



Doxey Primary School

Calculation policy for multiplication and division



This calculation policy has been written alongside the long term plan for Maths in school, which is taken from the White Rose Maths Schemes of Learning.

This policy is written to enable children to become fluent mathematicians; being able to work flexibly, accurately and efficiently. It is expected that children move forwards/backwards between concrete, pictorial and abstract; often using different representations alongside each other in order to embed their conceptual understanding.

More details around the teaching and learning of each operation have been downloaded from the NCETM website. These documents are the NCETM Spines; 1 - addition and subtraction, 2 - multiplication and division and 3 - fractions, which can be found on Sharepoint.

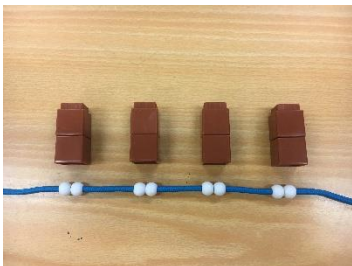
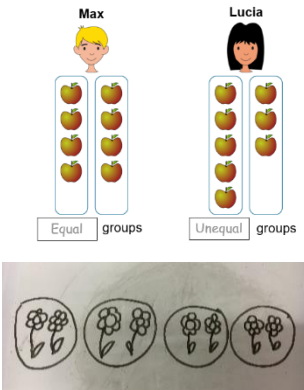
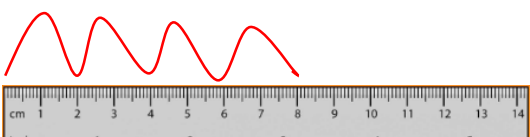
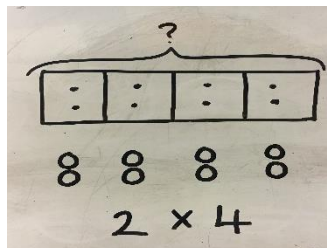
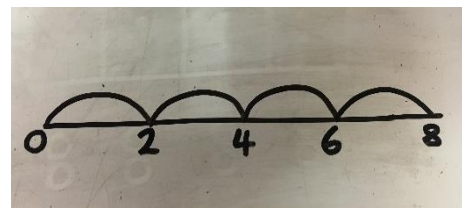
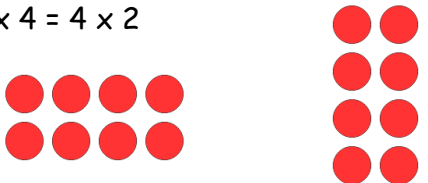

Calculation Policy- for multiplication and division

Times Tables objectives; **Y2:** 2,5 and 10 **Y3:** 3,4 and 8 **Y4:** 6,7,9,11 and 12 2 forms of division- grouping and sharing


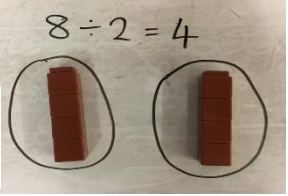
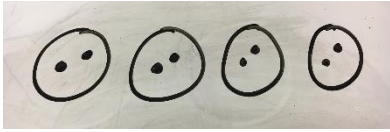
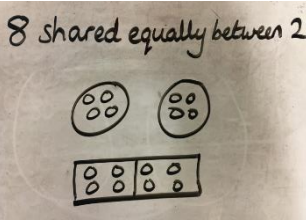
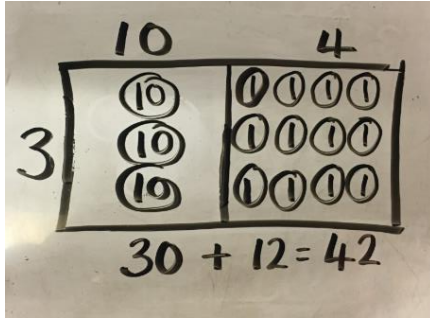
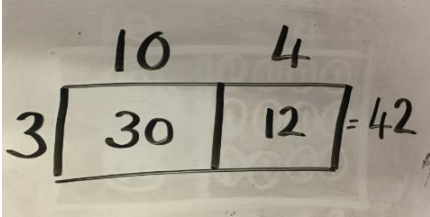
Year guidance for multiplication	<p>EYFS/Year 1</p> <p>Recognising and making equal groups</p> <p>Doubling numbers to 10 (<i>1 to 10 inclusive</i>)</p> <p>Counting in multiples using cubes and other objects in the classroom</p>	<p>Year 2</p> <p>Redistributing to make equal groups</p> <p>Arrays - showing commutative multiplication</p> <p>Doubling (known facts to 100 - <i>Multiples of 5</i>)</p>	<p>Year 3</p> <p>Arrays</p> <p>2 digit x 1 digit - Grid method using place value counters or base 10</p> <p>Doubling within 1,000</p>	<p>Year 4</p> <p>Column multiplication - introduced with place value counters</p> <p>(2 and 3 digit multiplied by 1 digit)</p> <p>Doubling numbers beyond 1,000</p>	<p>Year 5</p> <p>Column multiplication</p> <p>Mainly abstract but might need a repeat of year 4 first (up to 4 digit numbers multiplied by 1 or 2 digit numbers)</p>	<p>Year 6</p> <p>Column multiplication</p> <p>Abstract methods (multi digit up to 4 digit numbers multiplied by a 2 digit numbers)</p>
Year guidance for division	<p>Sharing objects into groups.</p> <p>Division as grouping e.g. I have 12 sweets and put them in groups of 3, how many groups?</p> <p>Halving even numbers up to 20</p>	<p>Division as grouping</p> <p>Division as sharing</p> <p>Division within arrays - linking to multiplication</p>	<p>Division with remainder - using times tables facts</p> <p>2 digit divided by 1 digit using place value counters or base 10</p>	<p>Division with remainder</p> <p>Short division (up to 3 digits by 1 digits - concrete and pictorial)</p>	<p>Short division (up to 4 digits by 1 digit number - including remainders)</p>	<p>Short division</p> <p>Long division with place value counters (up to 4 digits by a 2 digit remainder)</p> <p>Children should exchange into the tenths and hundredths column too.</p>

Calculation Policy- for multiplication and division

Times Tables objectives; **Y2:** 2,5 and 10 **Y3:** 3,4 and 8 **Y4:** 6,7,9,11 and 12 2 forms of division- grouping and sharing

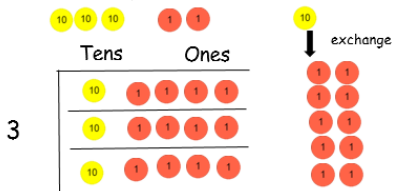
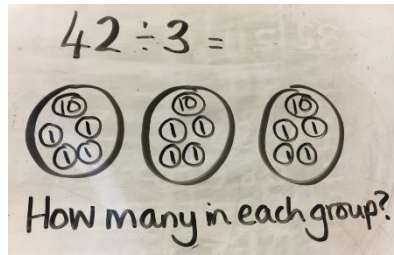
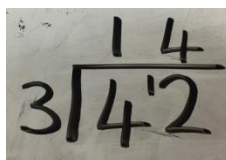
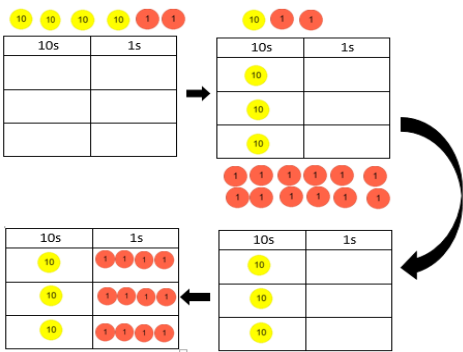
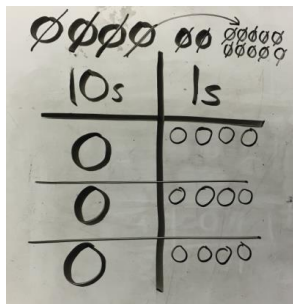
Objective and strategy	Concrete	Pictorial	Abstract
Multiplication Making equal groups Ensure children can identify unequal groups and redistribute to make them equal.	 Use manipulatives to create equal groups	 Draw and make representations to show equal groupings	$2 + 2 + 2 + 2$
Multiplication Repeated grouping/ repeated addition	2×4 	Represent this pictorially alongside a bar model 	Abstract number line showing 4 jumps of 2 2×4 
Multiplication Use arrays to illustrate commutativity	- multi link and other objects can also be used $2 \times 4 = 4 \times 2$  2 lots of 4 4 lots of 2	Children to represent the arrays pictorially  2 lots of 4 4 lots of 2	Children to be able to use an array to write a range of calculations $8 = 2 \times 4$ $8 = 4 \times 2$ $2 \times 4 = 8$ $4 \times 2 = 8$

Times Tables objectives; **y2:** 2,5 and 10 **y3:** 3,4 and 8 **y4:** 6,7,9,11 and 12 2 forms of division- grouping and sharing

<p>Division</p> <p>Dividing as grouping</p> <p>Dividing as sharing</p>	<p>Grouping using a range of objects</p> <p>$8 \div 2$</p> <p>8 grouped into 2s There are 4 groups of 2 in 8</p>  <p>$8 \div 2 = 4$</p>  <p>$8 \div 2$ 8 shared between 2</p>	<p>Represent the grouping pictorially</p>  <p>Children should also be encouraged to use their 2 times tables facts</p> 	<p>$8 \div 2 = 4$</p>												
<p>Multiplication</p> <p>Grid method</p>	<p>Show the links with arrays to first introduce the grid method $3 \times 14 =$</p> <table border="1" data-bbox="427 794 866 936"> <tr> <td>x</td><td>10</td><td>4</td></tr> <tr> <td>3</td><td></td><td></td></tr> </table> <p>3 rows of 10 and 3 rows of 4 Move onto base ten to move towards a more compact method.</p> <table border="1" data-bbox="387 1077 694 1254"> <tr> <td>x</td><td>tens</td><td>ones</td></tr> <tr> <td>3</td><td></td><td></td></tr> </table> <p>$3 \times 14 =$ 3 rows of 14</p> <p>Encouraging children to count in multiples to multiply more efficiently.</p>	x	10	4	3			x	tens	ones	3			<p>$3 \times 14 =$ Partition the 2 digit number into tens and ones. $3 \times 10 = 30$ $3 \times 4 = 12$ $30 + 12 = 42$</p> 	<p>$3 \times 14 =$</p> 
x	10	4													
3															
x	tens	ones													
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<p>Division</p> <p>Grouping leading to short division no remainders</p>	<p>$42 \div 3 = 14$</p>  <p>We are grouping in 3s so we need 3 rows Use place value counters alongside short division method</p>	<p>Children to represent the place value counters pictorially.</p>  <p>Encourage children to count in multiples to divide more efficiently</p>	<p>1 ten in each group with 1 ten remaining.</p> <p>Exchange that 10 for ten ones so the 2 ones now become 12 ones.</p> <p>4 ones in each group.</p> <p>In total there is 1 ten and 4 ones in each group.</p> 
<p>Division</p> <p>Sharing leading to short division no remainders</p>	<p>Using place value counters $42 \div 3 = 14$</p> 	<p>Children to represent the place value counters pictorially</p> 	<p>Children to be able to make sense of the place value counters and write calculations to show the process</p> <p>$42 \div 3$ $42 = 30 + 12$ $30 \div 3 = 10$ $12 \div 3 = 4$ $10 + 4 = 14$</p> <p>Start to include remainders</p>

Calculation Policy- for multiplication and division

Times Tables objectives; Y2: 2,5 and 10 **Y3:** 3,4 and 8 **Y4:** 6,7,9,11 and 12 2 forms of division- grouping and sharing

Multiply two and three digit numbers by 1 digit

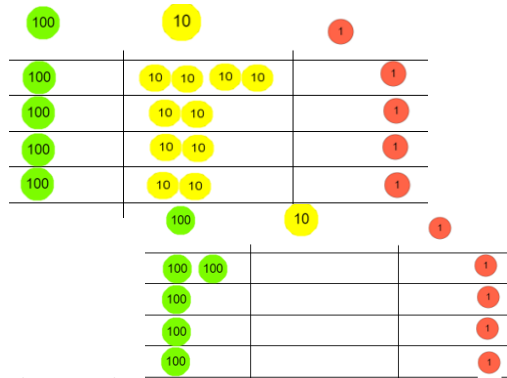
Moving into column multiplication compact method

$$126 \times 4 =$$

We are multiplying by 4 so we need 4 rows
Fill each row with 126

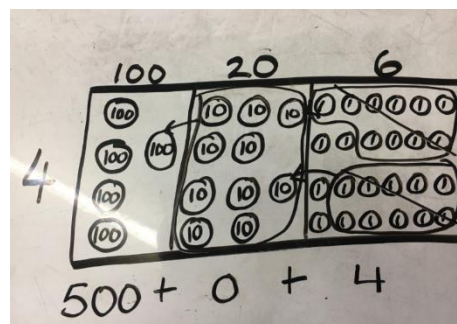
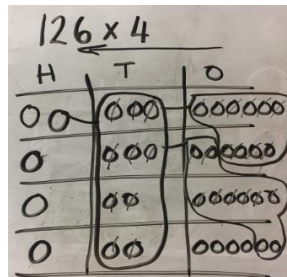


Add up each column starting with the ones making any exchanges needed

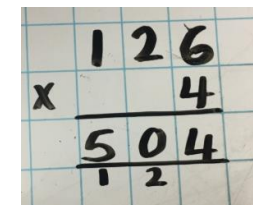


Then you have your answer
 $126 \times 4 = 504$

Children to represent the place value counters pictorially



When children have understood the concept they should be able to use compact method. Initially this will need to be alongside concrete or pictorial.



Divide two and three digit numbers by 1 digit.

Moving into short division with remainders

Use mental strategies alongside jottings

$$615 \div 5 =$$

$$15 \div 5 = 3$$

$$500 \div 5 = 100$$

$$100 \div 5 = 20$$

$$100 + 20 + 3 = 123$$

Begin with divisions that divide equally with no remainders

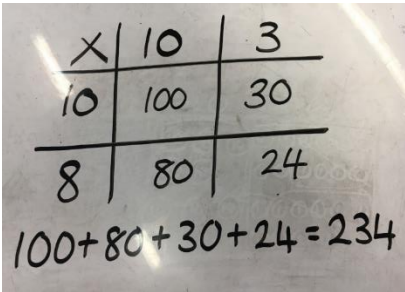
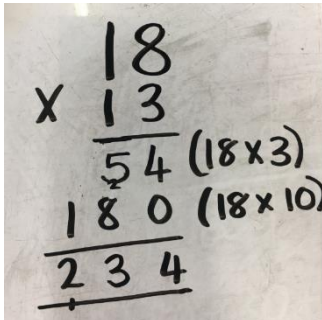
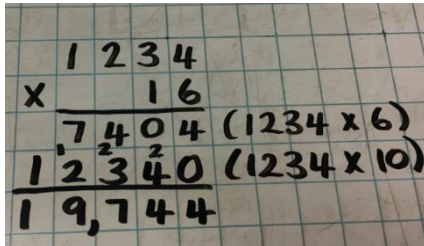
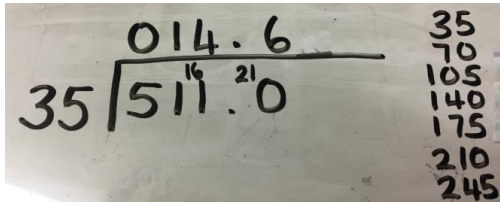
$$\begin{array}{r} 123 \\ 5 \overline{) 615} \end{array}$$

Move onto divisions with remainders

$$\begin{array}{r} 086 \text{ r } 2 \\ 5 \overline{) 432} \end{array}$$

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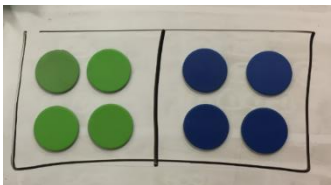
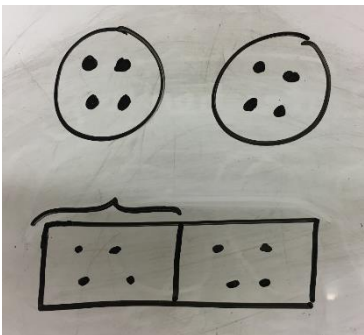
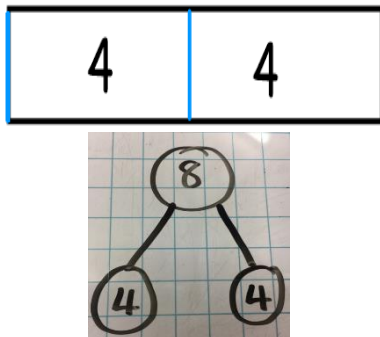
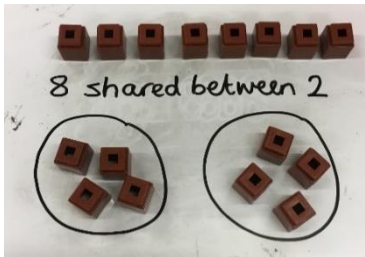
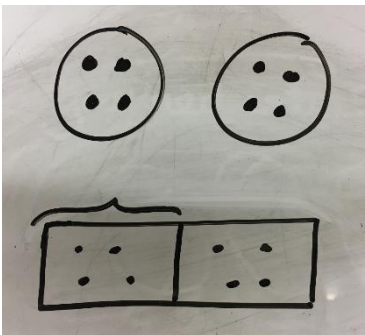
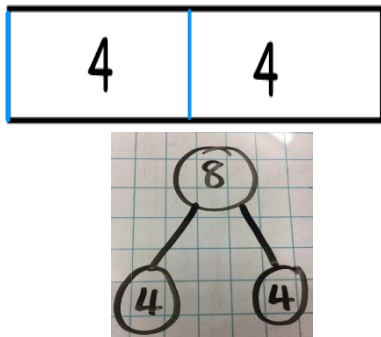
Times Tables objectives; Y2: 2,5 and 10 **Y3:** 3,4 and 8 **Y4:** 6,7,9,11 and 12 2 forms of division- grouping and sharing

<p>Multiply two digit numbers by two digit numbers</p> <p>Progressing to multiplying larger numbers by two digits.</p>	<p>Manipulatives may still be used with the corresponding long multiplication modelled alongside.</p>	<p>Using the grid method</p>  <p>A grid method calculation for 103×8. The grid is divided into three columns by a vertical line and a horizontal line. The top row is labeled '10' and '3', and the bottom row is labeled '8'. The grid contains the following values: 100, 30, 80, and 24. Below the grid, the calculation is shown: $100 + 80 + 30 + 24 = 234$.</p>	 <p>A long multiplication calculation for 18×13. The calculation shows $18 \times 3 = 54$ and $18 \times 10 = 180$, which are then added to get the final result of 234.</p>  <p>A long multiplication calculation for 1234×16. The calculation shows $1234 \times 6 = 7404$ and $1234 \times 10 = 12340$, which are then added to get the final result of 19744.</p>
<p>Division</p> <p>Divide at least 3 digit numbers by 1 and 2 digit numbers</p> <p>When working with decimals draw attention to the context of the calculation in terms of how they should be recorded.</p>			<p>Move into decimal places to divide the number accurately.</p>  <p>A long division calculation for $511.0 \div 35$. The calculation shows the quotient as 14.6, with the remainder 10. The calculation is shown as $35 \overline{) 511.0}$ with the quotient 14.6 and the remainder 10. The final result is 14.6.</p> <p>If the divisor is a 2 digit number then jot the multiples of that divisor down to help.</p>

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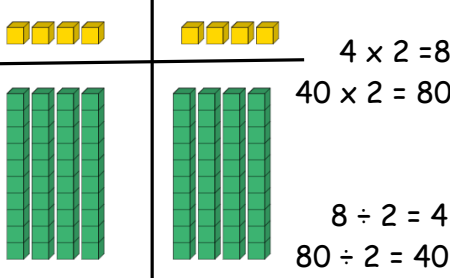
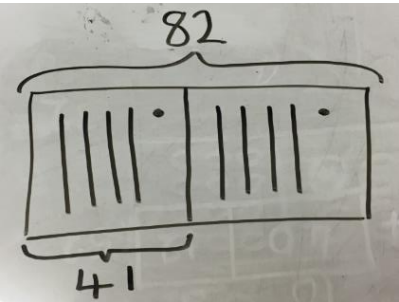
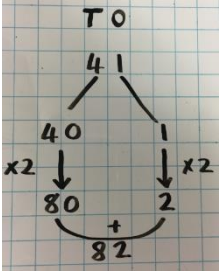
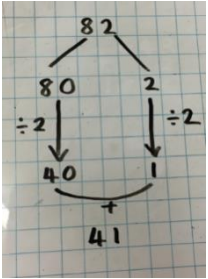

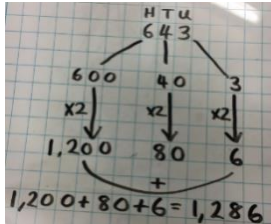
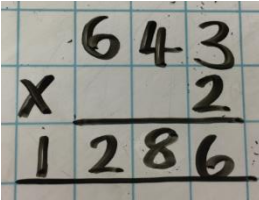
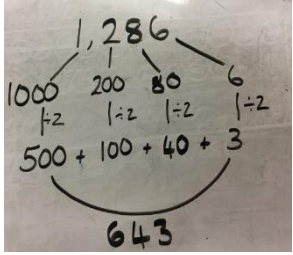
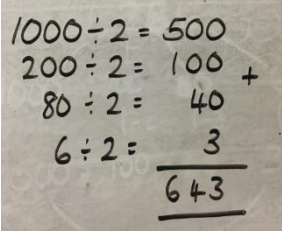
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Doubling and Halving

<p>Doubling <i>numbers to 10</i></p> <p>Leading on from equal groups - children understand that doubling something means putting the same quantity out twice (two times)</p>	<p>Use a range of equipment and scaffolds.</p> <p>Double 4 is 8 4 doubled is 8 4 put out twice is 8 4 add another 4 is 8</p> 	<p>Represent the doubling pictorially</p> 	<p>$4 + 4 = 8$ $4 \times 2 = 8$</p> 
<p>Halving even numbers to 20</p>	<p>Sharing using a range of objects</p>  <p>8 shared between 2 Half of 8 8 halved</p>	<p>Represent the sharing pictorially</p> 	<p>$8 \div 2 = 4$</p> 

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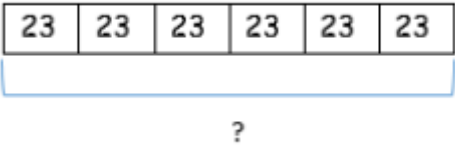

Times Tables objectives; Y2: 2,5 and 10 **Y3:** 3,4 and 8 **Y4:** 6,7,9,11 and 12 **2 forms of division-** grouping and sharing

<p>Doubling/halving Using known facts - numbers within 100</p>	<p>Model doubling/halving using diennes If I know that double 4 is 8 I also know that double 40 is 80</p>  <p>$4 \times 2 = 8$ $40 \times 2 = 80$ $8 \div 2 = 4$ $80 \div 2 = 40$</p> <p>If I know that half of 8 is 2, I also know that half of 80 is 40</p>	<p>Representing doubling/halving pictorially</p> 	<p>starting to use partitioning - sticks and smiles</p> <p>41 doubled = 82</p>  <p>82 halved = 41</p>  <p>The smiles recombine the numbers to arrive at the quotient or product.</p>
<p>Doubling/halving numbers within 1,000</p> <p>Numbers beyond 1,000 including numbers with decimal points</p>	<p>Doubling using place value counters Double 643 = 643×2</p>  <p>Putting the same quantity out twice</p> <p>Half 1,286 = $1,286 \div 2$ Use PVC to share into 2 equal groups</p>		<p>Partitioning with 3 digits $643 \times 2 = \text{double } 643$</p>   <p>Partitioning numbers with at least 4 digits</p>  

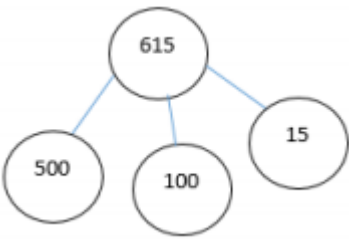
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Conceptual variation for multiplication; different ways to ask children to solve 6×23

	<p>Mai had to swim 23 lengths, 6 times a week. How many lengths did she swim in one week.</p> <p>With the place value counters, prove that $6 \times 23 = 138$</p>	<p>Find the product of 6 and 23</p> <p>$6 \times 23 =$</p> <p>$\square = 6 \times 23$</p> $\begin{array}{r} 6 \quad 23 \\ \times \quad 23 \\ \hline \end{array}$	<p>What is the calculation? What is the product?</p> 
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Conceptual variation for division; different ways to ask children to solve $615 \div 5$

<p>Using the part whole model below, how can you divide 615 by 5 without using short division?</p> 	<p>I have £615 and share it equally between 5 bank accounts. How much will be in each bank account? (sharing)</p> <p>615 pupils need to be put into 5 groups. How many will be in each group? (grouping)</p>	<p>$5 \overline{)615}$</p> <p>$615 \div 5 =$</p> <p>$\square = 615 \div 5$</p>
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