





### Multiplication Policy and Methods

	<b><u>Multiplication &amp; division facts/ Mental Calculations</u></b>	<b><u>Calculation</u></b>	<b><u>Methods</u></b>
<b>E Y F S</b>		<p>Count reliably with numbers from 1 to 20.</p> <p>Solve problems, including doubling.</p> <p>Solve practical problems that involve combining groups of 2, 5 or 10.</p>	<p>Children use objects and pictures to support <b>multiplication</b>.</p> <p><u>Repeated addition</u> 'Neil has 3 apples. Sita has 3 apples. How many apples are there altogether?'</p> <p> </p>

Y  
e  
a  
r  
1

Count in multiples of twos, fives and tens

Solve one-step problems involving **multiplication and division**, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

### Multiple representations of multiplication

Children see and understand different representations of multiplication facts using symbols/pictures. They begin to use apparatus and later jottings, to support calculations involving repeated addition.

- How many flowers are there altogether?

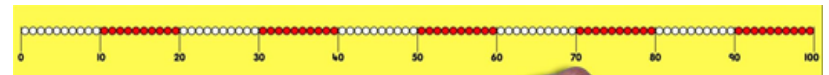


There are \_\_\_ cookies in each jar.

There are \_\_\_ jars.

There are \_\_\_ cookies altogether.

- Use a 0-100 bead string to count in tens.



- Jemima is counting in 10s on part of a hundred square.

**100 Square**

100	99	98	97	96	95	94	93	92	91
90	89	88	87	86	85	84	83	82	81
80	79	78	77	76	75	74	73	72	71
70	69	68	67	66	65	64	63	62	61
60	59	58	57	56	55	54	53	52	51
50	49	48	47	46	45	44	43	42	41
40	39	38	37	36	35	34	33	32	31
30	29	28	27	26	25	24	23	22	21
20	19	18	17	16	15	14	13	12	11
10	9	8	7	6	5	4	3	2	1

- How many wheels altogether?



$$2 + 2 + 2 = 6$$



$$5 + 5 + 5 + 5 = 20$$

How many pears are there?



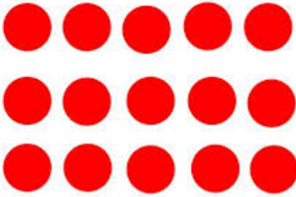
$$5 + 5 + 5 = 15$$

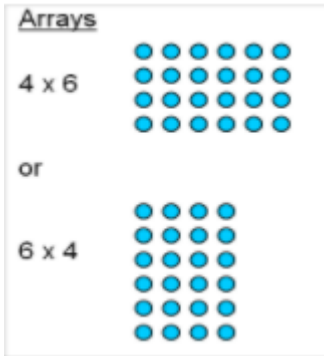
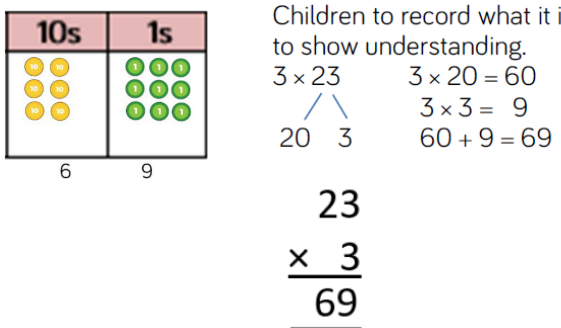
$$3 \times 5 = 15$$

There are 15 pears.

- Complete and continue the table.

Build	Represent	Add	Double
		$1 + 1 = 2$	Double 1 is 2
		$2 + 2 = \underline{\quad}$	Double 2 is $\underline{\quad}$
		$3 + 3 = \underline{\quad}$	Double 3 is $\underline{\quad}$
		$\underline{\quad} + \underline{\quad} = \underline{\quad}$	Double 4 is $\underline{\quad}$

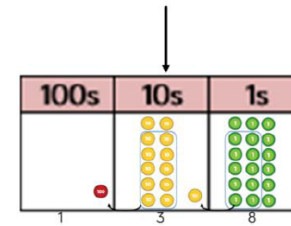
<b>Y e a r 2</b>	<p>Count in steps of 2, 3, and 5 from 0, and in tens from any number, forward or backward</p> <p>Recall and use multiplication and division facts for the <b>2, 5 and 10</b> multiplication tables, including recognising odd and even numbers</p> <p>Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot</p>	Calculate mathematical statements for <b>multiplication and division</b> within the multiplication tables and write them using the multiplication ( $\times$ ), division ( $\div$ ) and equals (=) signs	Arrays showing commutative multiplication 
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<p><b>Y e a r 3</b></p>	<p>Count from 0 in multiples of 4, 8, 50 and 100</p> <p>Recall and use multiplication and division facts for the <b>3, 4 and 8</b> multiplication tables</p> <p>Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods</p>	<p>Write and calculate mathematical statements for <b>multiplication and division</b> using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods (appears also in Mental Methods)</p>	<p>Children continue to use arrays to represent <b>multiplications</b>. Use Base Ten/Place value counters to support children's visual understanding.</p>  <p>The diagram shows two arrays of blue circular counters. The first array is labeled '4 x 6' and consists of 4 rows and 6 columns of counters. Below it is the word 'or' and a second array labeled '6 x 4' which consists of 6 rows and 4 columns of counters.</p>
<p><b>Y e a r 4</b></p>	<p>Count in multiples of 6, 7, 9, 25 and 1000</p> <p>Recall multiplication and division facts for multiplication tables <b>up to 12 x 12</b></p> <p>Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers</p> <p>Recognise and use factor pairs and commutativity in mental calculations</p>	<p>Multiply two-digit and three-digit numbers by a one-digit number using formal written layout</p> <p>Solve problems involving multiplying and dividing, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.</p>	<p>Children write statements about the equality of expressions: Use the distributive law <math>39 \times 7 = 30 \times 7 + 9 \times 7</math> and associative law <math>(2 \times 3) \times 4 = 2 \times (3 \times 4)</math>.</p> <p>They combine knowledge of number facts and rules of arithmetic to solve mental and written calculations eg, <math>2 \times 6 \times 5 = 10 \times 6 = 60</math>. Recall multiplication and division facts for times tables up to 12.</p>  <p>The diagram shows a place value chart with two columns: '10s' and '1s'. The '10s' column contains three yellow circles representing 30, and the '1s' column contains six green circles representing 6. Below the chart are the numbers 6 and 9. To the right, there is a multiplication diagram for 3 x 23. It shows 3 x 23 = 3 x 20 + 3 x 3 = 60 + 9 = 69. Below this is a standard written multiplication: 23 x 3 = 69.</p>

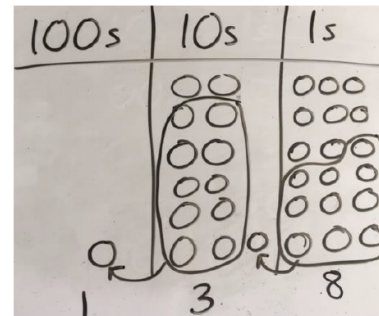
**Formal written methods of short multiplication for 2-digit numbers times single digit numbers e.g. 23 x 6**

Formal column method with place value counters.

$$6 \times 23$$



Children to represent the counters/base 10, pictorially e.g. the image below.



Formal written method

$$\begin{array}{r}
 6 \times 23 = \\
 23 \\
 \times 6 \\
 \hline
 138 \\
 \hline
 1 \quad 1
 \end{array}$$

**Y  
e  
a  
r  
5**

Count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000

Multiply and divide numbers mentally drawing upon known facts.

Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.

Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers

Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes

Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates

**Formal written methods**

**Short Multiplication** for 2-digit numbers times single digit numbers e.g. 23 x 8

Expanded:

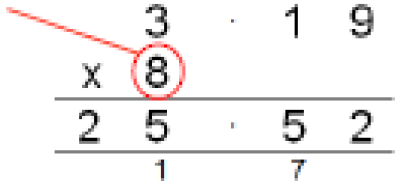
	H	T	O		
		3	4		
x			5		
		2	0	(5 x 4)	
+	1	5	0	(5 x 30)	
	1	7	0		

Short:

	H	T	O		
		3	4		
x			5		
	1	7	0		
	1	2			

**Expanded Multiplication** for 2-digit times 2-digit numbers e.g. 23 x 18

$$\begin{array}{r} 23 \\ \times 18 \\ \hline 24 \text{ (8x3)} \\ 160 \text{ (8x20)} \\ 30 \text{ (10x3)} \\ 200 \text{ (10x20)} \\ \hline 414 \end{array}$$

			<p><b>Long Multiplication</b> for <b>2-digit</b> number times <b>2-digit</b> numbers e.g.</p> <p>Mo is calculating <math>34 \times 23</math> Here is his working.</p> <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <math display="block">\begin{array}{r} 34 \\ \times 23 \\ \hline 102 \\ 68 \\ \hline 170 \end{array}</math> </div> <p>What mistake has Mo made? What is the correct answer? You may use the blank grid for your workings.</p> <div style="border: 1px solid lightblue; padding: 5px; display: inline-block;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td></td><td></td><td>3</td><td>4</td><td></td><td></td></tr> <tr><td>x</td><td></td><td>2</td><td>3</td><td></td><td></td></tr> <tr><td></td><td>1</td><td>0</td><td>2</td><td></td><td></td></tr> <tr><td></td><td>6</td><td>8</td><td>0</td><td></td><td></td></tr> <tr><td></td><td>7</td><td>8</td><td>2</td><td></td><td></td></tr> </table> </div>			3	4			x		2	3				1	0	2				6	8	0				7	8	2		
		3	4																														
x		2	3																														
	1	0	2																														
	6	8	0																														
	7	8	2																														
<p><b>Y</b> <b>e</b> <b>a</b> <b>r</b> <b>6</b></p>	<p>Perform mental calculations, including with mixed operations and large numbers</p> <p>Associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.25) for a simple fraction (e.g. 1/4)</p>	<p>Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication</p>	<p>Use <b>short multiplication</b> and <b>long multiplication</b> as in Year 5, but apply to numbers with <b>decimals</b>.</p> <p>Children may need reminding that single digits belong in the ones (units) column.</p> <div style="text-align: center;">  <math display="block">\begin{array}{r} 319 \\ \times 8 \\ \hline 2552 \\ \phantom{25}17 \end{array}</math> </div> <p>Children need to have a <i>sound understanding of place value</i> and the formal method itself before progressing to decimal multiplication.</p> <p>Use <b>place value counters</b> to support if needed but add counters with 0.1 and 0.01 on them.</p>																														

## **Glossary:**

**Commutativity:** can be done in any order:  $3 \times 5 = 5 \times 3$ . Multiplication and addition are commutative. Subtraction and division are not.

**Scaling:** increasing a number by a scale factor

A scaling model is also used to compare two numbers or amounts involving phrases such as 'so many times as much (or as many)'

**Correspondence:** If you know a fact for one object, this can be used to find further facts, e.g. 1 sandwich costs £2, so 4 sandwiches cost £8

**Associativity:** The property that if the same operation is applied to the same numbers, the answer will be the same.

Addition is associative, e.g.  $1 + (2 + 3) = (1 + 2) + 3$ .

Multiplication is associative, e.g.  $1 \times (2 \times 3) = (1 \times 2) \times 3$ .

Subtraction and division are not associative because, as counter examples,  $1 - (2 - 3) \neq (1 - 2) - 3$  and  $1 \div (2 \div 3) \neq (1 \div 2) \div 3$ .

We can use the associative law to help with multiplication calculations. For example: Find  $5 \times 26$ :

Factorise 26 as  $13 \times 2$ , so we now have  $13 \times 2 \times 5$ . Use the associative law to associate the 2 with the five, rather than with the 13 in order to make the calculation easier.  $(13 \times 2) \times 5 = 13 \times (2 \times 5) = 13 \times 10 = 130$ .

**Distributive law:** The property that you will get the same answer when you: multiply a number by a group of numbers added together, or do each multiplication separately then add them, eg  $3 \times (2 + 4)$  is the same as  $(3 \times 2) + (3 \times 4)$