

Calculation Policy 2016



Wheelwright Lane Primary School

Aims of this calculation policy in relation to mathematics curriculum 2014

Key Stage 1

The principal focus of mathematics teaching in Key Stage 1 is to ensure that pupils develop confidence and mental fluency with whole numbers, counting and place value. This should involve working with numerals, words and the four operations, including with practical resources (e.g. concrete objects and measuring tools).

By the end of Year 2, pupils should know the number bonds to 20 and be precise in using and understanding place value. An emphasis on practice at this early stage will aid fluency.

Pupils should read and spell mathematical vocabulary, at a level consistent with their increasing word reading and spelling knowledge at Key Stage 1.

Lower Key Stage 2 - Years 3-4

The principal focus of mathematics teaching in lower Key Stage 2 is to ensure that pupils become increasingly fluent with whole numbers and the four operations, including number facts and the concept of place value. This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers.

By the end of Year 4, pupils should have memorised their multiplication tables up to and including the 12 multiplication table and show precision and fluency in their work.

Pupils should read and spell mathematical vocabulary correctly and confidently, using their growing word reading knowledge and their knowledge of spelling.

Upper Key Stage 2 - Years 5-6

The principal focus of mathematics teaching in upper Key Stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio.

At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation.

By the end of Year 6, pupils should be fluent in written methods for all four operations, including long multiplication and division, and in working with fractions, decimals and percentages.

Pupils should read, spell and pronounce mathematical vocabulary correctly.

This policy is based on expected age related progress. This document is to support differentiation within your classroom. Therefore, it is purely guidance and should be used to support the stage at which each child within your class is working.


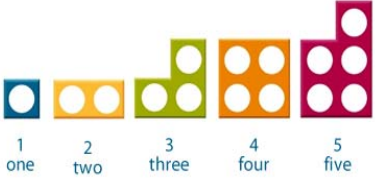
In the Mathematical Programme of Study there is an emphasis on vocabulary and it will be expected that all appropriate vocabulary is shared with the children both orally and in written form.

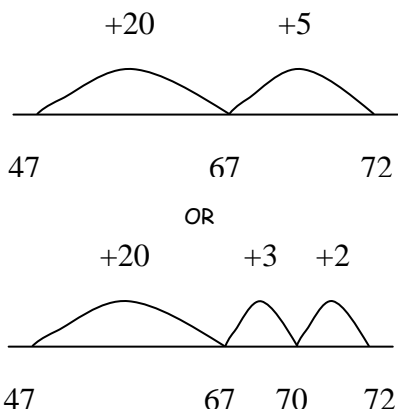
School overall aims:

- For children to become fluent in the formal written methods for addition, subtraction, multiplication and division.
- Children will apply their knowledge of taught methods for addition, subtraction, multiplication and division, therefore using these as a tool to problem solve.
- Children will gain a varied and established range of appropriate mathematical vocabulary, which they will confidently use when conjecturing and convincing during mathematical lessons.

ADDITION

Children are taught to understand addition through the following methods:


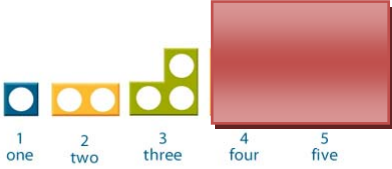
Year Group	Examples	Chosen Methods	<i>Numbers:</i> Working to at least 10
Reception	$2 + 3 = \square$ <p>At a party, I eat 2 cakes and my friend eats 3. How many cakes did we eat altogether?</p>	<p>Children use objects or counters to help them work out the answer.</p> 	<i>Vocabulary:</i> Add, counting on, counting together, how many?, more, 1 more than.
	$8 + 4 = \square$ <p>In my purse I have 8p. I find 4p. How much do I now have?</p>	<p>Children use a number line, starting with the largest number.</p> <p>Children look for patterns using Numicon.</p> 	
Year 1 (expected)	$20 + 4 = \square$ <p>20 people are on the bus. 4 more get on at the next stop. How many people are on the bus?</p>	<p>Children use a hundred square to add multiples of 10 to a 1 or 2 digit number.</p>	<i>Numbers:</i> Working to at least 20
	$37 + 22 = \square$ <p>In my piggy bank I have 37p. My gran gives me 22p to add to my savings. How much money do I now have?</p>	<p>Children partition the smallest number to add to the larger number.</p> $37 + 20 = 57$ $57 + 2 = 59$ <p>With support from using the hundred square.</p>	<i>Vocabulary:</i> Altogether, together, make, total, sum, addition, add, plus, more than, ten more, how many more?, double, near double.

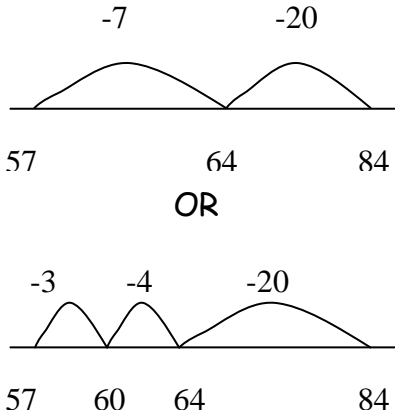
	$47 + 25 = \square$ <p>My sunflower is 47cm tall. It grows another 25cm. How tall is it now?</p>	<p>Children draw an empty number line to record their calculations.</p> 	
<p>Year 2 (expected)</p>	$45 + 34 = \square$ <p>There are 45 children in one class and 34 children in another. How many children are there altogether?</p>	<p>Children will use expanded column addition, initially with no carrying. The language used is important: 5+4, 40+30. Children will start with the smallest digit first, e.g. units</p> $\begin{array}{r} \text{T} \quad \text{U} \\ 4 \quad 5 \\ + 3 \quad 4 \\ \hline 9 \\ 7 \quad 0 \\ \hline 7 \quad 9 \end{array}$	<p><i>Numbers:</i> Working to at least 100</p> <p><i>Vocabulary:</i> Addition, sum, one hundred more, tens boundary, commutative law.</p>
	$487 + 546 = \square$ <p>There are 487 boys and 546 girls in a school. How many children are there altogether?</p>	<p>Children will use expanded column addition, with carrying. Children will start with the smallest digit first, e.g. units.</p> $\begin{array}{r} 4 \quad 8 \quad 7 \\ + 5 \quad 4 \quad 6 \\ \hline 1 \quad 3 \\ 1 \quad 2 \quad 0 \\ 9 \quad 0 \quad 0 \\ \hline 1 \quad 0 \quad 3 \quad 3 \end{array}$	

<p>Year 3 (expected)</p>	$487 + 546 = \square$ <p>There are 487 boys and 546 girls in a school. How many children are there altogether?</p>	<p>Children will use formal written method of columnar addition, with carrying. Children will start with the smallest digit first, e.g. units.</p> $\begin{array}{r} 487 \\ + 546 \\ \hline 1033 \\ \hline 11 \end{array}$	<p><i>Numbers:</i> Working to at least 1000</p> <hr/> <p><i>Vocabulary:</i> Hundred more, associative law.</p>
<p>Year 4 (expected)</p>	$2786 + 2568 = \square$ <p>2786 people visit the museum last year. The number increased by 2568 this year. How many people altogether visited this year?</p>	<p>When children are confident using compact method they can start to use larger numbers accurately and confidently.</p> $\begin{array}{r} 2786 \\ + 2568 \\ \hline 5354 \\ \hline 111 \end{array}$	<p><i>Numbers:</i> Working beyond 1000</p> <hr/> <p><i>Vocabulary:</i> Increase.</p>
<p>Year 5 (expected)</p>	$12786 + 2568 = \square$ <p>12786 people visit the museum last year. The number increased by 2568 this year. How many people altogether visited this year?</p>	<p>When children are confident, they can move onto larger numbers.</p> $\begin{array}{r} 12786 \\ + 2568 \\ \hline 15354 \\ \hline 111 \end{array}$	<p><i>Numbers:</i> Working up to 1,000,000</p> <hr/> <p><i>Vocabulary:</i> Unit boundary, decimals.</p>
<p>Year 6 (expected)</p>	$5.45 + 2.86 = \square$ <p>5.45m of string is added to another piece of string which is 2.86m. How long is the piece of string now?</p>	<p>Children use the traditional compact method to complete problems involving decimals. Ensure they add the least significant digit first. Ensure they remember place value.</p>	<p><i>Numbers:</i> Working beyond 10,000,000</p> <hr/> <p><i>Vocabulary:</i></p>

SUBTRACTION

Children are taught to understand subtraction through the following methods:

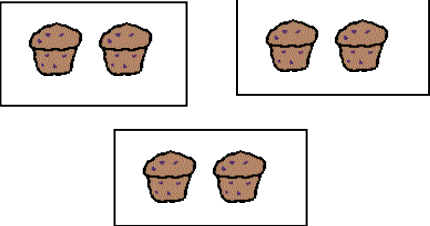


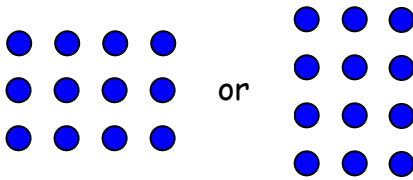
Year Group	Examples	Chosen Method	Numbers: Working to at least 10
Reception	$5 - 2 = \square$ <p>At a party there is 5 cakes, I eat 2 cakes. How many cakes are left?</p>	<p>Children use objects or counters to physically take away.</p> 	<p><i>Vocabulary:</i> Subtract, take away, counting back, fewer, fewer than, less, 1 less than.</p>
	$5 - 2 = \square$ <p>A teddy bear costs £5 and a doll costs £2. How much more does the bear cost?</p>	<p>Children hide Numicon.</p> 	
	$8 - 3 = \square$ <p>Lisa has 8 felt tips and Tim has 3. How many more does Lisa have?</p>	<p>Children use a number line, counting back.</p>	
Year 1 (expected)	$21 - 4 = \square$ <p>21 people are on the bus. 4 people get off at the next stop. How many people are on the bus?</p>	<p>Children use a hundred square to subtract from a two digit number.</p>	<p><i>Numbers:</i> Working to at least 20</p> <p><i>Vocabulary:</i> Take away, minus, Ten less, less than, How many less?, differencee between, half, halves.</p>

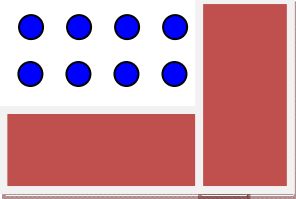
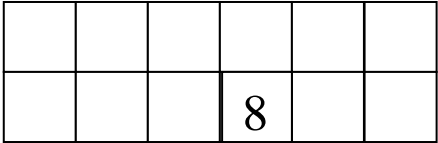
	$84 - 27 = \square$ I cut 27cm off a ribbon measuring 84cm. How much is left?	Children draw an empty number line to record their calculations. 	
Year 2 (expected)	$78 - 34 = \square$ There are 78 children in year 2 and 34 children go on a trip. How many children are left in year 2?	Children will use columnar subtraction, initially with no exchanging. They will partition TU to help with place value. The language used is important: 8-4 and 70-30. Children will start with the smallest digit first, e.g. units. $\begin{array}{r} 70 \quad 8 \\ - 30 \quad 4 \\ \hline 40 \quad 4 = 44 \end{array}$	<i>Numbers:</i> Working to at least 100 <i>Vocabulary:</i> Subtraction, difference, partition, one hundred less, tens boundary, inverse.
	$754 - 86 = \square$ The library own 754 books. 86 are out on loan. How many are on the shelves?	Children will use columnar subtraction. Initially children will use the expanded method to clearly show decomposition (steps of exchange). $\begin{array}{r} 754 \\ - 86 \\ \hline 700 \quad 50 \quad 4 \\ - \quad 80 \quad 6 \\ \hline = 700 \quad 40 \quad 14 \\ - \quad 80 \quad 6 \\ \hline = 600 \quad 140 \quad 14 \\ - \quad 80 \quad 6 \\ \hline 600 \quad 60 \quad 8 = 668 \end{array}$	

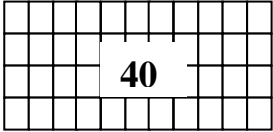
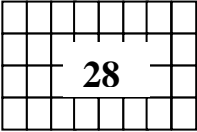
<p>Year 3 (expected)</p>	<p>$736 - 268 = \square$</p> <p>736 computer games are in a shop. On the first day 268 games are sold. How many games are still to be sold?</p>	<p>Children will use formal written method of columnar subtraction, with exchanging. Children will start with the smallest digit first, e.g. units</p> $\begin{array}{r} 6 \quad 12 \quad 1 \\ \cancel{7} \quad \cancel{3} \quad 6 \\ - 2 \quad 6 \quad 8 \\ \hline 4 \quad 6 \quad 8 \end{array}$	<p><i>Numbers:</i> Working to at least 1000</p>
<p>Year 6</p>	<p>$5.45 - 2.86 = \square$</p> <p>2.86m of rope is cut from a piece which is 5.45m. How much rope is left?</p>	<p>Children use the traditional compact method to complete problems involving decimals. Ensure they subtract the least significant digit first. Ensure they remember place value.</p>	<p><i>Numbers:</i> Working beyond 10,000,000</p>
			<p><i>Vocabulary:</i> Hundred less, decrease.</p>
			<p><i>Vocabulary:</i></p>

MULTIPLICATION

Children are taught to understand multiplication through the following methods:

Year Group	Examples	Chosen Method	
Reception	$2 \times 3 = \square$ At a party, there are 3 children. Each child eats 2 cakes. How many cakes do the 3 children eat altogether?	Children practically count out the cakes using objects. 	<i>Multiplication tables:</i> 2 & 10
			<i>Vocabulary:</i> Double (up to 10)
	$2 \times 4 = \square$ Each child has two eyes. How many eyes do four children have?	Children draw pictures, allowing them to count up. Concentrating on the 2, 5 and 10 times tables.  $2 + 2 + 2 + 2$	
	$5 \times 3 = \square$ There are 5 cakes in a pack. How many cakes in 3 packs?	Children use dots or tally marks to group items together.  $5 + 5 + 5$	
Year 1 (expected)	$4 \times 3 = \square$ A chew costs 4p. How much do 3 chews cost?	Children draw arrays. It allows children to visualise the answer and understand that multiplication can be done in any order. 	<i>Multiplication tables:</i> 2, 5 & 10
			<i>Vocabulary:</i> Multiplication, doubling, repeated addition, arrays, row, columns number patterns.

<p>Year 2 (expected)</p>	<p>Introduce the multiplication grid.</p>	 <p>4 lots of 2 = 8</p> <p>On a 10 x 10 grid put in 8 in correct place to build up the multiplication grid.</p> 	<p><i>Multiplication tables:</i> 2, 4, 5 & 10</p> <p><i>Vocabulary:</i> Multiplication, product, arrays, repeated addition, commutative law, multiplicative reasoning.</p>
	<p>$17 \times 4 = \square$</p> <p>There are 17 biscuits in a packet. How many biscuits in 4 packets?</p>	<p>Children continue to use their knowledge of arrays to support their transition of using the grid method.</p>	

	x	10	7
4			

<p>Year 3 (expected)</p>	<p>$6 \times 24 = \square$</p> <p>24 books were sold. Each book cost £6. How much money was taken?</p>	<p>Children will use the grid method, partitioning numbers and multiplying each number in the grid.</p> <div data-bbox="689 432 1273 674" style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> $\begin{array}{r} x \quad 20 \quad 4 \\ 6 \quad \boxed{120} \quad \boxed{24} \quad = 144 \end{array}$ </div>	<p><i>Multiplication tables:</i> 3, 4, 6 & 8</p> <p><i>Numbers:</i> 2 digit number times one digit number.</p> <p><i>Vocabulary:</i> Multiplication, arrays, repeated addition, factor, commutative law, grid method.</p>
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<p>Year 4 (expected)</p>	<p>$6 \times 324 = \square$</p> <p>324 books were sold. Each book cost £6. How much money was taken?</p>	<p>Children will use the grid method, partitioning numbers and multiplying each number in the grid.</p> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> <table style="border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 5px;">x</td> <td style="padding: 5px;">300</td> <td style="padding: 5px;">20</td> <td style="padding: 5px;">4</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">6</td> <td style="border: 1px solid black; padding: 5px;">1800</td> <td style="border: 1px solid black; padding: 5px;">120</td> <td style="border: 1px solid black; padding: 5px;">24</td> <td style="padding: 5px;">= 1944</td> </tr> </table> </div>	x	300	20	4		6	1800	120	24	= 1944	<p><i>Multiplication tables:</i> 7, 9, 11 & 12</p> <p><i>Numbers:</i> 2 digit/3 digit number times one digit number.</p> <p><i>Vocabulary:</i> Distributive law, associative law</p>
x	300	20	4										
6	1800	120	24	= 1944									
	<p>$6 \times 324 = \square$</p> <p>324 books were sold. Each book cost £6. How much money was taken?</p>	<p>Children will begin to become fluent in the formal written method of long multiplication.</p> $ \begin{array}{r} 324 \\ \times 6 \\ \hline 1944 \end{array} $ <p>When introducing long multiplication, initially show both equations side by side and ask:</p> <p>'What's the same? What's different?'</p>											

<p>Year 5 (expected)</p>	<p>Reference $72 \times 34 = \square$</p> <p>A cat is 72cm long. A tiger is 34 times longer. How long is the tiger?</p>	<p>Children to use the grid method for TU x TU, moving onto HTU x TU, to support their mathematical understanding.</p> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> <table style="border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 5px;">x</td> <td style="padding: 5px;">30</td> <td style="padding: 5px;">4</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">70</td> <td style="border: 1px solid black; padding: 5px;">2100</td> <td style="border: 1px solid black; padding: 5px;">280</td> <td style="padding: 5px;">= 2380</td> </tr> <tr> <td style="padding: 5px;">2</td> <td style="border: 1px solid black; padding: 5px;">60</td> <td style="border: 1px solid black; padding: 5px;">8</td> <td style="padding: 5px;">= 68</td> </tr> <tr> <td style="padding: 5px;"></td> <td style="border: none;"></td> <td style="border: none;"></td> <td style="padding: 5px;">= 2448</td> </tr> </table> </div>	x	30	4		70	2100	280	= 2380	2	60	8	= 68				= 2448	<p><i>Multiplication tables:</i> 12×12</p> <p><i>Numbers:</i> Up to 4 digit number times one/two digit numbers.</p> <p><i>Vocabulary:</i> Multiple, factor, common factors, prime numbers, prime factors, composite numbers, square numbers, cube numbers.</p>
x	30	4																	
70	2100	280	= 2380																
2	60	8	= 68																
			= 2448																
	<p>$72 \times 34 = \square$</p> <p>A cat is 72cm long. A tiger is 34 times longer. How long is the tiger?</p>	<p>Children will begin to become fluent in the formal written method of long multiplication.</p> $ \begin{array}{r} \cancel{2} \quad \cancel{3} \quad \cancel{4} \\ \quad 3 \quad 4 \\ X \quad 7 \quad 2 \\ \hline \quad 6 \quad 8 \\ 2 \quad 3 \quad 8 \quad 0 \\ \hline 2 \quad 4 \quad 4 \quad 8 \\ \hline \cancel{2} \quad \cancel{3} \quad \cancel{4} \end{array} $																	
<p>Year 6 (expected)</p>	<p>$373 \times 35 = \square$</p>	<p>Children will continue to become fluent in the formal written method of long multiplication, moving up to 4 digit numbers by 2 digit numbers.</p> $ \begin{array}{r} \cancel{2} \quad \cancel{3} \quad \cancel{4} \\ \quad 3 \quad 7 \quad 3 \\ X \quad \quad 3 \quad 5 \\ \hline \quad 1 \quad 8 \quad 6 \quad 5 \\ 1 \quad 1 \quad 1 \quad 9 \quad 0 \\ \hline 1 \quad 3 \quad 0 \quad 5 \quad 5 \\ \hline \quad \cancel{1} \quad \cancel{3} \end{array} $	<p><i>Multiplication tables:</i> 12×12</p> <p><i>Numbers:</i> 4 digit number times two digit numbers.</p> <p><i>Vocabulary:</i> Factorise, common factors, common multiples</p>																

Throughout
Key Stage
2.

$$3.2 \times 4.6 = \square$$

An athlete jumps 4.6m. His
opponent jumps 3.2 times
further than him. How far
does his opponent jump?

Children encouraged to use
known fact to ensure place
value, therefore making links
to what they already know.

$$20 \times 60 = 1200$$

$$20 \times 6 = 120$$

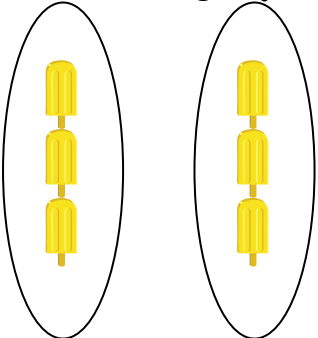


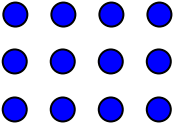
$$2 \times 6 = 12$$

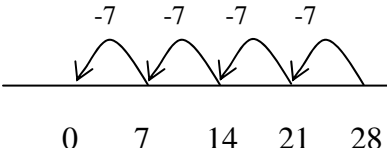
$$0.2 \times 6 = 1.2$$

$$0.2 \times 0.6 = 0.12$$

DIVISION

Children are taught to understand division through the following methods:

Year Group	Examples	Chosen Method	<i>Multiplication tables:</i> 2 & 10
Reception	$6 \div 2 = \square$ <p>6 lollies are shared between 2 children. How many lollies does each child get?</p>	<p>Children practically count out the lollies using objects.</p> 	<i>Vocabulary:</i> Share, halving.
	$12 \div 2 = \square$ <p>There are 12 eyes. Each person has two eyes. How many people are there?</p>	<p>Children draw pictures. Concentrating on the 2, 5 and 10 times tables.</p> 	
	$12 \div 3 = \square$ <p>12 apples are shared equally between 3 baskets. How many apples are in each basket?</p>	<p>Children use dots or tally marks to share items into equal groups.</p>  <p style="text-align: center;">Grouping in 4s.</p>	
Year 1 (expected)	<p>Starting to recall number facts, using relationship between multiplication and division.</p> $12 \div 4 = \square$	<p>Children draw arrays. It allows children to visualise the relationship between multiplication facts and division facts.</p> 	<p><i>Multiplication tables:</i> 2, 5 & 10</p> <p><i>Vocabulary:</i> Divison, grouping, share equally, left, left over.</p>

<p>Year 2 (expected)</p>		<p>Children will recall multiplication facts and related division facts, supported by their understanding of arrays.</p>	<p><i>Multiplication tables:</i> 2, 4, 5 & 10</p>
	<p>$28 \div 7 = \square$</p> <p>A chew bar costs 7p. How many can I buy with 28p?</p>	<p>Children draw an empty number line to record their calculations. Children then count back in equal jumps, recording each jump.</p>  <p>0 7 14 21 28</p> <p>When children are ready they can move onto numbers with remainders.</p>	<p><i>Vocabulary:</i> Divison, divide, divided by, divided into, remainder.</p>
<p>Year 3 (expected)</p>	<p>$86 \div 3 = \square$</p> <p>86 books are sold. The shop sold 3 books a day. How many days did it take to sell all the books?</p>	<p>Children will use long division, using their knowledge of multiplication to take known chunks away. Encouraging children to take chunks of 2, 5 and 10 initially.</p> $\begin{array}{r} 3 \overline{) 86} \\ \underline{60} \quad (20) \\ 26 \\ \underline{15} \quad (5) \\ 11 \\ \underline{9} \quad (3) \\ 2 \end{array}$ <p>$86 \div 3 = 28r2$ So it took 29 days to sell the books.</p> <p>Children round up or down appropriate to the answer.</p>	<p><i>Multiplication tables:</i> 3, 4, 6 & 8</p>
			<p><i>Numbers:</i> 2 digit number divided by one digit number.</p>
			<p><i>Vocabulary:</i> Quotient.</p>

<p>Year 4 (expected)</p>	<p>$184 \div 7 = \square$</p> <p>I need 184 chairs for a concert. I arrange them in rows of 7. How many rows do I need?</p>	<p>Same as above, but encouraging chunks of multiples of 10, e.g. chunks of 20, 30, etc...</p>	<p><i>Multiplication tables:</i> 7, 9, 11 & 12</p> <p><i>Numbers:</i> 2 digit/3 digit number divided by one digit number.</p> <p><i>Vocabulary:</i></p>
<p>Year 5 (expected)</p>	<p>$432 \div 5 = \square$</p> <p>432 books are sold. The shop sold 5 books a day. How many days did it take to sell all the books?</p>	<p>Children will use the long division.</p> $ \begin{array}{r} 86r2 \\ 5 \overline{) 432} \\ \underline{40} \\ 32 \\ \underline{30} \\ 2 \end{array} $ <p>Support children with recording remainders appropriately. E.g.</p> $ \begin{array}{l} 86r2 \\ 86\frac{2}{5} \\ 86.4 \end{array} $	<p><i>Multiplication tables:</i> 12 x 12</p> <p><i>Numbers:</i> 4 digit number divided by one digit number.</p> <p><i>Vocabulary:</i></p>
<p>Year 6 (expected)</p>	<p>$432 \div 15 = \square$</p>	<p>Children to use long division to divide 4 digit numbers by 2 digit numbers.</p> $ \begin{array}{r} 28.8 \\ 15 \overline{) 432.0} \\ \underline{30} \\ 132 \\ \underline{120} \\ 120 \\ \underline{120} \\ 0 \end{array} $	<p><i>Multiplication tables:</i> 12 x 12</p> <p><i>Numbers:</i> 4 digit number divided by two digit number.</p> <p><i>Vocabulary:</i></p>

$$511 \div 35 = \square$$

For those children that are ready move to the short method.

$$\begin{array}{r} 14.6 \\ 35 \overline{) 511.0} \\ \underline{35} \\ 161 \\ \underline{140} \\ 210 \\ \underline{210} \\ 0 \end{array}$$

$$511 \div 35 = 14.6$$