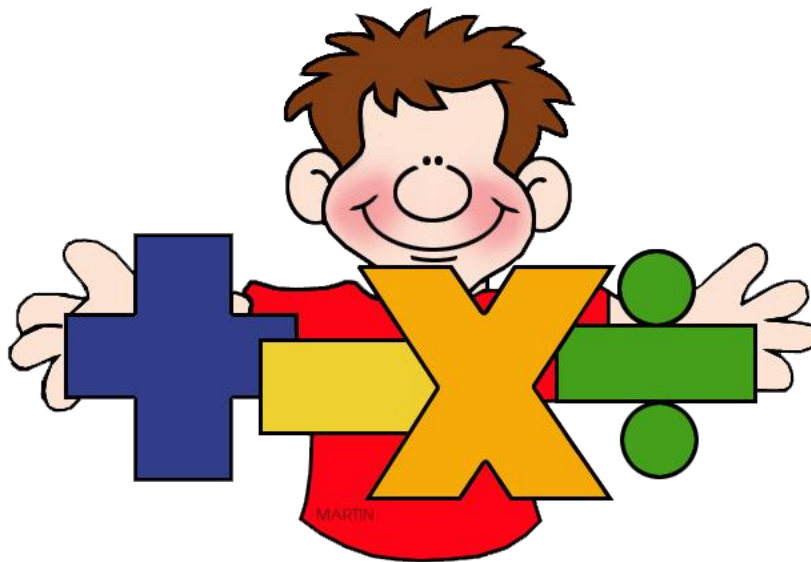


Upper Key Stage Two

Mathematics Calculation Policy

February 2022

Breadsall CE Primary School



Hope, Love & Respect

A flourishing community built on faith

Progression towards a standard written method of calculation

INTRODUCTION

At Breadsall CE Primary School, we aim to provide the best possible education for each child within the context of a caring Christian community. Maths is taught as part of a broad and balanced curriculum, which will enable each child to develop confidently and achieve to the best of his/her ability.

Aims and Objectives

The New Maths Curriculum is broadly broken down into **Arithmetic**, **Problem Solving** and **Reasoning** and aims to ensure that all pupils:

- become fluent in the fundamentals of **Arithmetic**, including varied and frequent practice with increasingly complex methods over time, so that pupils develop understanding and the ability to recall and apply maths facts.
- can **solve problems** by applying their maths knowledge to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.
- **reason** mathematically by following a line of enquiry and developing an argument, justification or proof using mathematical language.

This calculation policy has been written in line with the programmes of study taken from the revised National Curriculum for Mathematics (2014). It is largely based on the Abacus Calculation Policy, as we use the Abacus scheme for our planning and follow the many of the methods laid out in these plans. It provides guidance on appropriate calculation methods and progression. The content is set out in yearly blocks under the following headings: addition, subtraction, multiplication and division.

Children will use mental methods as their first port of call when appropriate, but for calculations that they cannot do in their heads, they will need to use an efficient written method accurately and with confidence.

HOW TO USE THIS POLICY

- Use the policy as the basis of your planning but ensure you use previous or following years' guidance to allow for personalised learning.
- Always use Assessment for Learning to identify suitable next steps in calculation for groups of children.
- If, at any time, children are making significant errors, return to the previous stage in calculation.
- Cross reference with the mental maths policy for guidance on key facts, key vocabulary and mental methods.
- Always use suitable resources, models and images to support children's understanding of calculation and place value, as appropriate.

Encourage children to make sensible choices about the methods they use when solving problems.

KEY STAGE 2

In upper Key Stage 2, children build on secure foundations in calculation, and develop fluency, accuracy and flexibility in their approach to the four operations. They work with whole numbers and adapt their skills to work with decimals, and they continue to develop their ability to select appropriate, accurate and efficient operations.

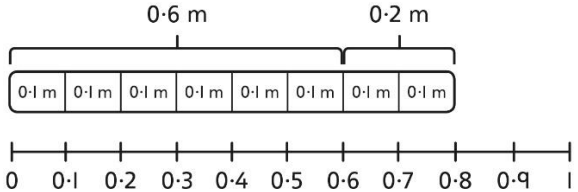
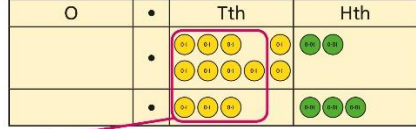
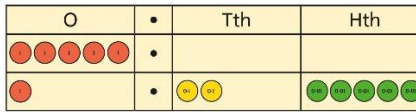
Key language: decimal, column methods, exchange, partition, mental method, ten thousand, hundred thousand, million, factor, multiple, prime number, square number, cube number

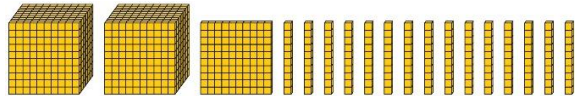
Addition and subtraction: Children build on their column methods to add and subtract numbers with up to seven digits, and they adapt the methods to calculate efficiently and effectively with decimals, ensuring understanding of place value at every stage. Children compare and contrast methods, and they select mental methods or jottings where appropriate and where these are more likely to be efficient or accurate when compared with formal column methods. Bar models are used to represent the calculations required to solve problems and may indicate where efficient methods can be chosen.

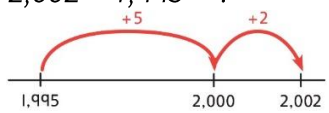
Multiplication and division: Building on their understanding, children develop methods to multiply up to 4-digit numbers by single-digit and 2-digit numbers. Children develop column methods with an understanding of place value, and they continue to use the key skill of unitising to multiply and divide by 10, 100 and 1,000. Written division methods are introduced and adapted for division by single-digit and 2-digit numbers and are understood alongside the area model and place value. In Year 6, children develop a secure understanding of how division is related to fractions. Multiplication and division of decimals are also introduced and refined in Year 6.

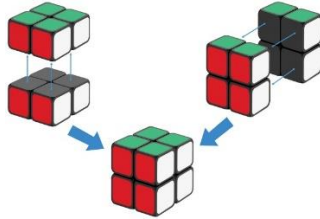
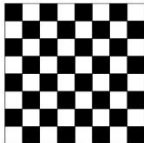
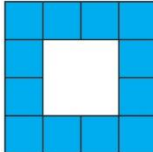
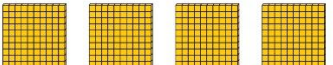
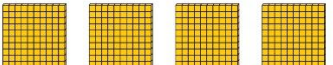
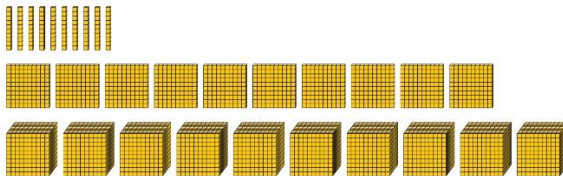
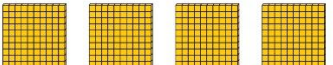
Fractions: Children find fractions of amounts, multiply a fraction by a whole number and by another fraction, divide a fraction by a whole number, and add and subtract fractions with different denominators. Children become more confident working with improper fractions and mixed numbers and can calculate with them. Understanding of decimals with up to 3 decimal places is built through place value and as fractions, and children calculate with decimals in the context of measure as well as in pure arithmetic. Children develop an understanding of percentages in relation to hundredths, and they understand how to work with common percentages: 50%, 25%, 10% and 1%.

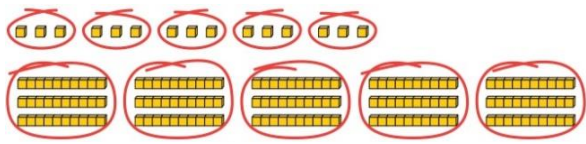
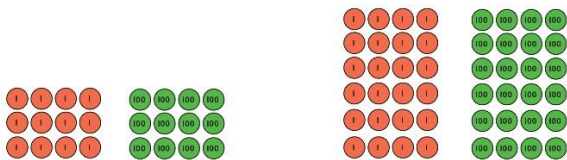
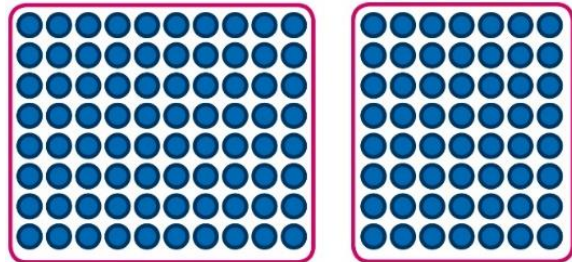
Year 5																																																																													
	Concrete	Pictorial	Abstract																																																																										
Year 5 Addition																																																																													
Column addition with whole numbers	Use place value equipment to represent additions. Add a row of counters onto the place value grid to show $15,735 + 4,012$. <table><tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>●</td><td>●●●●●</td><td>●●●●●</td><td>●●●●●</td><td>●●●●●</td></tr></table>	TTh	Th	H	T	O	●	●●●●●	●●●●●	●●●●●	●●●●●	Represent additions, using place value equipment on a place value grid alongside written methods. <table><tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>●●</td><td></td><td>●</td><td>●●●●●</td><td>●●●●●</td></tr><tr><td>●</td><td>●●●●●</td><td>●</td><td>●●●●●</td><td>●●●●●</td></tr></table> I need to exchange 10 tens for a 100. <table><tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>2</td><td>0</td><td>1</td><td>5</td><td>3</td></tr><tr><td>+</td><td>1</td><td>9</td><td>1</td><td>7</td><td>5</td></tr><tr><td>3</td><td>9</td><td>3</td><td>2</td><td>8</td></tr></table>	TTh	Th	H	T	O	●●		●	●●●●●	●●●●●	●	●●●●●	●	●●●●●	●●●●●	TTh	Th	H	T	O	2	0	1	5	3	+	1	9	1	7	5	3	9	3	2	8	Use column addition, including exchanges. <table><tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>1</td><td>9</td><td>1</td><td>7</td><td>5</td></tr><tr><td>+</td><td>1</td><td>8</td><td>4</td><td>1</td><td>7</td></tr><tr><td>3</td><td>7</td><td>5</td><td>9</td><td>2</td></tr></table>	TTh	Th	H	T	O	1	9	1	7	5	+	1	8	4	1	7	3	7	5	9	2							
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Representing additions		Bar models represent addition of two or more numbers in the context of problem solving. £19,579 £28,370 £16,725 Jen £2,600 Holly £2,600 £1,450 £4,050 <table><tr><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>2</td><td>6</td><td>0</td><td>0</td></tr><tr><td>+</td><td>1</td><td>4</td><td>5</td><td>0</td></tr><tr><td>4</td><td>0</td><td>5</td><td>0</td></tr></table> <table><tr><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>2</td><td>6</td><td>0</td><td>0</td></tr><tr><td>+</td><td>4</td><td>0</td><td>5</td><td>0</td></tr><tr><td>6</td><td>6</td><td>5</td><td>0</td></tr></table>	Th	H	T	O	2	6	0	0	+	1	4	5	0	4	0	5	0	Th	H	T	O	2	6	0	0	+	4	0	5	0	6	6	5	0	<table><tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>2</td><td>3</td><td>4</td><td>0</td><td>5</td></tr><tr><td>+</td><td>7</td><td>8</td><td>9</td><td>2</td></tr><tr><td>2</td><td>0</td><td>2</td><td>9</td><td>7</td></tr></table> <table><tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>2</td><td>3</td><td>4</td><td>0</td><td>5</td></tr><tr><td>+</td><td>7</td><td>8</td><td>9</td><td>2</td></tr><tr><td>3</td><td>1</td><td>2</td><td>9</td><td>7</td></tr></table> I will use $23,000 + 8,000$ to check.	TTh	Th	H	T	O	2	3	4	0	5	+	7	8	9	2	2	0	2	9	7	TTh	Th	H	T	O	2	3	4	0	5	+	7	8	9	2	3	1	2	9	7
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Adding tenths	Link measure with addition of decimals. <i>Two lengths of fencing are 0.6 m and 0.2 m.</i> <i>How long are they when added together?</i> 	Use a bar model with a number line to add tenths.  $0.6 + 0.2 = 0.8$ <i>6 tenths + 2 tenths = 8 tenths</i>	Understand the link with adding fractions. $\frac{6}{10} + \frac{2}{10} = \frac{8}{10}$ <i>6 tenths + 2 tenths = 8 tenths</i> $0.6 + 0.2 = 0.8$
Adding decimals using column addition	Use place value equipment to represent additions. <i>Show $0.23 + 0.45$ using place value counters.</i>	Use place value equipment on a place value grid to represent additions. Represent exchange where necessary.  Include examples where the numbers of decimal places are different. 	Add using a column method, ensuring that children understand the link with place value. $\begin{array}{r} \text{O} \cdot \text{Tth} \text{Hth} \\ 0 \cdot 2 \quad 3 \\ + 0 \cdot 4 \quad 5 \\ \hline 0 \cdot 6 \quad 8 \end{array}$ Include exchange where required, alongside an understanding of place value. $\begin{array}{r} \text{O} \cdot \text{Tth} \text{Hth} \\ 0 \cdot 9 \quad 2 \\ + 0 \cdot 3 \quad 3 \\ \hline 1 \cdot 2 \quad 5 \end{array}$ Include additions where the numbers of decimal places are different. $3.4 + 0.65 = ?$ $\begin{array}{r} \text{O} \cdot \text{Tth} \text{Hth} \\ 3 \cdot 4 \quad 0 \\ + 0 \cdot 6 \quad 5 \\ \hline \end{array}$

Year 5 Subtraction																																																																																								
Column subtraction with whole numbers	Use place value equipment to understand where exchanges are required. $2,250 - 1,070$ 	Represent the stages of the calculation using place value equipment on a grid alongside the calculation, including exchanges where required. $15,735 - 2,582 = 13,153$ <table><tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>1</td><td>5</td><td>7</td><td>3</td><td>5</td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table> Now subtract the 10s. Exchange 1 hundred for 10 tens. <table><tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>1</td><td>5</td><td>7</td><td>3</td><td>5</td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table> Subtract the 100s, 1,000s and 10,000s. <table><tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>1</td><td>5</td><td>7</td><td>3</td><td>5</td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>	TTh	Th	H	T	O	1	5	7	3	5											TTh	Th	H	T	O	1	5	7	3	5											TTh	Th	H	T	O	1	5	7	3	5											Use column subtraction methods with exchange where required. <table><tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>~~5~~</td><td>~~12~~</td><td>~~10~~</td><td>9</td><td>7</td></tr><tr><td>-</td><td>1</td><td>8</td><td>5</td><td>3</td></tr><tr><td></td><td>4</td><td>3</td><td>5</td><td>6</td></tr><tr><td></td><td></td><td></td><td>3</td><td></td></tr></table> $62,097 - 18,534 = 43,563$	TTh	Th	H	T	O	~~5~~	~~12~~	~~10~~	9	7	-	1	8	5	3		4	3	5	6				3	
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			3																																																																																					
Checking strategies and representing subtractions		Bar models represent subtractions in problem contexts, including 'find the difference'. <table><tr><td>Athletics Stadium</td><td>75,450</td><td></td></tr><tr><td>Hockey Centre</td><td></td><td>42,300</td></tr><tr><td>Velodrome</td><td>15,735</td><td>?</td></tr></table>	Athletics Stadium	75,450		Hockey Centre		42,300	Velodrome	15,735	?	Children can explain the mistake made when the columns have not been ordered correctly. <table><tr><th colspan="5">Bella's working</th><th colspan="5">Correct method</th></tr><tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>1</td><td>7</td><td>8</td><td>7</td><td>7</td><td>1</td><td>7</td><td>8</td><td>7</td><td>7</td></tr><tr><td>+</td><td>4</td><td>0</td><td>1</td><td>2</td><td>+</td><td>4</td><td>0</td><td>1</td><td>2</td></tr><tr><td></td><td>5</td><td>7</td><td>9</td><td>9</td><td></td><td>2</td><td>1</td><td>8</td><td>9</td></tr></table> Use approximation to check calculations. <i>I calculated $18,000 + 4,000$ mentally to check my subtraction.</i>	Bella's working					Correct method					TTh	Th	H	T	O	TTh	Th	H	T	O	1	7	8	7	7	1	7	8	7	7	+	4	0	1	2	+	4	0	1	2		5	7	9	9		2	1	8	9																										
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Choosing efficient methods			To subtract two large numbers that are close, children find the difference by counting on. $2,002 - 1,995 = ?$  Use addition to check subtractions. <i>I calculated $7,546 - 2,355 = 5,191$.</i> <i>I will check using the inverse.</i>																																																															
Subtracting decimals	Explore complements to a whole number by working in the context of length.  1 m - m = m $1 - 0.49 = ?$	Use a place value grid to represent the stages of column subtraction, including exchanges where required. $5.74 - 2.25 = ?$ <table data-bbox="954 772 1375 868"><tr><th>O</th><th>•</th><th>Tth</th><th>Hth</th></tr><tr><td>5</td><td></td><td>7</td><td>4</td></tr><tr><td>2</td><td></td><td>2</td><td>5</td></tr></table> Exchange 1 tenth for 10 hundredths. <table data-bbox="954 906 1375 1026"><tr><th>O</th><th>•</th><th>Tth</th><th>Hth</th></tr><tr><td>5</td><td></td><td>6</td><td>14</td></tr><tr><td>2</td><td></td><td>2</td><td>5</td></tr></table> Now subtract the 5 hundredths. <table data-bbox="954 1067 1375 1187"><tr><th>O</th><th>•</th><th>Tth</th><th>Hth</th></tr><tr><td>5</td><td></td><td>6</td><td>9</td></tr><tr><td>2</td><td></td><td>2</td><td>5</td></tr></table> Now subtract the 2 tenths, then the 2 ones. <table data-bbox="954 1227 1375 1347"><tr><th>O</th><th>•</th><th>Tth</th><th>Hth</th></tr><tr><td>3</td><td></td><td>4</td><td>9</td></tr><tr><td>2</td><td></td><td>2</td><td>5</td></tr></table>	O	•	Tth	Hth	5		7	4	2		2	5	O	•	Tth	Hth	5		6	14	2		2	5	O	•	Tth	Hth	5		6	9	2		2	5	O	•	Tth	Hth	3		4	9	2		2	5	Use column subtraction, with an understanding of place value, including subtracting numbers with different numbers of decimal places. $3.921 - 3.75 = ?$ <table data-bbox="1552 772 1812 916"><tr><th>O</th><th>•</th><th>Tth</th><th>Hth</th><th>Thth</th></tr><tr><td>3</td><td></td><td>9</td><td>2</td><td>1</td></tr><tr><td>3</td><td></td><td>7</td><td>5</td><td>0</td></tr></table>	O	•	Tth	Hth	Thth	3		9	2	1	3		7	5	0
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Year 5 Multiplication															
Understanding factors	Use cubes or counters to explore the meaning of 'square numbers'. <i>25 is a square number because it is made from 5 rows of 5.</i> Use cubes to explore cube numbers.  <i>8 is a cube number.</i>	Use images to explore examples and non-examples of square numbers.  $8 \times 8 = 64$ $8^2 = 64$  <i>12 is not a square number, because you cannot multiply a whole number by itself to make 12.</i>	Understand the pattern of square numbers in the multiplication tables. Use a multiplication grid to circle each square number. Can children spot a pattern?												
Multiplying by 10, 100 and 1,000	Use place value equipment to multiply by 10, 100 and 1,000 by unitising. <table><tr><td>$4 \times 1 = 4 \text{ ones} = 4$</td><td></td></tr><tr><td>$4 \times 10 = 4 \text{ tens} = 40$</td><td></td></tr><tr><td>$4 \times 100 = 4 \text{ hundreds} = 400$</td><td></td></tr></table>	$4 \times 1 = 4 \text{ ones} = 4$		$4 \times 10 = 4 \text{ tens} = 40$		$4 \times 100 = 4 \text{ hundreds} = 400$		Understand the effect of repeated multiplication by 10. 	Understand how exchange relates to the digits when multiplying by 10, 100 and 1,000. <table><tr><td>H</td><td>T</td><td>O</td></tr><tr><td></td><td>1</td><td>7</td></tr></table> $17 \times 10 = 170$ $17 \times 100 = 17 \times 10 \times 10 = 1,700$ $17 \times 1,000 = 17 \times 10 \times 10 \times 10 = 17,000$	H	T	O		1	7
$4 \times 1 = 4 \text{ ones} = 4$															
$4 \times 10 = 4 \text{ tens} = 40$															
$4 \times 100 = 4 \text{ hundreds} = 400$															
H	T	O													
	1	7													
Multiplying by multiples of 10, 100 and 1,000	Use place value equipment to explore multiplying by unitising.	Use place value equipment to represent how to multiply by multiples of 10, 100 and 1,000.	Use known facts and unitising to multiply. $5 \times 4 = 20$												

	 5 groups of 3 ones is 15 ones. 5 groups of 3 tens is 15 tens. So, I know that 5 groups of 3 thousands would be 15 thousands.	 $4 \times 3 = 12$ $4 \times 300 = 1,200$ $2,400$ $6 \times 4 = 24$ $6 \times 400 =$	$5 \times 40 = 200$ $5 \times 400 = 2,000$ $5 \times 4,000 = 20,000$ $5,000 \times 4 = 20,000$																										
Multiplying up to 4-digit numbers by a single digit	Explore how to use partitioning to multiply efficiently. $8 \times 17 = ?$  $8 \times 10 = 80$ $8 \times 7 = 56$ $80 + 56 = 136$ So, $8 \times 17 = 136$	Represent multiplications using place value equipment and add the 1s, then 10s, then 100s, then 1,000s. <table border="1" data-bbox="956 743 1404 1160"><thead><tr><th>H</th><th>T</th><th>O</th></tr></thead><tbody><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></tbody></table>	H	T	O																Use an area model and then add the parts. <table border="1" data-bbox="1554 700 2121 783"><thead><tr><th></th><th>100</th><th>60</th><th>3</th></tr></thead><tbody><tr><td>5</td><td>$100 \times 5 = 500$</td><td>$60 \times 5 = 300$</td><td>$3 \times 5 = 15$</td></tr></tbody></table> Use a column multiplication, including any required exchanges. $\begin{array}{r} 136 \\ \times 5 \\ \hline 680 \\ 1500 \\ \hline 6800 \end{array}$		100	60	3	5	$100 \times 5 = 500$	$60 \times 5 = 300$	$3 \times 5 = 15$
H	T	O																											
	100	60	3																										
5	$100 \times 5 = 500$	$60 \times 5 = 300$	$3 \times 5 = 15$																										
Multiplying 2-digit numbers	Partition one number into 10s and 1s, then add the parts.	Use an area model and add the parts. $28 \times 15 = ?$	Use column multiplication, ensuring understanding of place value at each stage.																										

by 2-digit numbers

$$23 \times 15 = ?$$



$$10 \times 15 = 150$$



$$10 \times 15 = 150$$



$$3 \times 15 = 45$$

There are 345 bottles of milk in total.

	H	T	O
	1	5	0
	1	5	0
+		4	5
	3	4	5

$$23 \times 15 = 345$$

	20 m	8 m
10 m	$20 \times 10 = 200 \text{ m}^2$	$8 \times 10 = 80 \text{ m}^2$
5 m	$20 \times 5 = 100 \text{ m}^2$	$8 \times 5 = 40 \text{ m}^2$

$$28 \times 15 = 420$$

	H	T	O
	2	0	0
	1	0	0
		8	0
+		4	0
	4	2	0

	3	4	
x	2	7	
	2	3	8
			34 x 7
	3	4	
x	2	7	
	2	3	8
	6	8	0
			34 x 20
	3	4	
x	2	7	
	2	3	8
	6	8	0
			34 x 20
	9	1	8
			34 x 27

Multiplying up to 4-digits by 2-digits

Use the area model then add the parts.

	100	40	3
10			
2			

$$143 \times 12 = 1,716$$

There are 1,716 boxes of cereal in total.

	Th	H	T	O
	1	0	0	0
		4	0	0
		2	0	0
			8	0
			3	0
+				6
	1	7	1	6

$$143 \times 12 = 1,716$$

Use column multiplication, ensuring understanding of place value at each stage.

	1	4	3	
x		1	2	
	2	8	6	
	1	4	3	0
	1	7	1	6

$$143 \times 2$$

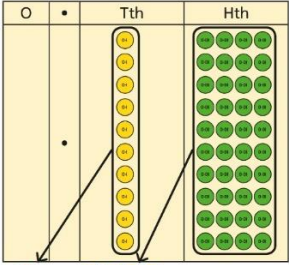
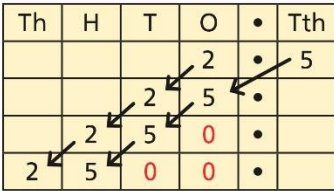
$$143 \times 10$$

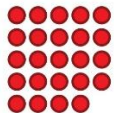
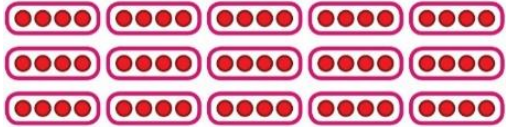
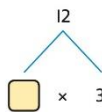
$$143 \times 12$$

Progress to include examples that require multiple exchanges as understanding, confidence and fluency build.

$$1,274 \times 32 = ?$$

First multiply 1,274 by 2.

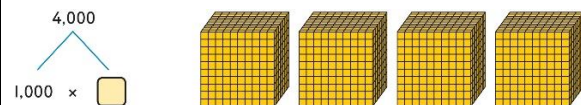
			$\begin{array}{r} 1\ 2\ 7\ 4 \\ \times \quad 3\ 2 \\ \hline 2\ 5\ 4\ 8 \end{array} \quad 1,274 \times 2$ Then multiply 1,274 by 30. $\begin{array}{r} 1\ 2\ 7\ 4 \\ \times \quad 3\ 2 \\ \hline 2\ 5\ 4\ 8 \quad 1,274 \times 2 \\ 3\ 8\ 2\ 2\ 0 \quad 1,274 \times 30 \\ \hline \end{array}$ Finally, find the total. $\begin{array}{r} 1\ 2\ 7\ 4 \\ \times \quad 3\ 2 \\ \hline 2\ 5\ 4\ 8 \quad 1,274 \times 2 \\ 3\ 8\ 2\ 2\ 0 \quad 1,274 \times 30 \\ \hline 4\ 0\ 7\ 6\ 8 \quad 1,274 \times 32 \\ \hline \end{array}$ $1,274 \times 32 = 40,768$
Multiplying decimals by 10, 100 and 1,000	Use place value equipment to explore and understand the exchange of 10 tenths, 10 hundredths or 10 thousandths.	Represent multiplication by 10 as exchange on a place value grid.  $0.14 \times 10 = 1.4$	Understand how this exchange is represented on a place value chart.  $2.5 \times 10 = 25$ $2.5 \times 100 = 250$ $2.5 \times 1,000 = 2,500$

Year 5 Division			
Understanding factors and prime numbers	Use equipment to explore the factors of a given number.  $24 \div 3 = 8$ $24 \div 8 = 3$ 8 and 3 are factors of 24 because they divide 24 exactly. $24 \div 5 = 4$ remainder 4.  5 is not a factor of 24 because there is a remainder.	Understand that prime numbers are numbers with exactly two factors. $13 \div 1 = 13$ $13 \div 2 = 6 \text{ r } 1$ $13 \div 4 = 4 \text{ r } 1$ 1 and 13 are the only factors of 13. 13 is a prime number.	Understand how to recognise prime and composite numbers. <i>I know that 31 is a prime number because it can be divided by only 1 and itself without leaving a remainder.</i> <i>I know that 33 is not a prime number as it can be divided by 1, 3, 11 and 33.</i> <i>I know that 1 is not a prime number, as it has only 1 factor.</i>
Understanding inverse operations and the link with multiplication, grouping and sharing	Use equipment to group and share and to explore the calculations that are present. <i>I have 28 counters.</i> <i>I made 7 groups of 4. There are 28 in total.</i> <i>I have 28 in total. I shared them equally into 7 groups. There are 4 in each group.</i> <i>I have 28 in total. I made groups of 4. There are 7 equal groups.</i>	Represent multiplicative relationships and explore the families of division facts.  $60 \div 4 = 15$ $60 \div 15 = 4$	Represent the different multiplicative relationships to solve problems requiring inverse operations. $12 \div 3 = \square$ $12 \div \square = 3$ $\square \times 3 = 12$ $\square \div 3 = 12$  Understand missing number problems for division calculations and know how to solve them using inverse operations. $22 \div ? = 2$ $22 \div 2 = ?$ $? \div 2 = 22$ $? \div 22 = 2$

Dividing whole numbers by 10, 100 and 1,000

Use place value equipment to support unitising for division.

$$4,000 \div 1,000$$



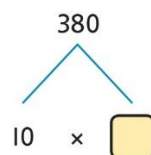
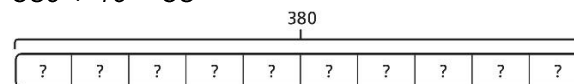
4,000 is 4 thousands.

$$4 \times 1,000 = 4,000$$

$$\text{So, } 4,000 \div 1,000 = 4$$

Use a bar model to support dividing by unitising.

$$380 \div 10 = 38$$



380 is 38 tens.

$$38 \times 10 = 380$$

$$10 \times 38 = 380$$

$$\text{So, } 380 \div 10 = 38$$

Understand how and why the digits change on a place value grid when dividing by 10, 100 or 1,000.

Th	H	T	O
3	2	0	0

$$3,200 \div 100 = ?$$

3,200 is 3 thousands and 2 hundreds.

$$200 \div 100 = 2$$

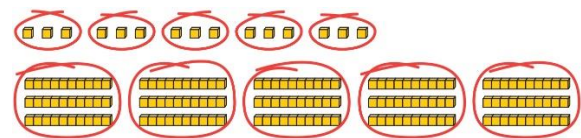
$$3,000 \div 100 = 30$$

$$3,200 \div 100 = 32$$

So, the digits will move two places to the right.

Dividing by multiples of 10, 100 and 1,000

Use place value equipment to represent known facts and unitising.



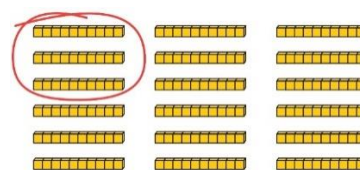
15 ones put into groups of 3 ones. There are 5 groups.

$$15 \div 3 = 5$$

15 tens put into groups of 3 tens. There are 5 groups.

$$150 \div 30 = 5$$

Represent related facts with place value equipment when dividing by unitising.



180 is 18 tens.

18 tens divided into groups of 3 tens. There are 6 groups.

$$180 \div 30 = 6$$

Reason from known facts, based on understanding of unitising. Use knowledge of the inverse relationship to check.

$$3,000 \div 5 = 600$$

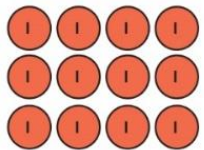
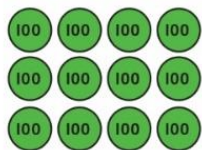
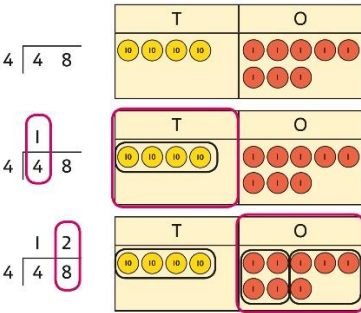
$$3,000 \div 50 = 60$$

$$3,000 \div 500 = 6$$

$$5 \times 600 = 3,000$$

$$50 \times 60 = 3,000$$

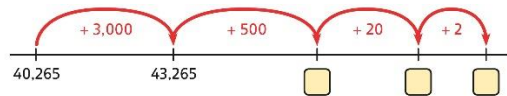
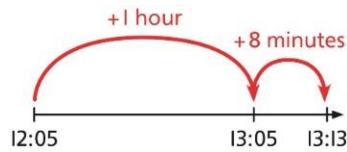
$$500 \times 6 = 3,000$$

		  12 ones divided into groups of 4. There are 3 groups. 12 hundreds divided into groups of 4 hundreds. There are 3 groups. $1200 \div 400 = 3$	
Dividing up to four digits by a single digit using short division	Explore grouping using place value equipment. $268 \div 2 = ?$ <i>There is 1 group of 2 hundreds.</i> <i>There are 3 groups of 2 tens.</i> <i>There are 4 groups of 2 ones.</i> $264 \div 2 = 134$	Use place value equipment on a place value grid alongside short division. The model uses grouping. A sharing model can also be used, although the model would need adapting.  Lay out the problem as a short division. <i>There is 1 group of 4 in 4 tens.</i> <i>There are 2 groups of 4 in 8 ones.</i> Work with divisions that require exchange.	Use short division for up to 4-digit numbers divided by a single digit. $\begin{array}{r} 0 \ 5 \ 5 \ 6 \\ 7 \overline{) 3 \ 8 \ 9 \ 2} \end{array}$ $3,892 \div 7 = 556$ Use multiplication to check. $556 \times 7 = ?$ $6 \times 7 = 42$ $50 \times 7 = 350$ $500 \times 7 = 3500$ $3,500 + 350 + 42 = 3,892$

		$\begin{array}{r} 4 \overline{) 92} \\ 2 \end{array}$ First, lay out the problem. $\begin{array}{r} 2 \\ 4 \overline{) 92} \end{array}$ How many groups of 4 go into 9 tens? 2 groups of 4 tens with 1 ten left over. $\begin{array}{r} 2 \\ 4 \overline{) 92} \end{array}$ Exchange the 1 ten left over for 10 ones. We now have 12 ones. $\begin{array}{r} 23 \\ 4 \overline{) 92} \end{array}$ How many groups of 4 go into 12 ones? 3 groups of 4 ones.	
Understanding remainders	Understand remainders using concrete versions of a problem. <i>80 cakes divided into trays of 6.</i> <i>80 cakes in total. They make 13 groups of 6, with 2 remaining.</i>	Use short division and understand remainders as the last remaining 1s. $\begin{array}{r} 6 \overline{) 80} \end{array}$ Lay out the problem as short division. $\begin{array}{r} 1 \\ 6 \overline{) 80} \end{array}$ How many groups of 6 go into 8 tens? There is 1 group of 6 tens. There are 2 tens remaining. $\begin{array}{r} 13 \text{ r } 2 \\ 6 \overline{) 80} \end{array}$ How many groups of 6 go into 20 ones? There are 3 groups of 6 ones. There are 2 ones remaining.	In problem solving contexts, represent divisions including remainders with a bar model. $683 = 136 \times 5 + 3$ $683 \div 5 = 136 \text{ r } 3$

$$11 \div 4 = \frac{11}{4} = 2\frac{3}{4}$$

Year 6

	Concrete	Pictorial	Abstract																																																																																																																																	
Year 6 Addition																																																																																																																																				
Comparing and selecting efficient methods	Represent 7-digit numbers on a place value grid, and use this to support thinking and mental methods. <table><tr><td>M</td><td>HTh</td><td>TTh</td><td>Th</td><td>H</td><td>T</td><td>O</td></tr><tr><td>●●</td><td>●●●●</td><td>●</td><td>●</td><td>●●●</td><td></td><td>●</td></tr></table>	M	HTh	TTh	Th	H	T	O	●●	●●●●	●	●	●●●		●	Discuss similarities and differences between methods, and choose efficient methods based on the specific calculation. Compare written and mental methods alongside place value representations. <table><tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>●●●●</td><td></td><td>●●</td><td>●●●●</td><td>●●●●</td></tr><tr><td></td><td>●●●</td><td>●●●●</td><td>●●</td><td>●●</td></tr></table><table><tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>4</td><td>0</td><td>2</td><td>6</td><td>5</td></tr><tr><td>+</td><td>3</td><td>5</td><td>2</td><td>2</td></tr><tr><td colspan="5"> </td></tr></table> Use bar model and number line representations to model addition in problem-solving and measure contexts. 	TTh	Th	H	T	O	●●●●		●●	●●●●	●●●●		●●●	●●●●	●●	●●	TTh	Th	H	T	O	4	0	2	6	5	+	3	5	2	2						Use column addition where mental methods are not efficient. Recognise common errors with column addition. $32,145 + 4,302 = ?$ <table><tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>3</td><td>2</td><td>1</td><td>4</td><td>5</td></tr><tr><td>+</td><td>4</td><td>3</td><td>0</td><td>2</td></tr><tr><td colspan="5"> </td></tr><tr><td>3</td><td>6</td><td>4</td><td>4</td><td>7</td></tr></table><table><tr><th>TTh</th><th>Th</th><th>H</th><th>T</th><th>O</th></tr><tr><td>3</td><td>2</td><td>1</td><td>4</td><td>5</td></tr><tr><td>+</td><td>4</td><td>3</td><td>0</td><td>2</td></tr><tr><td colspan="5"> </td></tr><tr><td>7</td><td>5</td><td>1</td><td>6</td><td>5</td></tr></table> Which method has been completed accurately? What mistake has been made? Column methods are also used for decimal additions where mental methods are not efficient. <table><tr><th>H</th><th>T</th><th>O</th><th>·</th><th>Tth</th><th>Hth</th></tr><tr><td>1</td><td>4</td><td>0</td><td>·</td><td>0</td><td>9</td></tr><tr><td>+</td><td>4</td><td>9</td><td>·</td><td>8</td><td>9</td></tr><tr><td colspan="6"> </td></tr><tr><td>1</td><td>8</td><td>9</td><td>·</td><td>8</td><td>8</td></tr></table> 1	TTh	Th	H	T	O	3	2	1	4	5	+	4	3	0	2						3	6	4	4	7	TTh	Th	H	T	O	3	2	1	4	5	+	4	3	0	2						7	5	1	6	5	H	T	O	·	Tth	Hth	1	4	0	·	0	9	+	4	9	·	8	9							1	8	9	·	8	8
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Selecting mental methods for larger numbers where appropriate

Represent 7-digit numbers on a place value grid, and use this to support thinking and mental methods.



$$2,411,301 + 500,000 = ?$$

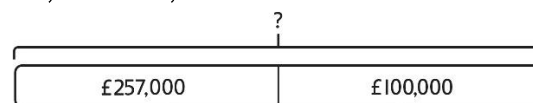
This would be 5 more counters in the HTh place.

So, the total is 2,911,301.

$$2,411,301 + 500,000 = 2,911,301$$

Use a bar model to support thinking in addition problems.

$$257,000 + 99,000 = ?$$



I added 100 thousands then subtracted 1 thousand.

257 thousands + 100 thousands = 357 thousands

$$257,000 + 100,000 = 357,000$$

$$357,000 - 1,000 = 356,000$$

$$\text{So, } 257,000 + 99,000 = 356,000$$

Use place value and unitising to support mental calculations with larger numbers.

$$195,000 + 6,000 = ?$$

$$195 + 5 + 1 = 201$$

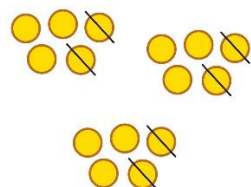
195 thousands + 6 thousands = 201 thousands

$$\text{So, } 195,000 + 6,000 = 201,000$$

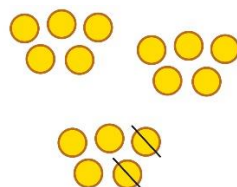
Understanding order of operations in calculations

Use equipment to model different interpretations of a calculation with more than one operation. Explore different results.

$$3 \times 5 - 2 = ?$$

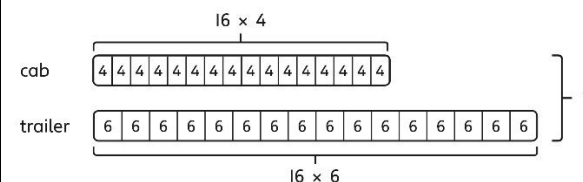


$$\begin{array}{r} 3 \times 5 - 2 \\ \downarrow \quad \downarrow \\ 3 \times 3 = 9 \end{array}$$



$$\begin{array}{r} 3 \times 5 - 2 \\ \downarrow \quad \downarrow \\ 15 - 2 = 13 \end{array}$$

Model calculations using a bar model to demonstrate the correct order of operations in multi-step calculations.



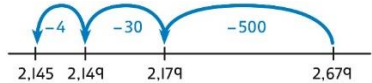
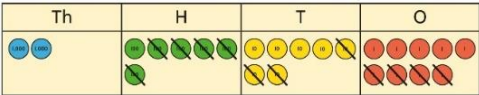
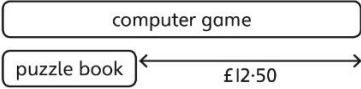
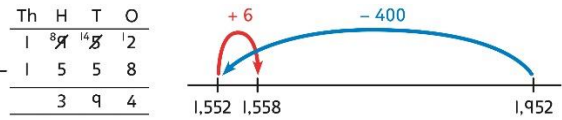
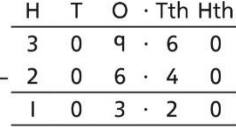
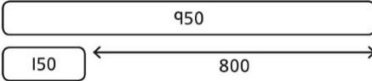
$$\begin{array}{r} \text{This can be written as: } 16 \times 4 + 16 \times 6 \\ \boxed{16 \times 4} + \boxed{16 \times 6} \\ 64 + 96 = 160 \end{array}$$

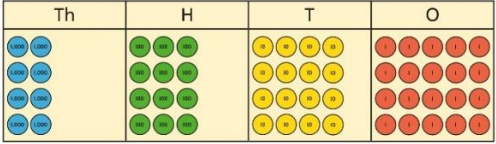
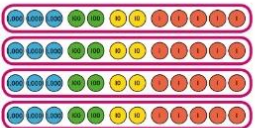
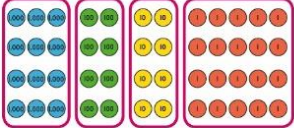
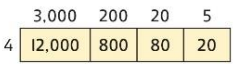
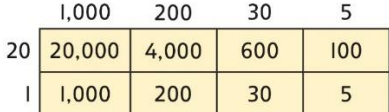
Understand the correct order of operations in calculations without brackets.

Understand how brackets affect the order of operations in a calculation.

$$\begin{array}{r} 4 + 6 \times 16 \\ 4 + 96 = 100 \end{array}$$

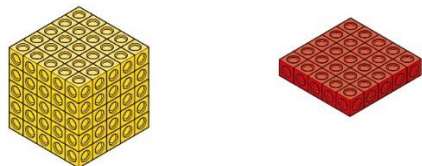
$$\begin{array}{r} (4 + 6) \times 16 \\ 10 \times 16 = 160 \end{array}$$

Year 6 Subtraction			
Comparing and selecting efficient methods	Use counters on a place value grid to represent subtractions of larger numbers. 	Compare subtraction methods alongside place value representations.   $\begin{array}{r} \text{Th} \quad \text{H} \quad \text{T} \quad \text{O} \\ 2 \quad 6 \quad 7 \quad 9 \\ - \quad 5 \quad 3 \quad 4 \\ \hline 2 \quad 1 \quad 4 \quad 5 \end{array}$ Use a bar model to represent calculations, including 'find the difference' with two bars as comparison. 	Compare and select methods. Use column subtraction when mental methods are not efficient. Use two different methods for one calculation as a checking strategy.  Use column subtraction for decimal problems, including in the context of measure. 
Subtracting mentally with larger numbers		Use a bar model to show how unitising can support mental calculations. $950,000 - 150,000$ That is 950 thousands – 150 thousands  So, the difference is 800 thousands. $950,000 - 150,000 = 800,000$	Subtract efficiently from powers of 10. $10,000 - 500 = ?$

Year 6 Multiplication			
Multiplying up to a 4-digit number by a single digit number	Use equipment to explore multiplications.  4 groups of 2,345 This is a multiplication: $4 \times 2,345$ $2,345 \times 4$	Use place value equipment to compare methods. Method 1  $\begin{array}{r} 3\ 2\ 2\ 5 \\ 3\ 2\ 2\ 5 \\ 3\ 2\ 2\ 5 \\ +\ 3\ 2\ 2\ 5 \\ \hline 1\ 2\ 9\ 0\ 0 \\ \text{1}\quad\text{1}\quad\text{2} \end{array}$ Method 2  $4 \times 3,000\ 4 \times 200\ 4 \times 20\ 4 \times 5$ $12,000 + 800 + 80 + 20 = 12,900$	Understand area model and short multiplication. Compare and select appropriate methods for specific multiplications. Method 3  $12,000 + 800 + 80 + 20 = 12,900$ Method 4 $\begin{array}{r} 3\ 2\ 2\ 5 \\ \times\quad\quad\quad 4 \\ \hline 1\ 2\ 9\ 0\ 0 \\ \text{1}\quad\text{2} \end{array}$
Multiplying up to a 4-digit number by a 2-digit number		Use an area model alongside written multiplication. Method 1  $\begin{array}{r} 1\ 2\ 3\ 5 \\ \times\quad\quad\quad 2\ 1 \\ \hline 5 \\ 3\ 0 \\ 2\ 0\ 0 \\ 1\ 0\ 0\ 0 \\ 1\ 0\ 0 \\ 6\ 0\ 0 \\ 4\ 0\ 0\ 0 \\ 2\ 0\ 0\ 0\ 0 \\ \hline 2\ 5\ 9\ 3\ 5 \end{array}$ $\begin{array}{r} 1\ 2\ 3\ 5 \\ \times\quad\quad\quad 2\ 1 \\ \hline 5 \\ 3\ 0 \\ 2\ 0\ 0 \\ 1\ 0\ 0\ 0 \\ 1\ 0\ 0 \\ 6\ 0\ 0 \\ 4\ 0\ 0\ 0 \\ 2\ 0\ 0\ 0\ 0 \\ \hline 2\ 5\ 9\ 3\ 5 \end{array}$ 1×5 1×30 1×200 $1 \times 1,000$ 20×5 20×30 20×200 $20 \times 1,000$ $21 \times 1,235$	Use compact column multiplication with understanding of place value at all stages. $\begin{array}{r} 1\ 2\ 3\ 5 \\ \times\quad\quad\quad 2\ 1 \\ \hline 1\ 2\ 3\ 5 \\ 2\ 4\ 7\ 0\ 0 \\ \hline 2\ 5\ 9\ 3\ 5 \end{array}$ $1 \times 1,235$ $20 \times 1,235$ $21 \times 1,235$

Using knowledge of factors and partitions to compare methods for multiplications

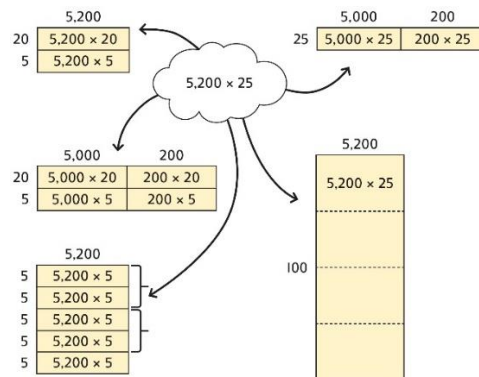
Use equipment to understand square numbers and cube numbers.



$$5 \times 5 = 5^2 = 25$$

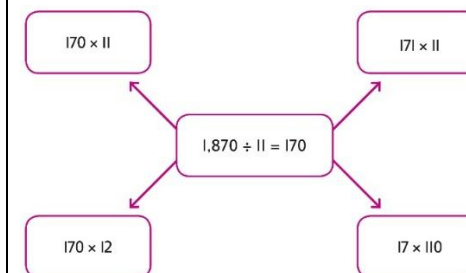
$$5 \times 5 \times 5 = 5^3 = 25 \times 5 = 125$$

Compare methods visually using an area model. Understand that multiple approaches will produce the same answer if completed accurately.



Represent and compare methods using a bar model.

Use a known fact to generate families of related facts.



Use factors to calculate efficiently.

$$15 \times 16$$

$$= 3 \times 5 \times 2 \times 8$$

$$= 3 \times 8 \times 2 \times 5$$

$$= 24 \times 10$$

$$= 240$$

Multiplying by 10, 100 and 1,000

Use place value equipment to explore exchange in decimal multiplication.

T	O	.	Tth
		.	3

Represent 0.3.

T	O	.	Tth
		.	30

Multiply by 10.

T	O	.	Tth
3		.	

Exchange each group of ten tenths.

$$0.3 \times 10 = ?$$

0.3 is 3 tenths.
10 x 3 tenths are 30 tenths.
30 tenths are equivalent to 3 ones.

Understand how the exchange affects decimal numbers on a place value grid.

T	O	.	Tth
3		.	

T	O	.	Tth
3		.	

$$0.3 \times 10 = 3$$

T	O	.	Tth
3		.	

T	O	.	Tth
3		.	

Use knowledge of multiplying by 10, 100 and 1,000 to multiply by multiples of 10, 100 and 1,000.

$$8 \times 100 = 800$$

$$8 \times 300 = 800 \times 3$$

$$= 2,400$$

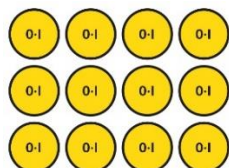
$$2.5 \times 10 = 25$$

$$2.5 \times 20 = 2.5 \times 10 \times 2$$

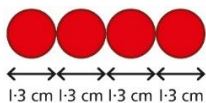
$$= 50$$

Multiplying decimals

Explore decimal multiplications using place value equipment and in the context of measures.



3 groups of 4 tenths is 12 tenths.
4 groups of 3 tenths is 12 tenths.



$$4 \times 1 \text{ cm} = 4 \text{ cm}$$

$$4 \times 0.3 \text{ cm} = 1.2 \text{ cm}$$

$$4 \times 1.3 = 4 + 1.2 = 5.2 \text{ cm}$$

Represent calculations on a place value grid.

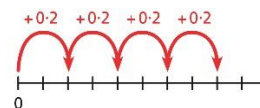
$$3 \times 3 = 9$$

$$3 \times 0.3 = 0.9$$

T	O	.	Tth

Understand the link between multiplying decimals and repeated addition.

T	O	.	Tth



Use known facts to multiply decimals.

$$4 \times 3 = 12$$

$$4 \times 0.3 = 1.2$$

$$4 \times 0.03 = 0.12$$

$$20 \times 5 = 100$$

$$20 \times 0.5 = 10$$

$$20 \times 0.05 = 1$$

Find families of facts from a known multiplication.

I know that $18 \times 4 = 72$.

This can help me work out:

$$1.8 \times 4 = ?$$

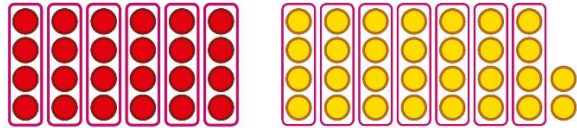
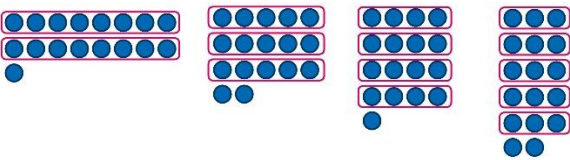
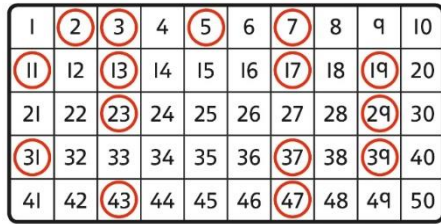
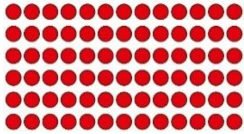
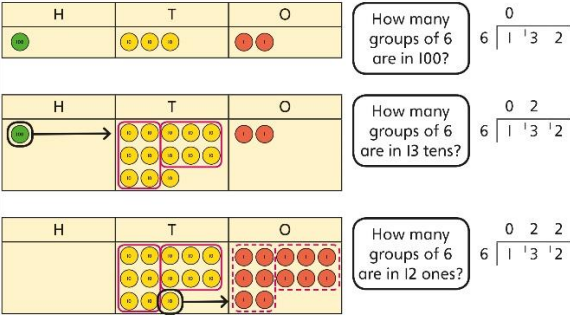
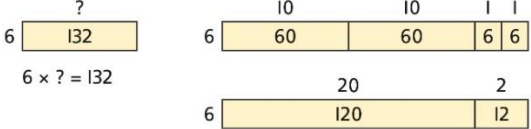
$$18 \times 0.4 = ?$$

$$180 \times 0.4 = ?$$

$$18 \times 0.04 = ?$$

Use a place value grid to understand the effects of multiplying decimals.

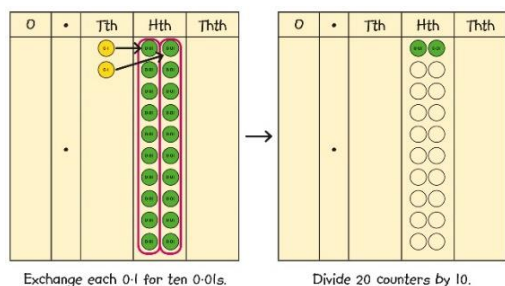
	H	T	O	.	Tth	Hth
2×3			6	.		
0.2×3			0	.	6	
0.02×3				.		

Year 6 Division			
Understanding factors	Use equipment to explore different factors of a number.  $24 \div 4 = 6$ $30 \div 4 = 7 \text{ remainder } 2$ <i>4 is a factor of 24 but is not a factor of 30.</i>	Recognise prime numbers as numbers having exactly two factors. Understand the link with division and remainders.  $17 \div 2 = 8 \text{ r } 1$ $17 \div 3 = 5 \text{ r } 2$ $17 \div 4 = 4 \text{ r } 1$ $17 \div 5 = 3 \text{ r } 2$	Recognise and know primes up to 100. Understand that 2 is the only even prime, and that 1 is not a prime number. 
Dividing by a single digit	Use equipment to make groups from a total.  <i>There are 78 in total. There are 6 groups of 13. There are 13 groups of 6.</i>	 How many groups of 6 are in 100? $6 \overline{) 132}$ How many groups of 6 are in 13 tens? $6 \overline{) 132}$ How many groups of 6 are in 12 ones? $6 \overline{) 132}$	Use short division to divide by a single digit. $\begin{array}{r} 0 \\ 6 \overline{) 132} \end{array}$ $\begin{array}{r} 0 \quad 2 \\ 6 \overline{) 132} \end{array}$ $\begin{array}{r} 0 \quad 2 \quad 2 \\ 6 \overline{) 132} \end{array}$ Use an area model to link multiplication and division.  $6 \times ? = 132$ $132 = 120 + 12$ $132 \div 6 = 20 + 2 = 22$

Dividing by a 2-digit number using factors	Understand that division by factors can be used when dividing by a number that is not prime.	Use factors and repeated division. $1,260 \div 14 = ?$ 1,260 $1,260 \div 2 = 630$ $630 \div 7 = 90$ $1,260 \div 14 = 90$	Use factors and repeated division where appropriate. $2,100 \div 12 = ?$ 2,100 → ÷ 2 → ÷ 6 → 2,100 → ÷ 6 → ÷ 2 → 2,100 → ÷ 3 → ÷ 4 → 2,100 → ÷ 4 → ÷ 3 → 2,100 → ÷ 3 → ÷ 2 → ÷ 2 →
Dividing by a 2-digit number using long division	Use equipment to build numbers from groups. 182 divided into groups of 13. There are 14 groups.	Use an area model alongside written division to model the process. $377 \div 13 = ?$ 13 377 10 ? 130 247 10 10 ? 130 130 117 29 10 10 9 130 130 117 $377 \div 13 = 29$	Use long division where factors are not useful (for example, when dividing by a 2-digit prime number). Write the required multiples to support the division process. $377 \div 13 = ?$ 0 13 26 39 52 65 78 91 104 117 130 0 × 13 1 × 13 2 × 13 3 × 13 4 × 13 5 × 13 6 × 13 7 × 13 8 × 13 9 × 13 10 × 13 13 377 130 247 10 9 130 130 117 $377 \div 13 = 29$

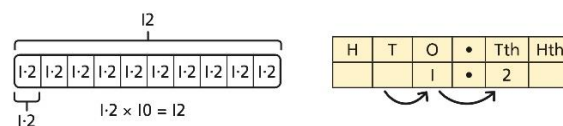
Dividing by 10, 100 and 1,000

Use place value equipment to explore division as exchange.

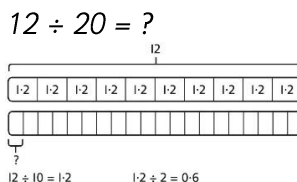


0.2 is 2 tenths.
2 tenths is equivalent to 20 hundredths.
20 hundredths divided by 10 is 2 hundredths.

Represent division to show the relationship with multiplication. Understand the effect of dividing by 10, 100 and 1,000 on the digits on a place value grid.



Understand how to divide using division by 10, 100 and 1,000.



A slightly different layout may be used, with the division completed above rather than at the side.

$$\begin{array}{r} 3 \\ 21 \overline{) 798} \\ - 630 \\ \hline 168 \end{array}$$

$$\begin{array}{r} 38 \\ 21 \overline{) 798} \\ - 630 \\ \hline 168 \\ - 168 \\ \hline 0 \end{array}$$

Divisions with a remainder explored in problem-solving contexts.

Use knowledge of factors to divide by multiples of 10, 100 and 1,000.

$$40 \div 50 = \boxed{}$$

$$40 \rightarrow \boxed{\div 10} \rightarrow \boxed{\div 5} \rightarrow ?$$

$$40 \rightarrow \boxed{\div 5} \rightarrow \boxed{\div 10} \rightarrow ?$$

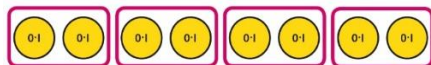
$$40 \div 5 = 8$$

$$8 \div 10 = 0.8$$

$$\text{So, } 40 \div 50 = 0.8$$

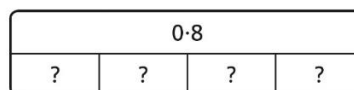
Dividing decimals

Use place value equipment to explore division of decimals.



8 tenths divided into 4 groups. 2 tenths in each group.

Use a bar model to represent divisions.



$$4 \times 2 = 8$$

$$8 \div 4 = 2$$

$$\text{So, } 4 \times 0.2 = 0.8$$

$$0.8 \div 4 = 0.2$$

Use short division to divide decimals with up to 2 decimal places.

$$8 \overline{) 4.24}$$

$$0 \cdot$$

$$8 \overline{) 4.24}$$

$$0 \cdot 5$$

$$8 \overline{) 4.24}$$

$$0 \cdot 53$$

$$8 \overline{) 4.24}$$