



# **B20 Maths Calculation Policy Part 1**

Date of Update	Reason for Update	Next Update
Sept 22	Feedback from NW Maths hub	Sept 24

At Norris Bank, the aim of our calculation policy is to ensure all children receive equity of offer. Calculation procedures are taught according to this document so they can be seamlessly built upon year after year, as children move through school.

The policy has been taken and adapted to suit from White Rose Maths. The use of concrete resources and visuals underpin this calculation policy and are what you would expect to see in a Norris Bank Maths lesson.

The development of secure mental methods to support fluency in calculations is an essential part of effective learning in Maths. Appendix 1 contains a list ( not exhaustive) of the facts children should be expected to recall to support their Maths as well as calculations which most children should be able to carry out mentally by the time they leave KS2. Appendix 2 states the times tables focus for different year groups.

The use and understanding of mathematical vocabulary is also a key element of the aims of our teaching and learning in Maths. A list of key vocabulary to be taught at each stage and then consolidated throughout school is found in Appendix 3. Again this list is not exhaustive.

The policy goes through:

Addition



Subtraction

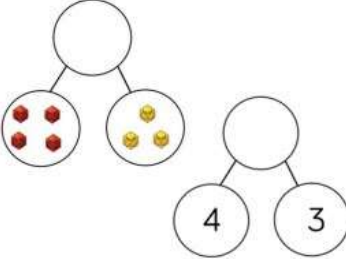
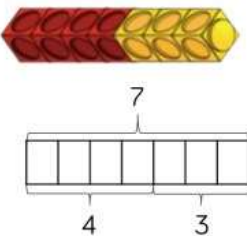
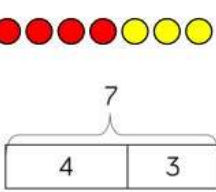
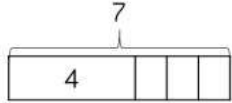
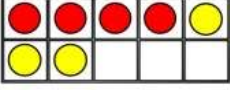


Multiplication

Division

Each operation is broken down into skills for the year group and shows recommended models and visuals to support the teaching of the corresponding concepts alongside. Staff need to be clear about which of these will support children's understanding of calculations as opposed to calculation methods which enable children to arrive at an answer. Not all visuals need to be or would be efficient to record. Some models are useful to support children's thinking for calculation strategies which will then become mental methods and again teachers need to be ready to support this and amend how children are expected to record their work as they progress.

**Addition**

Skill: Add numbers up to 5		EYFS
<p>Numicon  5 frame and 2 sided counters</p> <p>Objects eg: cars, bears , fingers etc</p> <p style="text-align: center;"><math>2 + 1 = 3</math></p> <p>Bead string </p> <p>Cubes / counters: concrete bar models    Number line / track</p>		<p>When adding numbers to 5, children can explore both aggregation and augmentation</p>

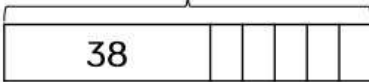
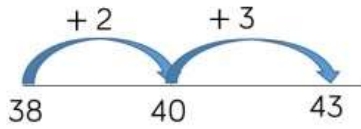
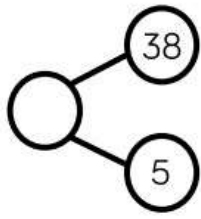
Skill: Add 1-digit numbers within 10		Year: 1
   <p style="text-align: center;"><math>4 + 3 = 7</math></p>    		<p>When adding numbers to 10, children can explore both aggregation and augmentation.</p> <p>The part-whole model, discrete and continuous bar model, number shapes and ten frame support aggregation.</p> <p>The combination bar model, ten frame, bead string and number track all support augmentation.</p>

Skill: Add 1 and 2-digit numbers to 20	Year: 1/2
<p><math>8 + 7 = 15</math></p>	<p>When adding one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.</p> <p>Different manipulatives can be used to represent this exchange. Use concrete resources alongside number lines to support children in understanding how to partition their jumps.</p>

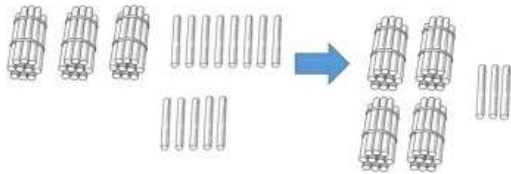
Skill: Add three 1-digit numbers	Year: 2
<p><math>7 + 6 + 3 = 16</math></p>	<p>When adding three 1-digit numbers, children should be encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently.</p> <p>This supports children in their understanding of commutativity.</p> <p>Manipulatives that highlight number bonds to 10 are effective when adding three 1-digit numbers.</p>

**Skill: Add 1-digit and 2-digit numbers to 100**

**Year: 2/3**



**$38 + 5 = 43$**



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

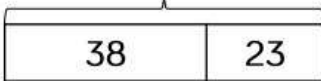
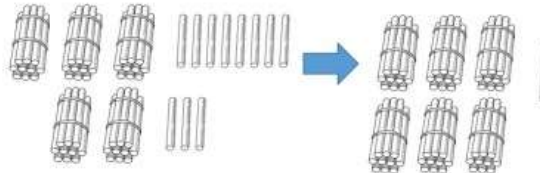
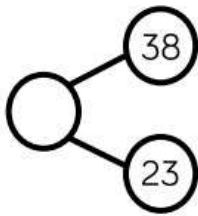
When adding single digits to a two-digit number, children should be encouraged to count on from the larger number.

They should also apply their knowledge of number bonds to add more efficiently e.g.  $8 + 5 = 13$  so  $38 + 5 = 43$ .

Hundred squares and straws can support children to find the number bond to 10.

**Skill: Add two 2-digit numbers to 100**

**Year: 2/3**



**$38 + 23 = 61$**

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

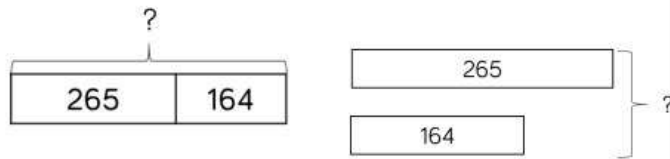
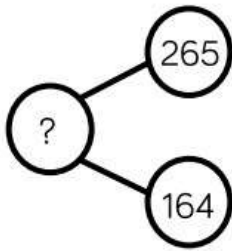
Partition second number into tens and ones. Add tens first, then ones. Use straws in the same way. Leads to mental methods

As numbers become larger, straws become less efficient.

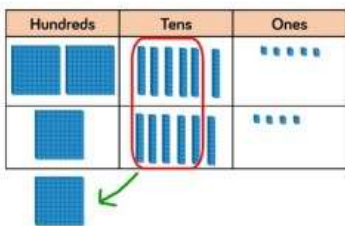
Children can also use a blank number line to count on to find the total. Encourage them to jump to multiples of 10 to become more efficient.

**Skill: Add numbers with up to 3 digits**

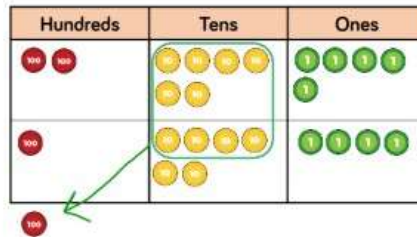
**Year: 3**



$$265 + 164 = 429$$



$$\begin{array}{r} 265 \\ + 164 \\ \hline 429 \\ 1 \end{array}$$



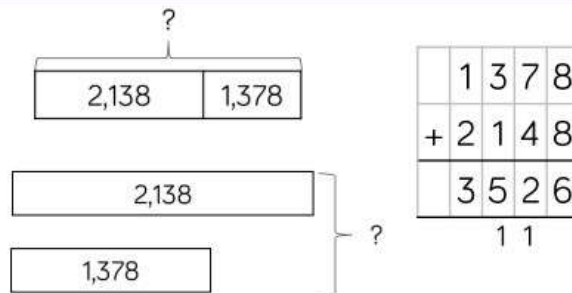
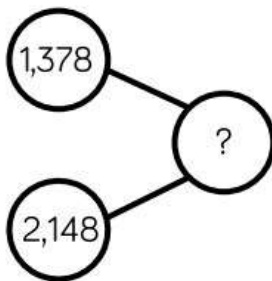
Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 3 digits.

Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

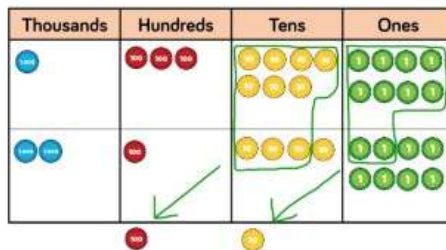
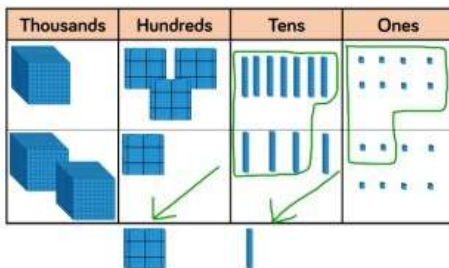
Plain counters on a place value grid can also be used to support learning.

**Skill: Add numbers with up to 4 digits**

**Year: 4**



$$1,378 + 2,148 = 3,526$$



Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 4 digits.

Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.



**Subtraction**

Skill: subtract numbers within 5		EYFS
Cubes	Objects	Can record as number sentences or pictures with items crossed out.  Year 1 apparatus and images within 5
Fingers	Number tracks	
Part wholes	Bead strings	
Numicon		

Skill: Subtract 1-digit numbers within 10	Year: 1
<p><math>7 - 3 = 4</math></p>	<p>Part-whole models, bar models, ten frames and number shapes support partitioning.</p> <p>Ten frames, number tracks, single bar models and bead strings support reduction.</p> <p>Cubes and bar models with two bars can support finding the difference.</p>



**Skill: Subtract 1 and 2-digit numbers to 20**

**Year: 1/2**

$14 - 6 = 8$

$14 - 6 = 8$

$14 - 6 = 8$

$14 - 6 = 8$

When subtracting one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.

Children should be encouraged to find the number bond to 10 when partitioning the subtracted number.

Link with addition (inverse)

**Skill: Subtract 1 and 2-digit numbers to 100**

**Year: 2 / 3**

$65 - 28 = 37$

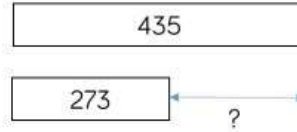
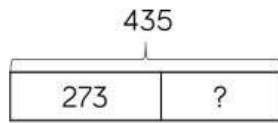
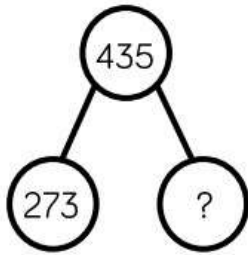
$65 - 28 = 37$

Use a blank number line to count back. Partition second number. Count back tens, then ones. Encourage as few jumps as possible. Leads to mental method.

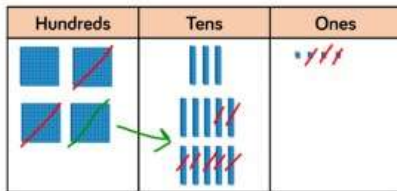
Children can also use a blank number line to count on to find the difference. Encourage them to jump to multiples of 10 to become more efficient.

**Skill: Subtract numbers with up to 3 digits**

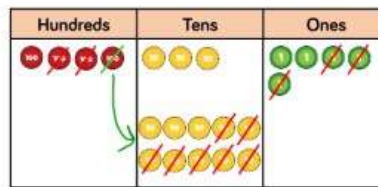
**Year: 3**



$$435 - 273 = 262$$



$$\begin{array}{r} 3 \ 1 \\ 435 \\ - 273 \\ \hline 262 \end{array}$$



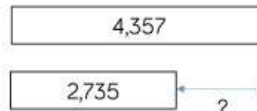
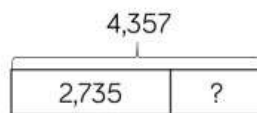
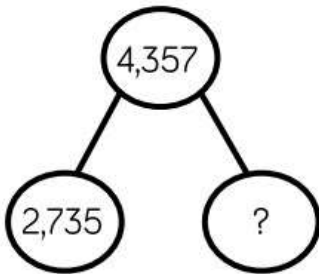
Base 10 and place value counters are the most effective manipulative when subtracting numbers with up to 3 digits.

Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.

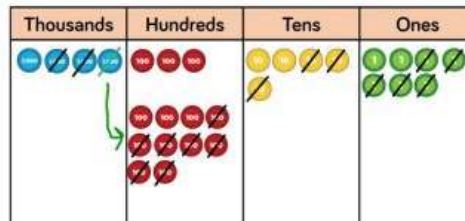
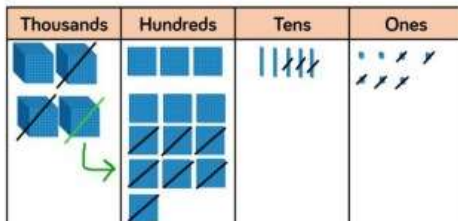
**Skill: Subtract numbers with up to 4 digits**

**Year: 4**



$$\begin{array}{r} 3 \ 1 \\ 4357 \\ - 2735 \\ \hline 1622 \end{array}$$

$$4,357 - 2,735 = 1,622$$



Base 10 and place value counters are the most effective manipulatives when subtracting numbers with up to 4 digits.

Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

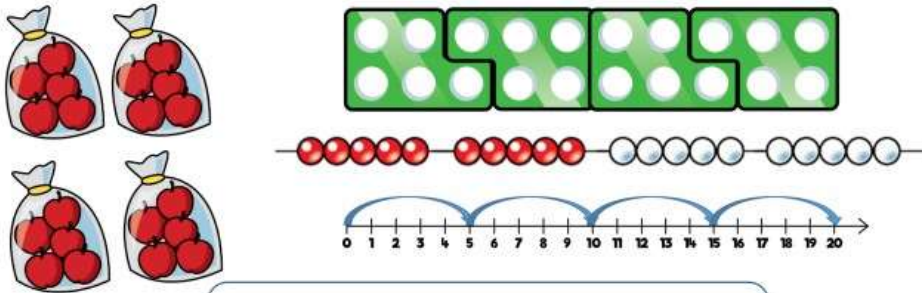
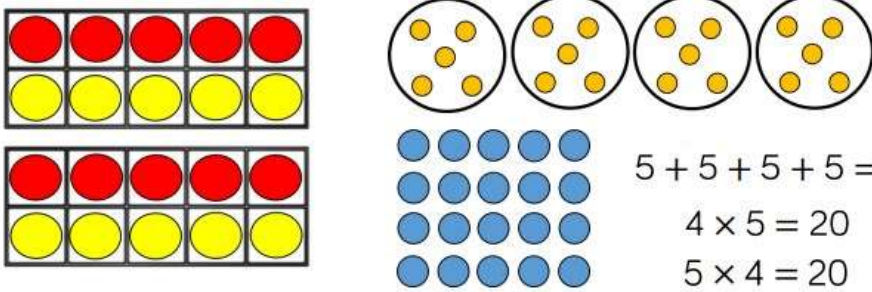
Plain counters on a place value grid can also be used to support learning.

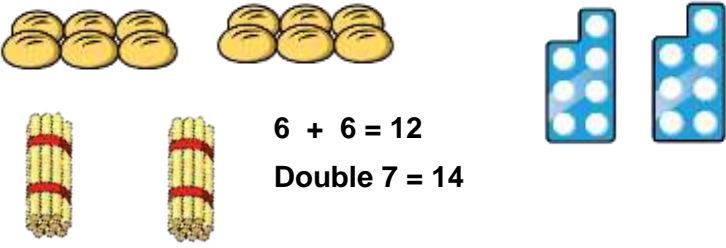
Skill: Subtract numbers with more than 4 digits	Year: 5/6												
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> </div> <div style="text-align: center;"> <math display="block">\begin{array}{r} 294,382 \\ \underline{182,501} \\ ? \end{array}</math> </div> </div> <div style="display: flex; justify-content: center; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; margin: 0 10px;">294,382</div> <div style="border: 1px solid black; padding: 5px; margin: 0 10px;">182,501</div> <div style="font-size: 2em;">←</div> <div style="border: 1px solid black; padding: 5px; margin: 0 10px;">?</div> </div> <div style="text-align: center; margin-top: 10px; border: 1px solid black; padding: 5px; border-radius: 10px;"> <math>294,382 - 182,501 = 111,881</math> </div> <div style="margin-top: 10px;"> <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <thead> <tr style="background-color: #d9e1f2;"> <th style="width: 12.5%;">HTh</th> <th style="width: 12.5%;">TTh</th> <th style="width: 12.5%;">Th</th> <th style="width: 12.5%;">H</th> <th style="width: 12.5%;">T</th> <th style="width: 12.5%;">O</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> </div>	HTh	TTh	Th	H	T	O							<p>Place value counters or plain counters on a place value grid are the most effective concrete resource when subtracting numbers with more than 4 digits.</p> <p>At this stage, children should be encouraged to work in the abstract, using column method to subtract larger numbers efficiently.</p>
HTh	TTh	Th	H	T	O								

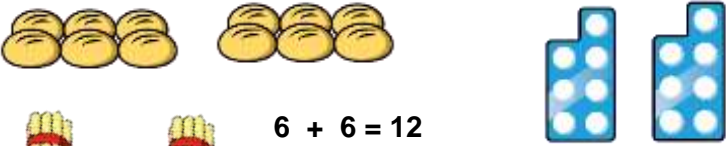
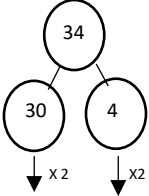
Skill: Subtract with up to 3 decimal places	Year: 5 /6						
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> </div> <div style="text-align: center;"> <math display="block">\begin{array}{r} 5.43 \\ \underline{2.7} \\ ? \end{array}</math> </div> </div> <div style="display: flex; justify-content: center; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; margin: 0 10px;">5.43</div> <div style="border: 1px solid black; padding: 5px; margin: 0 10px;">2.7</div> <div style="font-size: 2em;">←</div> <div style="border: 1px solid black; padding: 5px; margin: 0 10px;">?</div> </div> <div style="text-align: center; margin-top: 10px; border: 1px solid black; padding: 5px; border-radius: 10px;"> <math>5.43 - 2.7 = 2.73</math> </div> <div style="margin-top: 10px;"> <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <thead> <tr style="background-color: #d9e1f2;"> <th style="width: 33%;">Ones</th> <th style="width: 33%;">Tenths</th> <th style="width: 33%;">Hundredths</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table> </div>	Ones	Tenths	Hundredths				<p>Place value counters and plain counters on a place value grid are the most effective manipulative when subtracting decimals with 1, 2 and then 3 decimal places.</p> <p>Ensure children have experience of subtracting decimals with a variety of decimal places. This includes putting this into context when subtracting money and other measures.</p>
Ones	Tenths	Hundredths					

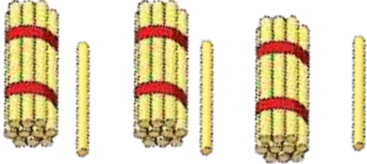
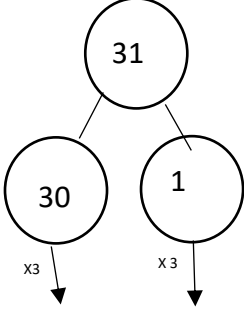
Multiplication

Skill: to create equal groups		EYFS
Objects	Bead strings	Record pictorially
Numicon	Skip counting	Recognise doubling as 2 equal groups
		Recognise equal / unequal groups

Skill: Solve 1-step problems using multiplication	Year: 1/2
 <p>One bag holds 5 apples. How many apples do 4 bags hold?</p>  <p> <math>5 + 5 + 5 + 5 = 20</math>  <math>4 \times 5 = 20</math>  <math>5 \times 4 = 20</math> </p>	<p>Children represent multiplication as repeated addition in many different ways.</p> <p>In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record multiplication formally.</p> <p>In Year 2, children are introduced to the multiplication symbol.</p>

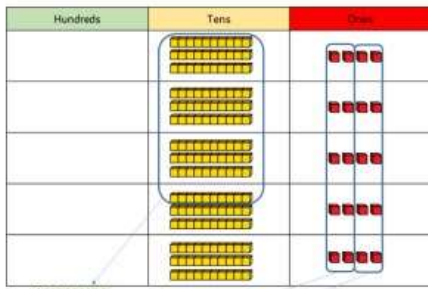
Skill: to be able to double numbers up to 20	Year 1
 <p> <math>6 + 6 = 12</math>  <b>Double 7 = 14</b> </p>	<p>Children use different objects to represent doubling. Children understand doubling as adding the same quantity to the group.</p> <p>Children can record their work as pictures or addition calculations eg: 3+3</p>

Skill: to consolidate doubling numbers up to 20 and double 2 digit numbers without crossing tens	Year 2
 <p data-bbox="459 427 655 555"> <math>6 + 6 = 12</math>  <b>Double 7 = 14</b>  <math>7 \times 2 = 14</math> </p>  <p data-bbox="772 667 965 701"> <math>60 + 8 = 68</math> </p>	<p data-bbox="1182 286 1437 521">Children use different objects to represent doubling. Children understand doubling as adding the same quantity to the group. Children begin to recall doubles to 20.</p> <p data-bbox="1182 539 1430 763">Children can partition numbers into tens and ones using part whole pictures and double the tens and ones before recombining. This can be supported by base 10 or straws</p>

Skill: Multiply 2 digit by one digit numbers	Year 3
 <p data-bbox="161 1205 762 1238">Use straws or base 10 to represent the calculation</p>  <p data-bbox="906 1352 1129 1386"> <math>90 + 3 = 93</math> </p>	<p data-bbox="1161 969 1445 1283">Part whole diagrams will support children's development of mental methods for these calculations. They can be recorded whilst they help children to manage the numbers. Children who can calculate mentally should do so.</p> <p data-bbox="1161 1305 1445 1563">Please note: children's understanding of multiplication and recall of tables should be developed using concrete and pictorial representations introduced in Years 1 &amp; 2.</p> <p data-bbox="1161 1585 1445 1742">Select numbers for carrying out 2 digit by 1 digit calculations carefully to reflect the times tables children are working on.</p>

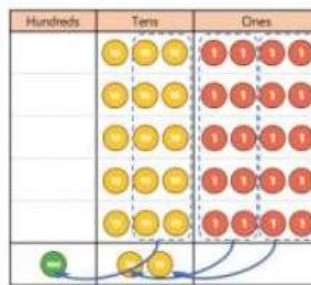
**Skill: Multiply 2-digit numbers by 1-digit numbers**

**Year: 3/4**



$$34 \times 5 = 170$$

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



Begin with using part whole to partition number to tens and ones and multiply each part by single digit. This supports mental calculations.

The place value counters should be used to support the understanding of the method rather than supporting the multiplication, as children should use times table knowledge.

**Skill- Double any 2 digit number to 100, including crossing tens**

**Year 3**

Use base 10

Place value counters

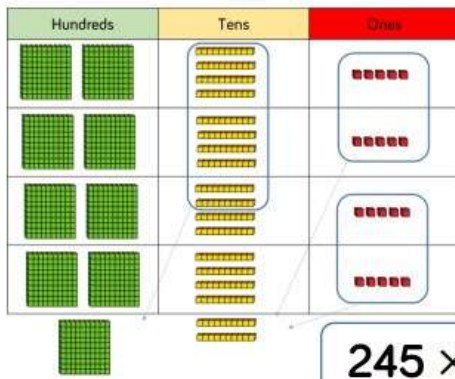
Part, part whole model used in Year 2 and to support multiplying 2 digit by 1 digit in Year 3

Children should be given opportunities to consolidate instant recall of doubles to 20 and understand their link to 2x table.

Understand doubling as inverse of halving.

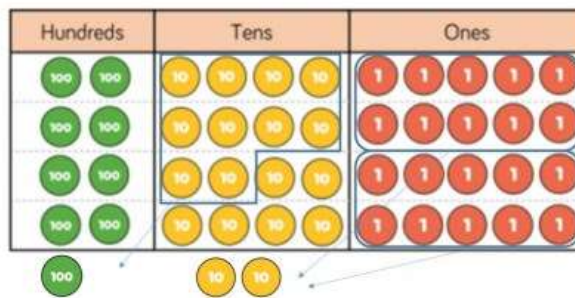
### Skill: Multiply 3-digit numbers by 1-digit numbers

Year: 4



	H	T	O
	2	4	5
x			4
	9	8	0
	1	2	

$$245 \times 4 = 980$$



When moving to 3-digit by 1-digit multiplication, encourage children to move towards the short, formal written method. Base 10 and place value counters continue to support the understanding of the written method. Limit the number of exchanges needed in the questions and move children away from resources when multiplying larger numbers.

### Skill- double 3 digit numbers to 1,000

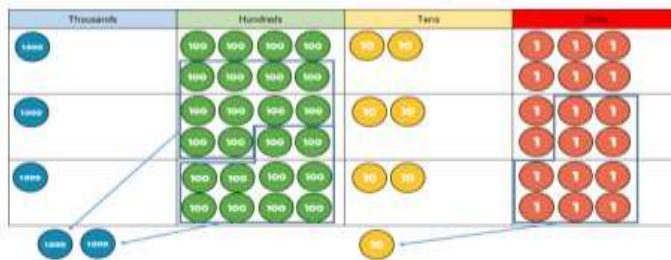
Year: 4

Use base 10 and place value counters to illustrate.  
Use part part whole diagrams extended to hundreds as well

Children should be encouraged to develop these skills mentally and use part whole diagrams only until the skills are secure.

### Skill: Multiply 4-digit numbers by 1-digit numbers

Year: 5



$$1,826 \times 3 = 5,478$$

	Th	H	T	O
	1	8	2	6
x				3
	5	4	7	8
	2		1	

When multiplying 4-digit numbers, place value counters are the best manipulative to use to support children in their understanding of the formal written method. If children are multiplying larger numbers and struggling with their times tables, encourage the use of multiplication grids so children can focus on the use of the written method.

Skill: Multiply 2-digit numbers by 2-digit numbers	Year: 5																												
<div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div style="text-align: center;">HTO 234 <u>X27</u></div> <div style="text-align: center;">HTO 234 <u>x 7</u></div> <div style="text-align: center;">HTO 234 <u>x20</u></div> </div> <p>Calculations can be done separately and then recombined to support clarity and accuracy.</p> <div style="border: 1px solid black; border-radius: 10px; padding: 10px; width: fit-content; margin: 10px auto;"> <math>22 \times 31 = 682</math> </div>	<p>WR power points to model the PV counters movement between columns - a visual representation of the concrete model - feeds into written methods. Leading into the formal written method - Separate the calculations - eg <math>24 \times 13 = 24 \times 10</math> and <math>24 \times 3</math>, to model the formal method of multiplication. Then work up using harder multiples of 10, eg <math>24 \times 23</math>, <math>24 \times 53</math> Extend to 3 digit by 2digit.</p>																												
<table border="1" style="border-collapse: collapse; margin: auto;"> <tr><td></td><td style="text-align: center;">H</td><td style="text-align: center;">T</td><td style="text-align: center;">O</td></tr> <tr><td></td><td></td><td style="text-align: center;">2</td><td style="text-align: center;">2</td></tr> <tr><td style="text-align: center;">x</td><td></td><td style="text-align: center;">3</td><td style="text-align: center;">1</td></tr> <tr><td colspan="4" style="border-top: 1px solid black;"></td></tr> <tr><td></td><td></td><td style="text-align: center;">2</td><td style="text-align: center;">2</td></tr> <tr><td></td><td style="text-align: center;">6</td><td style="text-align: center;">6</td><td style="text-align: center;">0</td></tr> <tr><td></td><td style="text-align: center;">6</td><td style="text-align: center;">8</td><td style="text-align: center;">2</td></tr> </table>		H	T	O			2	2	x		3	1							2	2		6	6	0		6	8	2	
	H	T	O																										
		2	2																										
x		3	1																										
		2	2																										
	6	6	0																										
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Skill: Multiply 4-digit numbers by 2-digit numbers	Year: 5/6																																																												
<table border="1" style="border-collapse: collapse; margin: auto;"> <tr><td></td><td style="text-align: center;">TTh</td><td style="text-align: center;">Th</td><td style="text-align: center;">H</td><td style="text-align: center;">T</td><td style="text-align: center;">O</td></tr> <tr><td></td><td></td><td style="text-align: center;">2</td><td style="text-align: center;">7</td><td style="text-align: center;">3</td><td style="text-align: center;">9</td></tr> <tr><td style="text-align: center;">x</td><td></td><td></td><td></td><td style="text-align: center;">2</td><td style="text-align: center;">8</td></tr> <tr><td colspan="6" style="border-top: 1px solid black;"></td></tr> <tr><td></td><td style="text-align: center;">2</td><td style="text-align: center;">1</td><td style="text-align: center;">9</td><td style="text-align: center;">1</td><td style="text-align: center;">2</td></tr> <tr><td style="text-align: center;">2</td><td></td><td style="text-align: center;">5</td><td style="text-align: center;">3</td><td style="text-align: center;">7</td><td></td></tr> <tr><td></td><td style="text-align: center;">5</td><td style="text-align: center;">4</td><td style="text-align: center;">7</td><td style="text-align: center;">8</td><td style="text-align: center;">0</td></tr> <tr><td style="text-align: center;">1</td><td></td><td></td><td style="text-align: center;">1</td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">7</td><td style="text-align: center;">6</td><td style="text-align: center;">6</td><td style="text-align: center;">9</td><td style="text-align: center;">2</td></tr> <tr><td></td><td></td><td></td><td style="text-align: center;">1</td><td></td><td></td></tr> </table> <div style="border: 1px solid black; border-radius: 10px; padding: 10px; width: fit-content; margin: 10px auto;"> <math>2,739 \times 28 = 76,692</math> </div>		TTh	Th	H	T	O			2	7	3	9	x				2	8								2	1	9	1	2	2		5	3	7			5	4	7	8	0	1			1				7	6	6	9	2				1			<p>When multiplying 4-digits by 2-digits, children should be confident in the written method.</p> <p>If they are still struggling with times tables, provide multiplication grids to support when they are focusing on the use of the method.</p> <p>Consider where exchanged digits are placed and make sure this is consistent.</p>
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