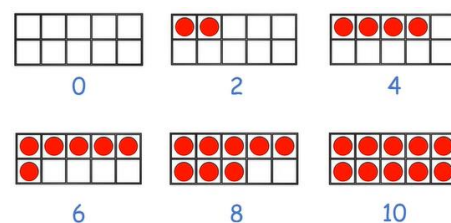
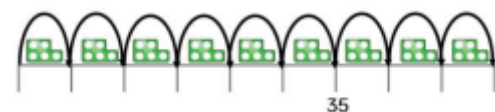
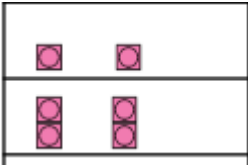
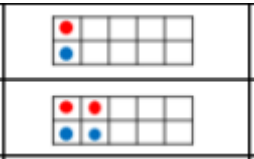


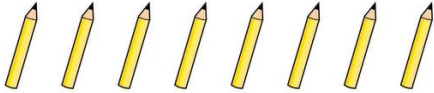
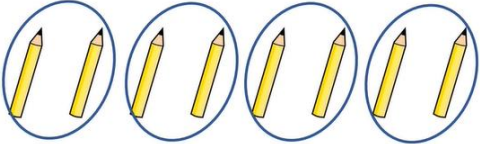
Ashton Gate Calculation Policy: Multiplication and Division

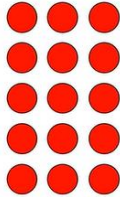
Year 1 Objectives

- 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

Strategies	Concrete	Pictorial	Abstract																																																		
Counting in multiples	Concrete manipulatives and objects are used to support children counting in multiples.  Use a 0-100 bead string to count in tens. Can we count forwards and backwards in tens? 	Tens frames are used to support children when counting in multiples.  Grids can be used to spot and discuss patterns. <table data-bbox="1117 852 1599 1051"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr><tr><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td></tr><tr><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td></tr><tr><td>41</td><td>42</td><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td><td>49</td><td>50</td></tr></table> Number lines can be used in conjunction with concrete resources, or with numbers. 	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	Writing sequences with multiples of 2, 5 and 10. For example: 2, 4, 6, 8, 10 5, 10, 15, 20, 25, 30
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																																												

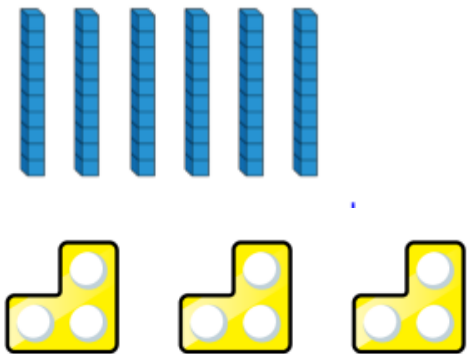
Making equal groups and adding to find the total	Children begin by using stories which link to concrete manipulatives to explore making equal groups. 	They then progress to stories linked to pictures. 	They use repeated addition to find the total of the equal groups. $2 + 2 + 2 + 2 + 2 = 10$ There are 5 equal groups of 2.
Doubling	Children demonstrate doubling using concrete manipulatives.  Double ____ is ____ 	Tens frames are used to represent doubling. 	$1 + 1 = 2$ Double 1 is 2

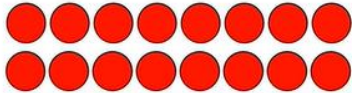
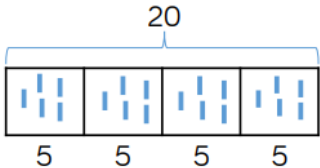
Grouping	Children start with a given total of a concrete resource and make groups of an equal amount. Make equal groups of 4 	Children then progress to using pictures to show their equal groups. Make equal groups of 2 	Children record their understanding in sentences, not formal division at this stage. There are 8 pencils altogether. There are 4 pencils in each group. There are 2 equal groups of 4 pencils.
Sharing	Children explore sharing as a model of division. They use 1 : 1 correspondence to share concrete objects into equal groups.	Children then progress to using pictures to show their equal groups. 	Children record their understanding in sentences, not formal division at this stage. 9 apples shared equally between 3 horses is 3

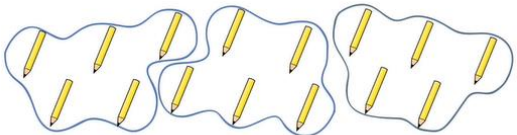
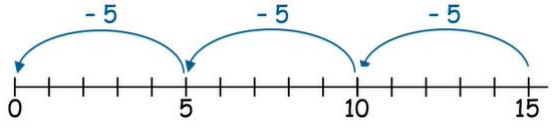
Arrays	Children begin to make arrays using concrete objects, building them up in columns or rows. 	Children progress to using pictorial representations alongside concrete, with stem sentences to support their understanding.  There are ____ rows. There are ____ counters in each row. There are ____ counters altogether.	Children describe the arrays as repeated addition $3 + 3 + 3 + 3 + 3 = 15$
--------	---	--	---

Year 2 Objectives

- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication ($\times$), division ($\div$) and equals ($=$) signs
- Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot
- Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

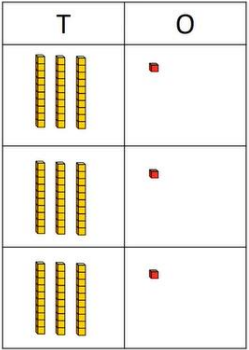
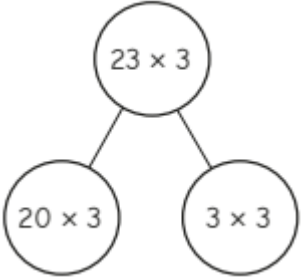
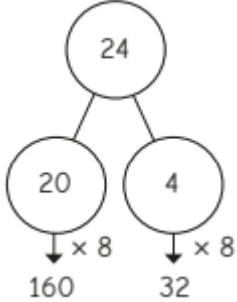
<u>Strategies</u>	<u>Concrete</u>	<u>Pictorial</u>	<u>Abstract</u>
Equal groups	Children should be able to make equal groups with concrete resources to demonstrate their understanding of the word 'equal'. 	Children move on to using pictures to represent equal groups. 	Children progress to describing these equal groups first as repeated addition, then multiplication. There are <u>3</u> equal groups of <u>4</u> $\boxed{4} + \boxed{4} + \boxed{4} = \boxed{12}$ $\boxed{3} \times \boxed{4} = \boxed{12}$ The multiplication symbol should be used interchangeably with the term 'lots of'

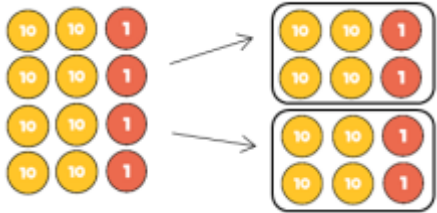
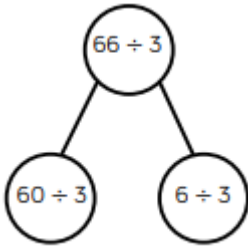
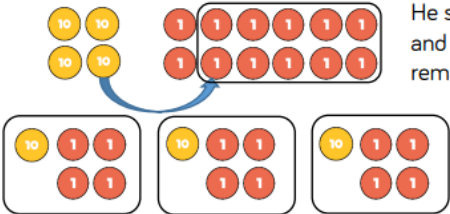
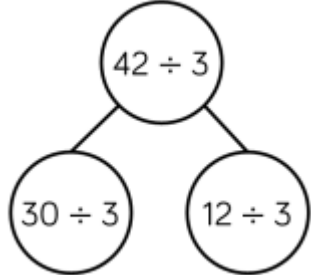
Using arrays	Children begin by using real-life objects to create arrays, then progressing to concrete manipulatives such as counters. 	Children may draw counters to create a pictorial array. 	Children write 2 multiplications for each array to see the commutativity of multiplication facts e.g. $5 \times 2 = 2 \times 5$
Sharing	Children divide by sharing concrete objects into equal groups using one-to-one correspondence. Share the 12 cubes equally into the two boxes. There are ___ cubes altogether. There are ___ boxes. There are ___ cubes in each box.  Can you share the 12 cubes equally into 3 boxes?	Bar models can be used to represent sharing into equal groups. 	$20 \div 4 = 5$

Grouping	Children divide by making equal groups. They then count on to find the total number of groups. You have 30 counters.  How many different ways can you put them into equal groups?	Children progress from concrete resources to pictorial representations.  	$15 \div 5 = 3$ 15 divided into groups of 5 is equal to 3.
-----------------	---	--	---

Year 3 Objectives

- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- 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
- Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.

Strategies	Concrete	Pictorial	Abstract
Multiplying two-digit numbers by a one-digit number with no exchange	Children use concrete resources to represent multiplication as repeated addition. 	Part-whole models are used to partition 	. $32 \times 4 = 3 \text{ tens} \times 4 + 2 \text{ ones} \times 4$ $= 12 \text{ tens} + 8 \text{ ones}$ $= 128$
Multiplying two-digit numbers by a one-digit number with exchanges	Children progress to multiplying numbers where they will need to exchange. They explore this using concrete manipulatives first. 	Part-whole models are used to partition 	$64 \times 3 = 6 \text{ tens} \times 3 + 4 \text{ ones} \times 3$ $= 18 \text{ tens} + 12 \text{ ones}$ $= 180 + 12 = 192$

Divide 2-digit numbers by a 1-digit number (no exchange)	Children partition into tens and ones, then share equally into groups. It is important that they divide the tens first and not the ones. 	Part-whole models represent the partitioning method 	<i>Children progress to abstract methods for division in Year 5.</i>
Divide 2-digit numbers by a 1-digit number (with exchanges)	Ron uses place value counters to divide 42 into three equal groups.  He shares the tens first and exchanges the remaining ten for ones. Then he shares the ones. $42 \div 3 = 14$	Flexible partitioning to represent the exchange of 1 ten for 10 ones. 	<i>Children progress to abstract methods for division in Year 5.</i>

Year 4 Objectives

- Recall multiplication and division facts for multiplication tables up to 12×12
- 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
- Recognise and use factor pairs and commutativity in mental calculations
- Multiply two-digit and three-digit numbers by a one-digit number using formal written layout
- Solve problems involving multiplying and adding, 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.

Strategies

Multiplying two-digit numbers by a one-digit number

Concrete

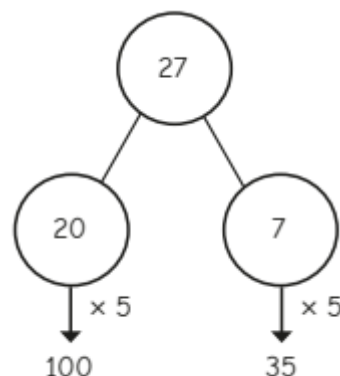
Children use their understanding of repeated addition to calculate with concrete manipulatives, such as base 10 and place value counters.

Tens	Ones
10 10 10	1 1 1 1
10 10 10	1 1 1 1

Tens	Ones
	
	
	

Pictorial

Part-whole models are used to partition



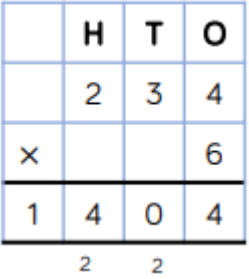
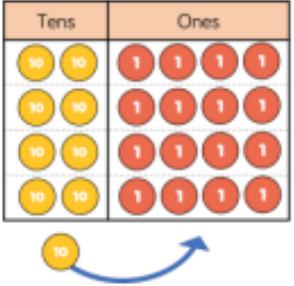
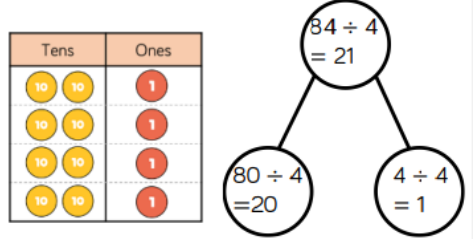
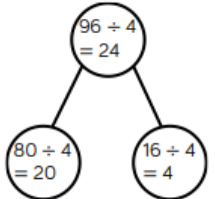
Abstract

Children start with an expanded written method.

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

They then progress to short multiplication.

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

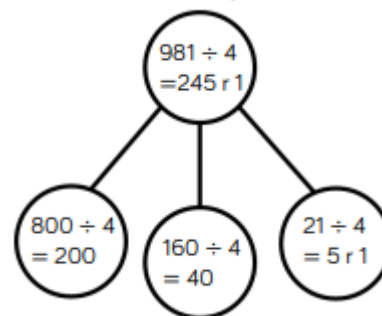
Multiplying three-digit numbers by a one-digit number	Children continue to use concrete manipulatives to represent the repeated addition. 	Children may draw place value grids and counters to represent multiplication as repeated addition.	
Divide two-digit numbers by a one-digit number	Children use concrete manipulatives to share into equal groups, starting with examples where the tens and ones are divisible by the divisor, e.g. 96 divided by 3 and 84 divided by 4.  They then move on to calculations where they exchange between tens and ones, e.g. 96 divided by 4 	Place value grids and part-whole models are used to support partitioning of the whole.  Flexible partitioning is used where the tens and ones are not divisible by the divisor. 	<i>Children will progress to using a formal written method for short division in Year 5.</i>

Divide three-digit numbers by a one-digit number

Children continue to use manipulatives to share into equal groups, progressing to examples with three-digit numbers.

Hundreds	Tens	Ones
100 100		1 1 1
100 100		1 1 1
100 100		1 1 1

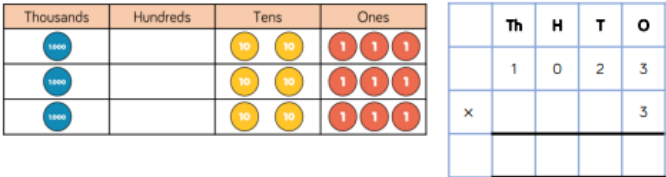
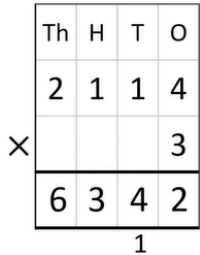
Children continue to use flexible partitioning.

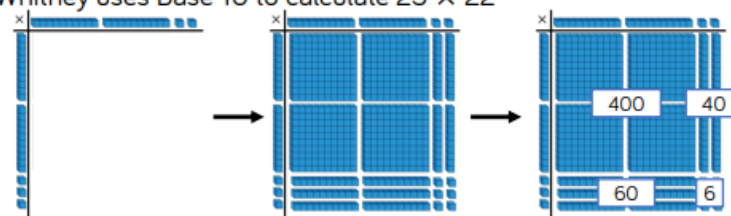
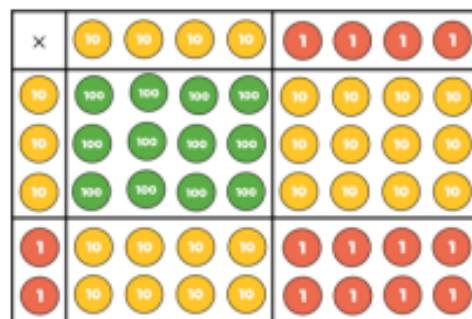


Children will progress to using a formal written method for short division in Year 5.

Year 5 Objectives

- Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers
- Know and use the vocabulary of prime numbers, prime factors and composite (nonprime) numbers
- Establish whether a number up to 100 is prime and recall prime numbers up to 19
- 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
- Multiply and divide numbers mentally drawing upon known facts
- Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context
- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
- Recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3)
- Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes
- Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign
- Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.

<u>Strategies</u>	<u>Concrete</u>	<u>Pictorial</u>	<u>Abstract</u>
Multiplying four-digit numbers by a one-digit number	Children build on previous steps to represent a 4-digit number multiplied by a 1-digit number using concrete manipulatives. 	Children may draw place value grids and counters to represent the multiplication.	Children revisit the short multiplication method learned in Year 4, applying this to four-digit numbers. 

Multiplying two-digit numbers by two-digit numbers	Children use Base 10 to represent the area model of multiplication, which will enable them to see the size and scale linked to multiplying. Whitney uses Base 10 to calculate 23×22   Children will then move on to representing multiplication more abstractly with place value counters.	Grid method is used alongside place value counters to support multiplication by two-digit numbers. <table border="1" data-bbox="1072 317 1352 595"><tr><td>×</td><td>40</td><td>4</td></tr><tr><td>30</td><td>1,200</td><td>120</td></tr><tr><td>2</td><td>80</td><td>8</td></tr></table> Children may also draw place value grids and counters to represent the multiplication.	×	40	4	30	1,200	120	2	80	8	Children use an expanded written method to multiply two-digit numbers by two-digit numbers. <table border="1" data-bbox="1688 341 1888 818"><tr><td></td><td>H</td><td>T</td><td>O</td></tr><tr><td></td><td></td><td>2</td><td>3</td></tr><tr><td>×</td><td></td><td>3</td><td>1</td></tr><tr><td></td><td></td><td>2</td><td>3</td></tr><tr><td>+</td><td>6</td><td>9</td><td>0</td></tr><tr><td></td><td>7</td><td>1</td><td>3</td></tr><tr><td></td><td>1</td><td></td><td></td></tr></table>		H	T	O			2	3	×		3	1			2	3	+	6	9	0		7	1	3		1					
×	40	4																																									
30	1,200	120																																									
2	80	8																																									
	H	T	O																																								
		2	3																																								
×		3	1																																								
		2	3																																								
+	6	9	0																																								
	7	1	3																																								
	1																																										
Multiplying three-digit numbers by a two-digit number	Children will continue to represent the multiplication using concrete resources as needed.	Children will continue to use the grid method alongside calculations as needed.	Children continue with the expanded method used to multiply two-digit numbers, applying this to three-digit numbers <table border="1" data-bbox="1688 1058 1977 1361"><tr><td colspan="5">132 × 23</td></tr><tr><td></td><td>Th</td><td>H</td><td>T</td><td>O</td></tr><tr><td></td><td></td><td>1</td><td>3</td><td>2</td></tr><tr><td>×</td><td></td><td></td><td>2</td><td>3</td></tr><tr><td></td><td></td><td>3</td><td>9</td><td>6</td></tr><tr><td>+</td><td>2</td><td>6</td><td>4</td><td>0</td></tr><tr><td></td><td>3</td><td>0</td><td>3</td><td>6</td></tr><tr><td></td><td>1</td><td>1</td><td></td><td></td></tr></table> (132 × 3) (132 × 20)	132 × 23						Th	H	T	O			1	3	2	×			2	3			3	9	6	+	2	6	4	0		3	0	3	6		1	1		
132 × 23																																											
	Th	H	T	O																																							
		1	3	2																																							
×			2	3																																							
		3	9	6																																							
+	2	6	4	0																																							
	3	0	3	6																																							
	1	1																																									

Multiplying four-digit numbers by a two-digit number	Children will continue to represent the multiplication using concrete resources as needed.	Children will continue to use the grid method alongside calculations as needed.	Children apply the same expanded method to four-digit numbers. $1,207 \times 36$<table><tr><td></td><td>TTh</td><td>Th</td><td>H</td><td>T</td><td>O</td></tr><tr><td></td><td></td><td>1</td><td>2</td><td>0</td><td>7</td></tr><tr><td>×</td><td></td><td></td><td></td><td>3</td><td>6</td></tr><tr><td></td><td></td><td>7</td><td>2</td><td>4</td><td>2</td></tr><tr><td>+</td><td>3</td><td>6</td><td>2</td><td>1</td><td>0</td></tr><tr><td></td><td>4</td><td>3</td><td>4</td><td>5</td><td>2</td></tr></table> 1 (1,207 × 6) (1,207 × 30)		TTh	Th	H	T	O			1	2	0	7	×				3	6			7	2	4	2	+	3	6	2	1	0		4	3	4	5	2					
	TTh	Th	H	T	O																																							
		1	2	0	7																																							
×				3	6																																							
		7	2	4	2																																							
+	3	6	2	1	0																																							
	4	3	4	5	2																																							
Divide numbers up to 4 digits by a one-digit number	Children use their knowledge from Year 4 of dividing 3-digits numbers by a 1-digit number to divide up to 4-digit numbers by a 1-digit number. They use place value counters to partition their number and then group to develop their understanding of the short division method. <table><tr><td>Thousands</td><td>Hundreds</td><td>Tens</td><td>Ones</td></tr><tr><td> 1000 1000 1000 1000 </td><td> 100 100 100 100 100 100 100 100 </td><td> 10 10 10 10 10 10 10 10 10 </td><td> 1 1 </td></tr></table><table><tr><td>Thousands</td><td>Hundreds</td><td>Tens</td><td>Ones</td></tr><tr><td> 1000 1000 1000 1000 </td><td> 100 100 100 100 100 100 100 100 </td><td> 10 10 10 10 10 10 10 10 10 </td><td> 1 1 1 1 1 1 1 1 1 1 1 1 </td></tr></table>	Thousands	Hundreds	Tens	Ones	1000 1000 1000 1000	100 100 100 100 100 100 100 100	10 10 10 10 10 10 10 10 10	1 1	Thousands	Hundreds	Tens	Ones	1000 1000 1000 1000	100 100 100 100 100 100 100 100	10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1 1	Children may draw place value grids and counters to represent the division.	Children begin to use the written method for short division alongside place value counters, progressing to using this method alone. <table><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td>1</td><td>2</td><td>2</td></tr><tr><td></td><td></td><td>2</td><td>3</td><td></td></tr><tr><td>4</td><td>4</td><td>8</td><td>9</td><td>2</td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table> The same method is used for dividing with remainders.								1	2	2			2	3		4	4	8	9	2					
Thousands	Hundreds	Tens	Ones																																									
1000 1000 1000 1000	100 100 100 100 100 100 100 100	10 10 10 10 10 10 10 10 10	1 1																																									
Thousands	Hundreds	Tens	Ones																																									
1000 1000 1000 1000	100 100 100 100 100 100 100 100	10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1 1																																									
		1	2	2																																								
		2	3																																									
4	4	8	9	2																																								

They then progress to dividing with remainders, using the same method.

Thousands	Hundreds	Tens	Ones
1000 1000	100 100	10 10	1
1000 1000	100 100	10 10	1 1
1000	100 100	10 10	1 1
	100 100	10 10	1 1
	100 100	10	1 1
	100 100		1 1

Year 6 Objectives

- Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context
- Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
- Perform mental calculations, including with mixed operations and large numbers
- Identify common factors, common multiples and prime numbers
- Use their knowledge of the order of operations to carry out calculations involving the four operations

Strategies	Concrete	Pictorial	Abstract																																																						
Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication	Children revisit strategies learned in Year 5 as needed.	Children revisit strategies learned in Year 5 as needed.	Children consolidate their knowledge of column multiplication and apply to problems in varying contexts. 1,207 × 36 <table><tr><td></td><td>TTh</td><td>Th</td><td>H</td><td>T</td><td>O</td></tr><tr><td></td><td></td><td>1</td><td>2</td><td>0</td><td>7</td></tr><tr><td>×</td><td></td><td></td><td></td><td>3</td><td>6</td></tr><tr><td></td><td></td><td>7</td><td>2</td><td>4</td><td>2</td></tr><tr><td></td><td></td><td>1</td><td></td><td>4</td><td></td></tr><tr><td>+</td><td>3</td><td>6</td><td>2</td><td>1</td><td>0</td></tr><tr><td></td><td></td><td></td><td>2</td><td></td><td></td></tr><tr><td></td><td>4</td><td>3</td><td>4</td><td>5</td><td>2</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>1</td></tr></table> (1,207 × 6) (1,207 × 30)		TTh	Th	H	T	O			1	2	0	7	×				3	6			7	2	4	2			1		4		+	3	6	2	1	0				2				4	3	4	5	2						1
	TTh	Th	H	T	O																																																				
		1	2	0	7																																																				
×				3	6																																																				
		7	2	4	2																																																				
		1		4																																																					
+	3	6	2	1	0																																																				
			2																																																						
	4	3	4	5	2																																																				
					1																																																				

Using short division to divide numbers up to four-digits by two-digit numbers	Children revisit strategies learned in Year 5 as needed.	Children revisit strategies learned in Year 5 as needed.	Children revisit short division method learned in Year 5 and use this to divide by two-digit numbers. 0264r1 13 3348353
Using long division to divide numbers up to four-digits by two-digit numbers	Children revisit strategies learned in Year 5 as needed.	Children revisit strategies learned in Year 5 as needed.	Children are introduced to long division as an alternative method for dividing by a two-digit number. They divide three-digit numbers by a two-digit number without remainders, starting with a more expanded method which shows multiples. 036 12 432 - 360 72 - 72 0 (x30) (x6) Multiples of 12: 12 x 1 = 12 12 x 2 = 24 12 x 3 = 36 12 x 4 = 48 12 x 5 = 60 12 x 6 = 72 12 x 7 = 84 12 x 8 = 96 12 x 9 = 108 12 x 10 = 120 Children then progress to dividing four-digit numbers by a two-digit number, using their knowledge of multiples and multiplying and dividing by 10 or 100 to calculate more efficiently.

			0	4	8	9	
15		7	3	3	5		
–		6	0	0	0		(×400)
		1	3	3	5		
–		1	2	0	0		(×80)
			1	3	5		
–			1	3	5		(×9)
					0		

Children then divide using long division where answers may have remainders.

			1	0	9	r	9
1	3		1	4	2	6	
	–		1	3	0	0	(× 100)
				1	2	6	
	–			1	1	7	(×9)
					9		