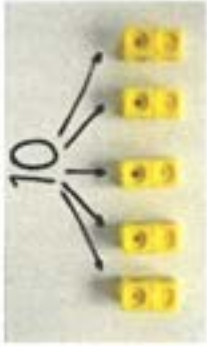



# Y1

# DIVISION ÷

Objective & Strategy	Concrete	Pictorial	Abstract
<p>Division as sharing</p> <p>Use Gordon ITPs for modelling</p>	  <p>I have 10 cubes, can you share them equally in 2 groups?</p>	<p>Children use pictures or shapes to share quantities.</p>  <p>8 Shared between 4 is 2</p>  <p>Sharing: 12 shared between 4 is 3</p>	<p>12 shared between 3 is 4</p> <p>4</p>

# Y2





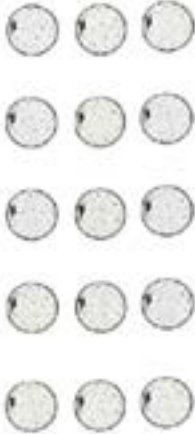
# DIVISION ÷

Objective & Strategy	Concrete	Pictorial	Abstract
Division as sharing  I have 10 cubes, can you share them equally in 2 groups?	 <p>10</p>	Children use pictures or shapes to share quantities.  $8 \div 2 = 4$ <p>Children use bar modelling to show and support understanding.</p>  $12 \div 4 = 3$	$12 \div 3 = 4$
Division as grouping  Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.	 <p>10</p> 	Use number lines for grouping   <p>Think of the number as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.</p> $12 \div 3 = 4$ <p>20</p> $20 \div 5 = 4$ $5 \times 4 = 20$	$28 \div 7 = 4$ <p>Divide 28 into 7 groups. How many are in each group?</p>



# Y3

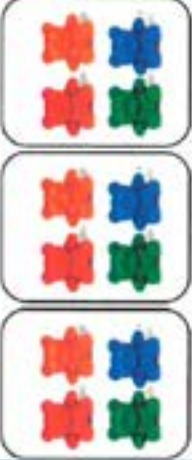


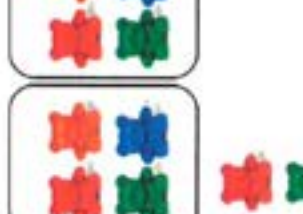
# DIVISION ÷

Objective & Strategy	Concrete	Pictorial	Abstract
Division as grouping	Use cubes, counters, objects or place value counters to aid understanding.  24 divided into groups of 6 = 4 $96 \div 3 = 32$ 	Continue to use bar modelling to aid solving division problems.  $20 \div 5 = ?$ $5 \times ? = 20$	How many groups of 6 in 24? $24 \div 6 = 4$
Division with arrays	Link division to multiplication by creating an array and thinking about the number sentences that can be created.  Eg $15 \div 3 = 5$ $5 \times 3 = 15$ $15 \div 5 = 3$ $3 \times 5 = 15$	Draw an array and use lines to split the array into groups to make multiplication and division sentences. 	Find the inverse of multiplication and division sentences by creating eight linking number sentences. $7 \times 4 = 28$ $4 \times 7 = 28$ $28 \div 7 = 4$ $28 \div 4 = 7$ $28 = 7 \times 4$ $28 = 4 \times 7$ $4 = 28 \div 7$ $7 = 28 \div 4$

# Y3

# DIVISION



Objective & Strategy	Concrete	Pictorial	Abstract
<p>Division with remainders.</p>	<p><math>14 \div 3 =</math></p> <p>Divide objects between groups and see how much is left over</p> 	<p>Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.</p>  <p>Draw dots and group them to divide an amount and clearly show a remainder.</p>  <p>Use bar models to show division with remainders.</p> 	<p>Complete written divisions and show the remainder using <math>r</math>.</p> $29 \div 8 = 3 \text{ REMAINDER } 5$ <p>↑    ↑    ↑    ↑</p> <p>dividend    divisor    quotient    remainder</p> <p><i>Example without remainder</i>  <math>40 \div 5</math>          Ask 'How many 5s in 40?'  <math>5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = 8 \text{ fives}</math></p> <p><i>Example with remainder</i>  <math>38 \div 6</math></p> <p>For larger numbers, when it becomes inefficient to count in single multiples bigger jumps can be recorded using known facts</p>

# Y4-6

# DIVISION ÷

Objective & Strategy	Concrete	Pictorial	Abstract				
<p>Divide at least 3 digit numbers by 1 digit.</p> <p>Short Division</p>	<p><math>96 \div 3</math></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Tens</td> <td style="text-align: center;">Units</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">2</td> </tr> </table> <p>Use place value counters to divide using the bus stop method alongside</p> <p><math>42 \div 3</math></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>	Tens	Units	3	2	<p>Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.</p> <p>Encourage them to move towards counting in multiples to divide more efficiently.</p>	<p>Begin with divisions that divide equally with no remainder.</p> $\begin{array}{r} 218 \\ 3 \overline{) 654} \end{array}$ <p>Move onto divisions with a remainder.</p> $\begin{array}{r} 86r2 \\ 3 \overline{) 258} \end{array}$ <p>Then turn the remainder into a fraction ie <math>\frac{2}{5}</math></p> <p>Finally move into decimal places to divide the total accurately.</p> $\begin{array}{r} 14.6 \\ 16 \overline{) 253.6} \end{array}$ $\begin{array}{r} 0.663r5 \\ 8 \overline{) 533.0} \end{array}$ <p>Replace the remainder with a decimal point and continue to divide up to 2 dp.</p>
Tens	Units						
3	2						



# Y6

## Long Division

# DIVISION $\div$

# DMSB

Divide

Multiply

Subtract

Bring Down

# Y6

# DIVISION ÷

## Long Division

Here the method is shown with simple numbers

<b>1. Divide.</b> $\begin{array}{r} 10 \\ 2 \\ 2 \overline{)58} \\ \underline{4} \\ 18 \end{array}$ <p>Two goes into 5 two times, or 5 tens - 2 = 2 whole tens -- but there is a remainder!</p>	<b>2. Multiply &amp; subtract.</b> $\begin{array}{r} 10 \\ 2 \\ 2 \overline{)58} \\ \underline{-4} \\ 18 \end{array}$ <p>To find it, multiply <math>2 \times 2 = 4</math>, write that 4 under the five, and subtract to find the remainder of 1 ten.</p>	<b>3. Drop down the next digit.</b> $\begin{array}{r} 10 \\ 29 \\ 2 \overline{)58} \\ \underline{-4} \\ 18 \end{array}$ <p>Next, drop down the 8 of the ones next to the leftover 1 ten. You combine the remainder ten with 8 ones, and get 18.</p>
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<b>1. Divide.</b> $\begin{array}{r} 10 \\ 29 \\ 2 \overline{)58} \\ \underline{-4} \\ 18 \end{array}$ <p>Divide 2 into 18. Place 9 into the quotient</p>	<b>2. Multiply &amp; subtract.</b> $\begin{array}{r} 10 \\ 29 \\ 2 \overline{)58} \\ \underline{-4} \\ 18 \\ \underline{-18} \\ 0 \end{array}$ <p>Multiply <math>9 \times 2 = 18</math>, write that 18 under the 18, and subtract.</p>	<b>3. Drop down the next digit.</b> $\begin{array}{r} 10 \\ 29 \\ 2 \overline{)58} \\ \underline{-4} \\ 18 \\ \underline{-18} \\ 0 \end{array}$ <p>The division is over since there are no more digits in the dividend. The quotient is 29.</p>
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# Y6

# DIVISION ÷

## Long Division

Next step is to divide a number by TU

1. Divide.	2. Multiply & subtract.	3. Drop down the next digit.
$\begin{array}{r} 16 \overline{) 2224} \\ \underline{16} \phantom{00} \\ 62 \phantom{0} \end{array}$ <p>16 does not go into 2 so make the thousands, hundreds</p>	$\begin{array}{r} 1 \phantom{00} \\ 16 \overline{) 2224} \\ \underline{-16} \phantom{00} \\ 62 \phantom{0} \end{array}$ <p>Multiply 16 x 1 = 16, write the 16 under the 22, and subtract and write the answer</p>	$\begin{array}{r} 1 \phantom{00} \\ 16 \overline{) 2224} \\ \underline{-16} \phantom{00} \\ 62 \phantom{0} \end{array}$ <p>Next, drop down the next digit which is 2</p>
<p><b>Divide.</b></p> $\begin{array}{r} 1 \phantom{00} \\ 16 \overline{) 2224} \\ \underline{-16} \phantom{00} \\ 62 \phantom{0} \end{array}$ <p>Divide 62 by 16</p>	<p><b>Multiply &amp; subtract.</b></p> $\begin{array}{r} 13 \phantom{00} \\ 16 \overline{) 2224} \\ \underline{-16} \phantom{00} \\ 62 \phantom{0} \\ \underline{-48} \phantom{0} \\ 14 \phantom{0} \end{array}$ <p>Multiply 16 by 3, write 48 under the 64 and subtract to find a remainder of 14</p>	<p><b>Drop down the next digit.</b></p> $\begin{array}{r} 13 \phantom{00} \\ 16 \overline{) 2224} \\ \underline{-16} \phantom{00} \\ 62 \phantom{0} \\ \underline{-48} \phantom{0} \\ 144 \phantom{0} \end{array}$ <p>Next, drop down the 4 of the ones next to the 1 hundred and 4 tens</p>
<p><b>1. Divide.</b></p> $\begin{array}{r} 139 \phantom{00} \\ 16 \overline{) 2224} \\ \underline{-16} \phantom{00} \\ 62 \phantom{0} \\ \underline{-48} \phantom{0} \\ 144 \phantom{0} \\ \underline{-144} \phantom{0} \\ 0 \phantom{0} \end{array}$ <p>Divide 16 into 144.</p>	<p><b>2. Multiply &amp; subtract.</b></p> <p>Multiply 16 by 9, write 144 under the 144 and subtract to find the remainder of zero</p>	<p><b>3. Drop down the next digit.</b></p> <p>There are no more digits to drop down.</p> <p>Note if you had a remainder, add a decimal point and continue to divide in this way up to 2 decimal places</p>