

Calculation policy

Year 5 and 6


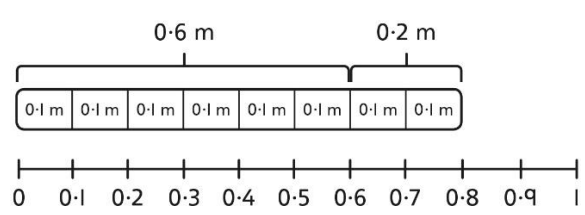
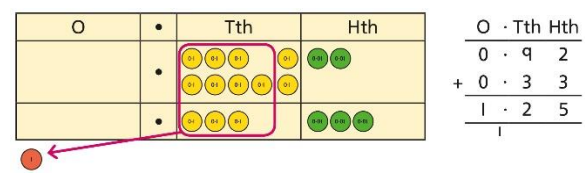
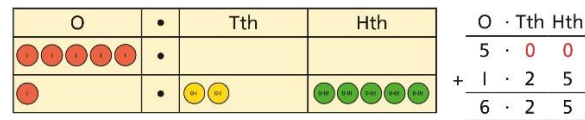
Year 5 Addition and Subtraction

Objectives	Key Skills
<ul style="list-style-type: none"> • add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) • add and subtract numbers mentally with increasingly large numbers • use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy • solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. 	<p>Addition</p> <ul style="list-style-type: none"> • Add numbers mentally with increasingly large numbers, using and practising a range of mental strategies ie. add the nearest multiple of 10, 100, 100 and adjust; use near doubles, inverse, partitioning and re-combining; using number bonds. • Use rounding to check answers and accuracy. • Solve multi-step problems in contexts, deciding which operations and methods to use and why. • Read, write, order and compare numbers to at least 1 million and determine the value of each digit. • Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000. • Add numbers with more than 4 digits using formal written method of columnar addition.
Vocabulary	<p>Subtraction</p> <ul style="list-style-type: none"> • Subtract numbers mentally with increasingly large numbers . • Use rounding and estimation to check answers to calculations and determine, in a range of contexts, levels of accuracy . • Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why. • Read, write, order and compare numbers to at least 1 million and determine the value of each digit. • Count forwards or backwards in steps of powers of 10 for any given number up to 1 million. • Interpret negative numbers in context, counting forwards and backwards with positive and negative integers through 0. • Round any number up to 1 million to the nearest 10, 100, 1000, 10 000 and 100 000.
<p>Addition add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, „carry“, expanded, compact, vertical, thousands, hundreds, digits, inverse & decimal places, decimal point, tenths, hundredths, thousandths</p> <p>Subtraction equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is_? difference, count on, strategy, partition, tens, units exchange, decrease, hundreds, value, digit, inverse, tenths, hundredths, decimal point, decimal</p>	

Year 5

Year 5: Addition

	Concrete	Pictorial	Abstract																																																																											
Column addition with whole numbers	<p>Use place value equipment to represent additions.</p> <p><i>Add a row of counters onto the place value grid to show $15,735 + 4,012$.</i></p> <div style="text-align: center;"> <table border="1" style="margin: auto; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">TTh</th> <th style="width: 15%;">Th</th> <th style="width: 15%;">H</th> <th style="width: 15%;">T</th> <th style="width: 15%;">O</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">●</td> <td style="text-align: center;">●●●●●</td> <td style="text-align: center;">●●●●● ●●</td> <td style="text-align: center;">●●●●</td> <td style="text-align: center;">●●●●●</td> </tr> </tbody> </table> </div>	TTh	Th	H	T	O	●	●●●●●	●●●●● ●●	●●●●	●●●●●	<p>Represent additions, using place value equipment on a place value grid alongside written methods.</p> <div style="text-align: center;"> <table border="1" style="margin: auto; border-collapse: collapse;"> <thead> <tr> <th style="width: 12%;">TTh</th> <th style="width: 12%;">Th</th> <th style="width: 12%;">H</th> <th style="width: 12%;">T</th> <th style="width: 12%;">O</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">●●</td> <td></td> <td style="text-align: center;">●</td> <td style="text-align: center;">●●●●●</td> <td style="text-align: center;">●●●●</td> </tr> <tr> <td style="text-align: center;">●●</td> <td style="text-align: center;">●●●●● ●●●●●</td> <td style="text-align: center;">●</td> <td style="text-align: center;">●●●●● ●●</td> <td style="text-align: center;">●●●●●</td> </tr> </tbody> </table> </div> <p><i>I need to exchange 10 tens for a 100.</i></p> <div style="text-align: center;"> <table style="margin: auto;"> <thead> <tr> <th style="width: 10%;">TTh</th> <th style="width: 10%;">Th</th> <th style="width: 10%;">H</th> <th style="width: 10%;">T</th> <th style="width: 10%;">O</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">5</td> <td style="text-align: center;">3</td> </tr> <tr> <td style="text-align: center;">+</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;">7</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">9</td> <td style="text-align: center;">3</td> <td style="text-align: center;">2</td> <td style="text-align: center;">8</td> </tr> </tbody> </table> </div>	TTh	Th	H	T	O	●●		●	●●●●●	●●●●	●●	●●●●● ●●●●●	●	●●●●● ●●	●●●●●	TTh	Th	H	T	O	2	0	1	5	3	+	1	9	1	7	3	9	3	2	8	<p>Use column addition, including exchanges.</p> <div style="text-align: center;"> <table style="margin: auto;"> <thead> <tr> <th style="width: 10%;">TTh</th> <th style="width: 10%;">Th</th> <th style="width: 10%;">H</th> <th style="width: 10%;">T</th> <th style="width: 10%;">O</th> </tr> </thead> <tbody> <tr> <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;">7</td> <td style="text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">+</td> <td style="text-align: center;">1</td> <td style="text-align: center;">8</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">7</td> <td style="text-align: center;">5</td> <td style="text-align: center;">9</td> <td style="text-align: center;">2</td> </tr> </tbody> </table> </div>	TTh	Th	H	T	O	1	9	1	7	5	+	1	8	4	1	3	7	5	9	2										
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Representing additions		<p>Bar models represent addition of two or more numbers in the context of problem solving.</p> <div style="text-align: center;"> <table style="margin: auto;"> <tr> <td style="border: 1px solid black; padding: 5px;">£19,579</td> <td style="border: 1px solid black; padding: 5px;">£28,370</td> <td style="border: 1px solid black; padding: 5px;">£16,725</td> </tr> </table> </div> <div style="margin-top: 10px;"> <p>Jen: £2,600</p> <p>Holly: £2,600 + £1,450</p> <p style="text-align: center;">} ?</p> <p style="text-align: center;">£4,050</p> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <table style="margin: auto;"> <thead> <tr> <th style="width: 10%;">Th</th> <th style="width: 10%;">H</th> <th style="width: 10%;">T</th> <th style="width: 10%;">O</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">6</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> </tr> <tr> <td style="text-align: center;">+</td> <td style="text-align: center;">1</td> <td style="text-align: center;">4</td> <td style="text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">0</td> <td style="text-align: center;">5</td> <td style="text-align: center;">0</td> </tr> </tbody> </table> <table style="margin: auto;"> <thead> <tr> <th style="width: 10%;">Th</th> <th style="width: 10%;">H</th> <th style="width: 10%;">T</th> <th style="width: 10%;">O</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">6</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> </tr> <tr> <td style="text-align: center;">+</td> <td style="text-align: center;">4</td> <td style="text-align: center;">0</td> <td style="text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">6</td> <td style="text-align: center;">6</td> <td style="text-align: center;">5</td> <td style="text-align: center;">0</td> </tr> </tbody> </table> </div>	£19,579	£28,370	£16,725	Th	H	T	O	2	6	0	0	+	1	4	5	4	0	5	0	Th	H	T	O	2	6	0	0	+	4	0	5	6	6	5	0	<p>Use approximation to check whether answers are reasonable.</p> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <table style="margin: auto;"> <thead> <tr> <th style="width: 10%;">TTh</th> <th style="width: 10%;">Th</th> <th style="width: 10%;">H</th> <th style="width: 10%;">T</th> <th style="width: 10%;">O</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">0</td> <td style="text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">+</td> <td style="text-align: center;">7</td> <td style="text-align: center;">8</td> <td style="text-align: center;">9</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">0</td> <td style="text-align: center;">2</td> <td style="text-align: center;">9</td> <td style="text-align: center;">7</td> </tr> </tbody> </table> <table style="margin: auto;"> <thead> <tr> <th style="width: 10%;">TTh</th> <th style="width: 10%;">Th</th> <th style="width: 10%;">H</th> <th style="width: 10%;">T</th> <th style="width: 10%;">O</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">0</td> <td style="text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">+</td> <td style="text-align: center;">7</td> <td style="text-align: center;">8</td> <td style="text-align: center;">9</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">9</td> <td style="text-align: center;">7</td> </tr> </tbody> </table> </div> <p><i>I will use $23,000 + 8,000$ to check.</i></p>	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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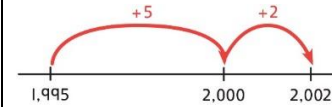
<p>Adding tenths</p>	<p>Link measure with addition of decimals.</p> <p>Two lengths of fencing are 0.6 m and 0.2 m. How long are they when added together?</p> 	<p>Use a bar model with a number line to add tenths.</p>  <p>$0.6 + 0.2 = 0.8$ 6 tenths + 2 tenths = 8 tenths</p>	<p>Understand the link with adding fractions.</p> $\frac{6}{10} + \frac{2}{10} = \frac{8}{10}$ <p>6 tenths + 2 tenths = 8 tenths $0.6 + 0.2 = 0.8$</p>
<p>Adding decimals using column addition</p>	<p>Use place value equipment to represent additions.</p> <p>Show $0.23 + 0.45$ using place value counters.</p>	<p>Use place value equipment on a place value grid to represent additions.</p> <p>Represent exchange where necessary.</p>  <p>Include examples where the numbers of decimal places are different.</p> 	<p>Add using a column method, ensuring that children understand the link with place value.</p> $\begin{array}{r} 0 \cdot \text{Tth Hth} \\ 0 \cdot 2 \ 3 \\ + 0 \cdot 4 \ 5 \\ \hline 0 \cdot 6 \ 8 \end{array}$ <p>Include exchange where required, alongside an understanding of place value.</p> $\begin{array}{r} 0 \cdot \text{Tth Hth} \\ 0 \cdot 9 \ 2 \\ + 0 \cdot 3 \ 3 \\ \hline 1 \cdot 2 \ 5 \end{array}$ <p>Include additions where the numbers of decimal places are different.</p> <p>$3.4 + 0.65 = ?$</p> $\begin{array}{r} 0 \cdot \text{Tth Hth} \\ 3 \cdot 4 \ 0 \\ + 0 \cdot 6 \ 5 \\ \hline \end{array}$

Year 5: Subtraction

	Concrete	Pictorial	Abstract																																																								
Column subtraction with whole numbers	<p>Use place value equipment to understand where exchanges are required.</p> <p>$2,250 - 1,070$</p>	<p>Represent the stages of the calculation using place value equipment on a grid alongside the calculation, including exchanges where required.</p> <p>$15,735 - 2,582 = 13,153$</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="border: 1px solid black; padding: 2px;">TTh</td> <td style="border: 1px solid black; padding: 2px;">Th</td> <td style="border: 1px solid black; padding: 2px;">H</td> <td style="border: 1px solid black; padding: 2px;">T</td> <td style="border: 1px solid black; padding: 2px;">O</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="text-align: center;">●</td> <td style="text-align: center;">●●●●●</td> <td style="text-align: center;">●●●●●</td> <td style="text-align: center;">●●●●●</td> <td style="text-align: center;">●●●●●</td> <td style="padding: 2px;">$\begin{array}{r} 15735 \\ - 2582 \\ \hline \end{array}$</td> </tr> </table> <p style="text-align: center; font-size: small;">Now subtract the 10s. Exchange 1 hundred for 10 tens.</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="border: 1px solid black; padding: 2px;">TTh</td> <td style="border: 1px solid black; padding: 2px;">Th</td> <td style="border: 1px solid black; padding: 2px;">H</td> <td style="border: 1px solid black; padding: 2px;">T</td> <td style="border: 1px solid black; padding: 2px;">O</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="text-align: center;">●</td> <td style="text-align: center;">●●●●●</td> <td style="text-align: center;">●●●●●</td> <td style="text-align: center;">●●●●●</td> <td style="text-align: center;">●●●●●</td> <td style="padding: 2px;">$\begin{array}{r} 15735 \\ - 2582 \\ \hline 53 \end{array}$</td> </tr> </table> <p style="text-align: center; font-size: small;">Subtract the 100s, 1,000s and 10,000s.</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="border: 1px solid black; padding: 2px;">TTh</td> <td style="border: 1px solid black; padding: 2px;">Th</td> <td style="border: 1px solid black; padding: 2px;">H</td> <td style="border: 1px solid black; padding: 2px;">T</td> <td style="border: 1px solid black; padding: 2px;">O</td> <td style="padding: 2px;"></td> </tr> <tr> <td style="text-align: center;">●</td> <td style="text-align: center;">●●●●●</td> <td style="text-align: center;">●●●●●</td> <td style="text-align: center;">●●●●●</td> <td style="text-align: center;">●●●●●</td> <td style="padding: 2px;">$\begin{array}{r} 15735 \\ - 2582 \\ \hline 13153 \end{array}$</td> </tr> </table>	TTh	Th	H	T	O		●	●●●●●	●●●●●	●●●●●	●●●●●	$\begin{array}{r} 15735 \\ - 2582 \\ \hline \end{array}$	TTh	Th	H	T	O		●	●●●●●	●●●●●	●●●●●	●●●●●	$\begin{array}{r} 15735 \\ - 2582 \\ \hline 53 \end{array}$	TTh	Th	H	T	O		●	●●●●●	●●●●●	●●●●●	●●●●●	$\begin{array}{r} 15735 \\ - 2582 \\ \hline 13153 \end{array}$	<p>Use column subtraction methods with exchange where required.</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 2px;">TTh</td> <td style="padding: 2px;">Th</td> <td style="padding: 2px;">H</td> <td style="padding: 2px;">T</td> <td style="padding: 2px;">O</td> </tr> <tr> <td style="text-align: center;">5</td> <td style="text-align: center;">12</td> <td style="text-align: center;">10</td> <td style="text-align: center;">9</td> <td style="text-align: center;">7</td> </tr> <tr> <td style="text-align: center;">-</td> <td style="text-align: center;">1</td> <td style="text-align: center;">8</td> <td style="text-align: center;">5</td> <td style="text-align: center;">3</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">3</td> <td style="text-align: center;">5</td> <td style="text-align: center;">6</td> <td style="text-align: center;">3</td> </tr> </table> <p style="text-align: center; margin-top: 10px;">$62,097 - 18,534 = 43,563$</p>	TTh	Th	H	T	O	5	12	10	9	7	-	1	8	5	3	4	3	5	6	3
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Checking strategies and representing subtractions		<p>Bar models represent subtractions in problem contexts, including 'find the difference'.</p> <div style="margin-top: 10px;"> <p>Athletics Stadium 75,450</p> <p>Hockey Centre $\xleftarrow{42,300}$</p> <p>Velodrome 15,735 $\xleftarrow{?}$</p> </div>	<p>Children can explain the mistake made when the columns have not been ordered correctly.</p> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; border-radius: 5px; padding: 2px; font-size: x-small;"> Bella's working </div> <div style="border: 1px solid black; border-radius: 5px; padding: 2px; font-size: x-small;"> Correct method </div> </div> <table style="margin-left: auto; margin-right: auto; font-size: x-small;"> <tr> <td style="padding: 2px;">TTh</td> <td style="padding: 2px;">Th</td> <td style="padding: 2px;">H</td> <td style="padding: 2px;">T</td> <td style="padding: 2px;">O</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">7</td> <td style="text-align: center;">8</td> <td style="text-align: center;">7</td> <td style="text-align: center;">7</td> </tr> <tr> <td style="text-align: center;">+</td> <td style="text-align: center;">4</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">5</td> <td style="text-align: center;">7</td> <td style="text-align: center;">9</td> <td style="text-align: center;">9</td> <td style="text-align: center;">7</td> </tr> </table> <table style="margin-left: auto; margin-right: auto; font-size: x-small;"> <tr> <td style="padding: 2px;">TTh</td> <td style="padding: 2px;">Th</td> <td style="padding: 2px;">H</td> <td style="padding: 2px;">T</td> <td style="padding: 2px;">O</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">7</td> <td style="text-align: center;">8</td> <td style="text-align: center;">7</td> <td style="text-align: center;">7</td> </tr> <tr> <td style="text-align: center;">+</td> <td style="text-align: center;">4</td> <td style="text-align: center;">0</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 style="text-align: center;">1</td> <td style="text-align: center;">8</td> <td style="text-align: center;">8</td> <td style="text-align: center;">9</td> </tr> </table> <p style="margin-top: 10px;">Use approximation to check calculations.</p> <p style="margin-top: 10px;"><i>I calculated 18,000 + 4,000 mentally to check my subtraction.</i></p>	TTh	Th	H	T	O	1	7	8	7	7	+	4	0	1	2	5	7	9	9	7	TTh	Th	H	T	O	1	7	8	7	7	+	4	0	1	2	2	1	8	8	9																
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+	4	0	1	2																																																							
5	7	9	9	7																																																							
TTh	Th	H	T	O																																																							
1	7	8	7	7																																																							
+	4	0	1	2																																																							
2	1	8	8	9																																																							

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 calculated $7,546 - 2,355 = 5,191$.
 I will check using the inverse.*

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.

$5.74 - 2.25 = ?$



Exchange 1 tenth for 10 hundredths.



Now subtract the 5 hundredths.

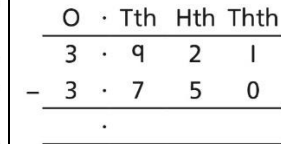


Now subtract the 2 tenths, then the 2 ones.



Use column subtraction, with an understanding of place value, including subtracting numbers with different numbers of decimal places.

$3.921 - 3.75 = ?$



Year 5 Multiplication and Division

Objectives	Key Skills
<ul style="list-style-type: none"> ▪ 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 (non-prime) 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. 	<p>Multiplication</p> <ul style="list-style-type: none"> • Identify multiples and factors, using knowledge of multiplication tables to 12x12. • Solve problems where larger numbers are decomposed into their factors • Multiply and divide integers and decimals by 10, 100 and 1000 • Recognise and use square and cube numbers and their notation • Solve problems involving combinations of operations, choosing and using calculations and methods appropriately <p>Division</p> <ul style="list-style-type: none"> • Recall multiplication and division facts for all numbers up to 12 x 12 (as in Y4) • Multiply and divide numbers mentally, drawing upon known facts • Identify multiples and factors, including finding all factor pairs of a number, and common factors of two number • Solve problems involving multiplication and division where larger numbers are decomposed into their factors • Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000. • Use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers • Work out whether a number up to 100 is prime, and recall prime numbers to 19 • 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 • Use multiplication and division as inverses • Interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (e.g. $98 \div 4 = 24 \text{ r } 2 = 24\frac{1}{2} = 24.5 \approx 25$) • Solve problems involving combinations of all four operations, including understanding of the equals sign, and including division for scaling by different fractions and problems involving simple rates

Vocabulary

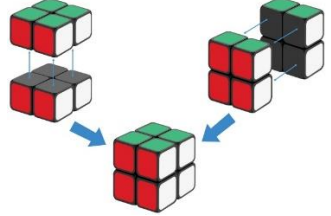
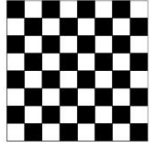
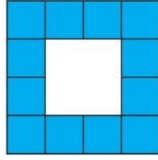


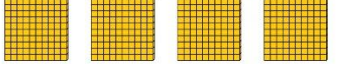


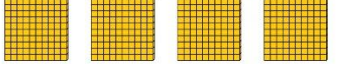
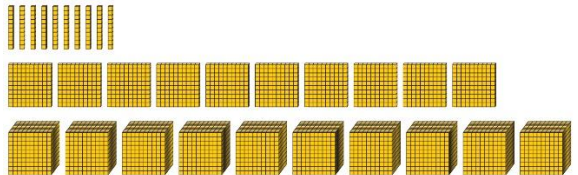


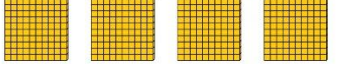
Multiplication

groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, _times as big as, once, twice, three times..., partition, grid method, **carry**, total, multiple, product, inverse, **square, factor, integer, decimal, short/long multiplication,**

Division

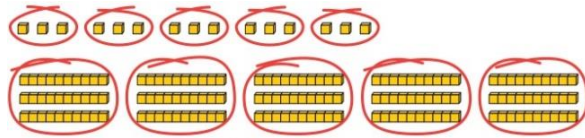
share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, „carry”, remainder, multiple, divisible by, factor, inverse, **quotient, prime number, prime factors, composite number (non-prime)**

Year 5: Multiplication

	Concrete	Pictorial	Abstract												
Understanding factors	<p>Use cubes or counters to explore the meaning of 'square numbers'.</p> <p><i>25 is a square number because it is made from 5 rows of 5.</i></p> <p>Use cubes to explore cube numbers.</p>  <p><i>8 is a cube number.</i></p>	<p>Use images to explore examples and non-examples of square numbers.</p>  <p>$8 \times 8 = 64$ $8^2 = 64$</p>  <p><i>12 is not a square number, because you cannot multiply a whole number by itself to make 12.</i></p>	<p>Understand the pattern of square numbers in the multiplication tables.</p> <p>Use a multiplication grid to circle each square number. Can children spot a pattern?</p>												
Multiplying by 10, 100 and 1,000	<p>Use place value equipment to multiply by 10, 100 and 1,000 by unitising.</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">$4 \times 1 = 4 \text{ ones} = 4$</td> <td style="text-align: center; padding: 5px;"></td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">$4 \times 10 = 4 \text{ tens} = 40$</td> <td style="text-align: center; padding: 5px;"></td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">$4 \times 100 = 4 \text{ hundreds} = 400$</td> <td style="text-align: center; padding: 5px;"></td> </tr> </table>	$4 \times 1 = 4 \text{ ones} = 4$		$4 \times 10 = 4 \text{ tens} = 40$		$4 \times 100 = 4 \text{ hundreds} = 400$		<p>Understand the effect of repeated multiplication by 10.</p> 	<p>Understand how exchange relates to the digits when multiplying by 10, 100 and 1,000.</p> <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <thead> <tr style="background-color: #fff9c4;"> <th style="width: 33%;">H</th> <th style="width: 33%;">T</th> <th style="width: 33%;">O</th> </tr> </thead> <tbody> <tr> <td></td> <td style="border: 1px solid black; padding: 10px;">1</td> <td style="border: 1px solid black; padding: 10px;">7</td> </tr> </tbody> </table> <p>$17 \times 10 = 170$ $17 \times 100 = 17 \times 10 \times 10 = 1,700$ $17 \times 1,000 = 17 \times 10 \times 10 \times 10 = 17,000$</p>	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

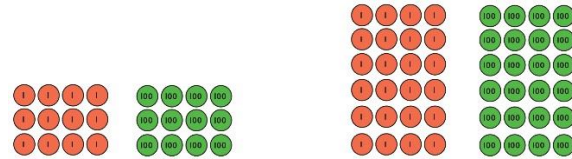
Use place value equipment to explore multiplying by unitising.



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.

Use place value equipment to represent how to multiply by multiples of 10, 100 and 1,000.



$$4 \times 3 = 12$$

$$4 \times 30 = 1,200$$

$$6 \times 4 = 24$$

$$6 \times 400 = 2,400$$

Use known facts and unitising to multiply.

$$5 \times 4 = 20$$

$$5 \times 40 = 200$$

$$5 \times 400 = 2,000$$

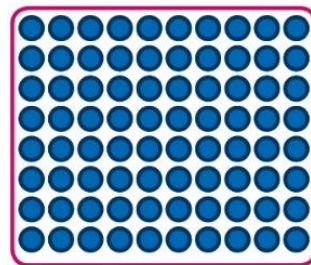
$$5 \times 4,000 = 20,000$$

$$5,000 \times 4 = 20,000$$

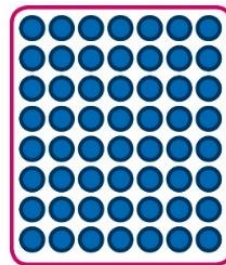
Multiplying up to 4-digit numbers by a single digit

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.

	H	T	O
100		10 10 10 10 10	1 1 1
		10	
100		10 10 10 10 10	1 1 1
		10	
100		10 10 10 10 10	1 1 1
		10	
100		10 10 10 10 10	1 1 1
		10	

	100	60	3
5	$100 \times 5 = 500$	$60 \times 5 = 300$	$3 \times 5 = 15$

Use short multiplication, including any required exchanges.

$$\begin{array}{r} 136 \\ \times 6 \\ \hline 816 \\ \hline 23 \end{array}$$

Multiplying up to 4-digits by 2-digits

Partition one number into 10s and 1s, then add the parts.

$$23 \times 15 = ?$$



$$10 \times 15 = 150$$



$$10 \times 15 = 150$$



$$3 \times 15 = 45$$

There are 345 bottles of milk in total.

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

$$23 \times 15 = 345$$

Use the grid method then add the parts.

		100	40	3	
10					
2					

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

There are 1,716 boxes of cereal in total.

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

X		10	8
10		100	80
3		30	24

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

Use long 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

143×2

143×10

143×12

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

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

First multiply 1,274 by 2.

		1	2	7	4	
x			3	2		
			2	5	4	8

$1,274 \times 2$

Then multiply 1,274 by 30.

		1	2	7	4	
x			3	2		
			2	5	4	8
		3	8	2	2	0

$1,274 \times 2$
 $1,274 \times 30$

Finally, find the total.

		1	2	7	4	
x			3	2		
			2	5	4	8
		3	8	2	2	0
		4	0	7	6	8

$1,274 \times 2$
 $1,274 \times 30$
 $1,274 \times 32$

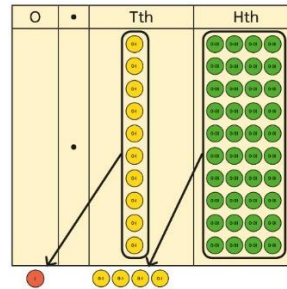
$$1,274 \times 32 = 40,768$$



Multiplying decimals by 10, 100 and 1,000

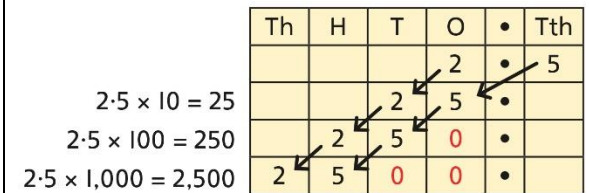
Use place value equipment to explore and understand the exchange of 10 tenths, 10 hundredths or 10 thousandths.


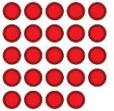
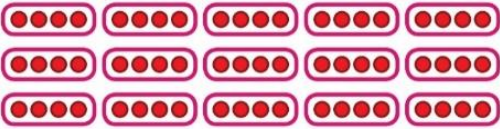
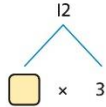
Represent multiplication by 10 as exchange on a place value grid.



$$0.14 \times 10 = 1.4$$

Understand how this exchange is represented on a place value chart.



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

Dividing whole numbers by 10, 100 and 1,000

Use place value equipment to support unitising for division.

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



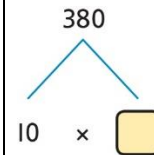
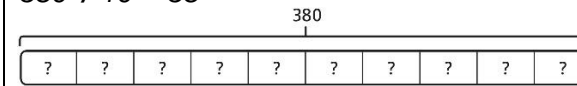
4,000 is 4 thousands.

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

So, $4,000 \div 1,000 = 4$

Use a bar model to support dividing by unitising.

$$380 \div 10 = 38$$



380 is 38 tens.

$$38 \times 10 = 380$$

$$10 \times 38 = 380$$

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.

$$200 \div 100 = 2$$

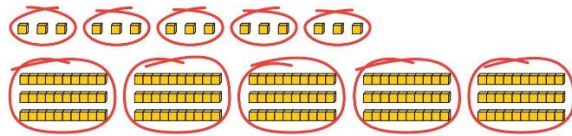
$$3,000 \div 100 = 30$$

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

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.



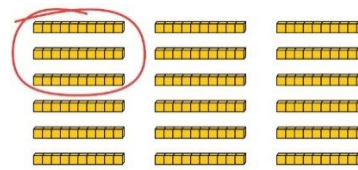
15 ones put into groups of 3 ones. There are 5 groups.

$$15 \div 3 = 5$$

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

$$150 \div 30 = 5$$

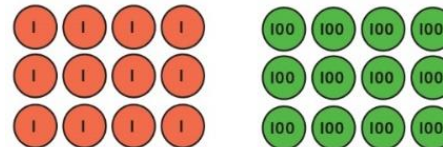
Represent related facts with place value equipment when dividing by unitising.



180 is 18 tens.

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

$$180 \div 30 = 6$$



12 ones divided into groups of 4. There are 3 groups.

12 hundreds divided into groups of 4 hundreds. There are 3 groups.

$$1200 \div 400 = 3$$

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

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

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

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

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

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

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

Dividing up to four digits by a single digit using short division

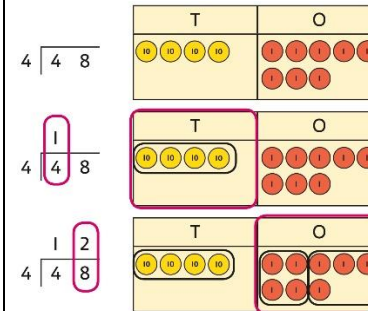
Explore grouping using place value equipment.

$$268 \div 2 = ?$$

*There is 1 group of 2 hundreds.
There are 3 groups of 2 tens.
There are 4 groups of 2 ones.*

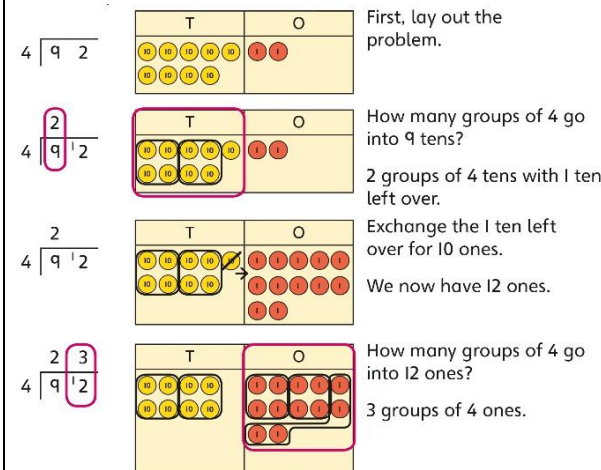
$$264 \div 2 = 134$$

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.
*There is 1 group of 4 in 4 tens.
There are 2 groups of 4 in 8 ones.*

Work with divisions that require exchange.



Use short division for up to 4-digit numbers divided by a single digit.

$$\begin{array}{r} 0556 \\ 7 \overline{) 3383942} \end{array}$$

$$3,892 \div 7 = 556$$

Use multiplication to check.

$$556 \times 7 = ?$$

$$6 \times 7 = 42$$

$$50 \times 7 = 350$$

$$500 \times 7 = 3500$$

$$3,500 + 350 + 42 = 3,892$$

Understanding remainders

Understand remainders using concrete versions of a problem.

80 cakes divided into trays of 6.



80 cakes in total. They make 13 groups of 6, with 2 remaining.

Use short division and understand remainders as the last remaining 1s.

6 | 80

T	O
10 10 10 10 10	

Lay out the problem as short division.

6 | 8¹0

T	O
10 10 10 10	

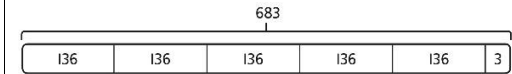
How many groups of 6 go into 8 tens?
There is 1 group of 6 tens.
There are 2 tens remaining.

6 | 8¹0²

T	O
10 10	1 1 1 1 1 1 1 1 1 1 1 1

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.



$$683 = 136 \times 5 + 3$$

$$683 \div 5 = 136 \text{ r } 3$$

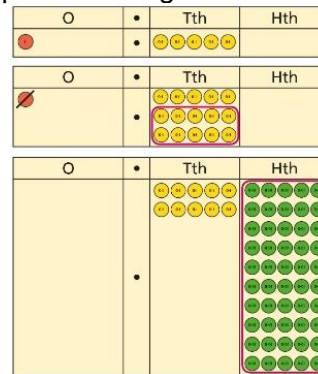
Dividing decimals by 10, 100 and 1,000

Understand division by 10 using exchange.

2 ones are 20 tenths.

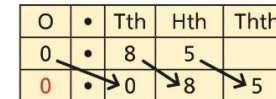
20 tenths divided by 10 is 2 tenths.

Represent division using exchange on a place value grid.

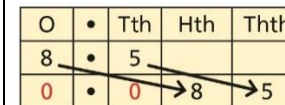


1.5 is 1 one and 5 tenths.
This is equivalent to 10 tenths and 50 hundredths.
10 tenths divided by 10 is 1 tenth.
50 hundredths divided by 10 is 5 hundredths.
1.5 divided by 10 is 1 tenth and 5 hundredths. $1.5 \div 10 = 0.15$

Understand the movement of digits on a place value grid.



$$0.85 \div 10 = 0.085$$



$$8.5 \div 100 = 0.085$$

Understanding the relationship between fractions and division

Use sharing to explore the link between fractions and division.

*1 whole shared between 3 people.
Each person receives one-third.*



Use a bar model and other fraction representations to show the link between fractions and division.



$$1 \div 3 = \frac{1}{3}$$

Use the link between division and fractions to calculate divisions.

$$5 \div 4 = \frac{5}{4} = 1\frac{1}{4}$$

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

Year 6 Addition and Subtraction

Objectives	Key Skills
<ul style="list-style-type: none"> • perform mental calculations, including with mixed operations and large numbers • use their knowledge of the order of operations to carry out calculations involving the four operations • solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why 	<p>Addition</p> <ul style="list-style-type: none"> • Perform mental calculations, including with mixed operations and large numbers, using and practising a range of mental strategies. • Solve multi-step problems in context, deciding which operations and methods to use and why. • Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy. • Read, write, order and compare numbers up to 10 million and determine the value of each digit. • Round any whole number to a required degree of accuracy. • Pupils understand how to add mentally with larger numbers and calculations of increasing complexity.
Vocabulary	
<p>Addition add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, „carry“, expanded, compact, vertical, thousands, hundreds, digits, inverse, decimal places, decimal point, tenths, hundredths, thousandths</p> <p>Subtraction equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is_? difference, count on, strategy, partition, tens, units exchange, decrease, hundreds, value, digit, inverse, tenths, hundredths, decimal point, decimal</p>	<p>Subtraction</p> <ul style="list-style-type: none"> • Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why. • Read, write, order and compare numbers up to 10 million and determine the value of each digit • Round any whole number to a required degree of accuracy • Use negative numbers in context, and calculate intervals across zero. • Children need to utilise and consider a range of mental subtraction strategies, jottings and written methods before choosing how to calculate.

Year 6

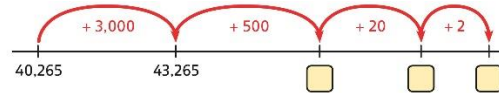
Year 6: Addition

Comparing and selecting efficient methods

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

M	HTh	TTh	Th	H	T	O
●●	●●●●	●	●	●●●		●

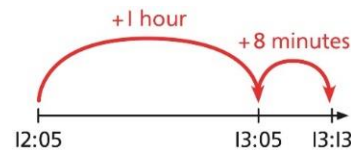
Discuss similarities and differences between methods, and choose efficient methods based on the specific calculation. Compare written and mental methods alongside place value representations.



TTh	Th	H	T	O
●●●●		●●	●●●●●	●●●●●
	●●	●●●●●	●●	●●

TTh	Th	H	T	O
4	0	2	6	5
+	3	5	2	2

Use bar model and number line representations to model addition in problem-solving and measure contexts.



Use column addition where mental methods are not efficient. Recognise common errors with column addition.

$$32,145 + 4,302 = ?$$

	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

Which method has been completed accurately?

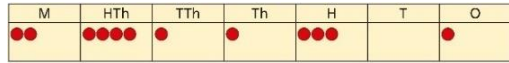
What mistake has been made?

Column methods are also used for decimal additions where mental methods are not efficient.

	H	T	O	·	Tth	Hth
	1	4	0	·	0	9
+		4	9	·	8	9
	1	8	9	·	9	8

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.



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

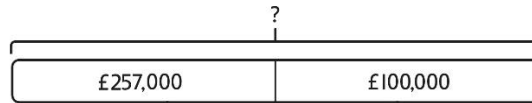
This would be 5 more counters in the HTh place.

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.

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

$$195 + 5 + 1 = 201$$

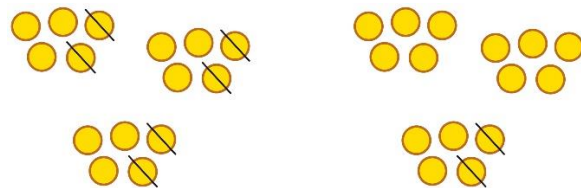
195 thousands + 6 thousands = 201 thousands

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

Understanding order of operations in calculations

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

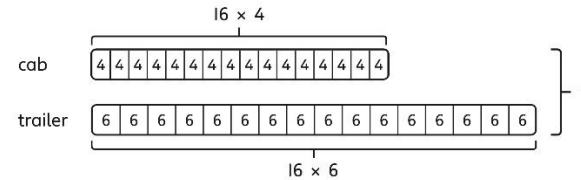
$$3 \times 5 - 2 = ?$$



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

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

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



This can be written as: $16 \times 4 + 16 \times 6$
 $16 \times 4 + 16 \times 6$
 $64 + 96 = 160$

Understand the correct order of operations in calculations without brackets.

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

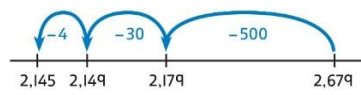
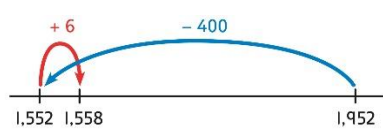
$$4 + 6 \times 16$$

$$4 + 96 = 100$$

$$(4 + 6) \times 16$$

$$10 \times 16 = 160$$

Year 6: Subtraction

	Concrete	Pictorial	Abstract																																																												
Comparing and selecting efficient methods	<p>Use counters on a place value grid to represent subtractions of larger numbers.</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 25%;">Th</th> <th style="width: 25%;">H</th> <th style="width: 25%;">T</th> <th style="width: 25%;">O</th> </tr> </thead> <tbody> <tr> <td>●●</td> <td>●●●●●●●●</td> <td>●●●●●●</td> <td>●●●●●●</td> </tr> <tr> <td></td> <td>●●</td> <td>●●●●●●</td> <td>●●●●●●</td> </tr> </tbody> </table>	Th	H	T	O	●●	●●●●●●●●	●●●●●●	●●●●●●		●●	●●●●●●	●●●●●●	<p>Compare subtraction methods alongside place value representations.</p>  <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 25%;">Th</th> <th style="width: 25%;">H</th> <th style="width: 25%;">T</th> <th style="width: 25%;">O</th> </tr> </thead> <tbody> <tr> <td>●●</td> <td>●●●●●●●●</td> <td>●●●●●●</td> <td>●●●●●●</td> </tr> <tr> <td></td> <td>●●</td> <td>●●●●●●</td> <td>●●●●●●</td> </tr> </tbody> </table> $ \begin{array}{r} \text{Th H T O} \\ 2 \ 6 \ 7 \ 9 \\ - \ 5 \ 3 \ 4 \\ \hline 2 \ 1 \ 4 \ 5 \end{array} $ <p>Use a bar model to represent calculations, including 'find the difference' with two bars as comparison.</p> <div style="margin: 10px auto; border: 1px solid black; padding: 5px; width: 150px; text-align: center;">computer game</div> <div style="margin: 10px auto; border: 1px solid black; padding: 5px; width: 150px; text-align: center;">puzzle book ← £12.50 →</div>	Th	H	T	O	●●	●●●●●●●●	●●●●●●	●●●●●●		●●	●●●●●●	●●●●●●	<p>Compare and select methods. Use column subtraction when mental methods are not efficient. Use two different methods for one calculation as a checking strategy.</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 25%;">Th</th> <th style="width: 25%;">H</th> <th style="width: 25%;">T</th> <th style="width: 25%;">O</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>8</td> <td>14</td> <td>12</td> </tr> <tr> <td>-</td> <td>1</td> <td>5</td> <td>5</td> </tr> <tr> <td></td> <td></td> <td>3</td> <td>9</td> </tr> <tr> <td></td> <td></td> <td>4</td> <td>4</td> </tr> </tbody> </table>  <p>Use column subtraction for decimal problems, including in the context of measure.</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 25%;">H</th> <th style="width: 25%;">T</th> <th style="width: 25%;">O</th> <th style="width: 25%;">Tth Hth</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>0</td> <td>9</td> <td>· 6 0</td> </tr> <tr> <td>-</td> <td>2</td> <td>0</td> <td>· 4 0</td> </tr> <tr> <td></td> <td>1</td> <td>0</td> <td>· 2 0</td> </tr> </tbody> </table>	Th	H	T	O	1	8	14	12	-	1	5	5			3	9			4	4	H	T	O	Tth Hth	3	0	9	· 6 0	-	2	0	· 4 0		1	0	· 2 0
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Subtracting mentally with larger numbers		<p>Use a bar model to show how unitising can support mental calculations.</p> <p>$950,000 - 150,000$ That is 950 thousands - 150 thousands</p> <div style="margin: 10px auto; border: 1px solid black; padding: 5px; width: 150px; text-align: center;">950</div> <div style="margin: 10px auto; border: 1px solid black; padding: 5px; width: 150px; text-align: center;">150 ← 800 →</div> <p>So, the difference is 800 thousands. $950,000 - 150,000 = 800,000$</p>	<p>Subtract efficiently from powers of 10.</p> <p>$10,000 - 500 = ?$</p>																																																												

Year 6 Multiplication and Division

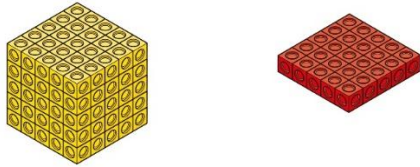
Objectives	Key Skills
<ul style="list-style-type: none"> ▪ multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication ▪ divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret 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 • solve problems involving addition, subtraction, multiplication and division • use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. 	<p>Multiplication</p> <ul style="list-style-type: none"> • Recall multiplication facts for all times tables up to 12 x 12 (as Y4 and Y5). • Multiply multi-digit numbers, up to 4-digit x 2-digit using long multiplication. • Perform mental calculations with mixed operations and large numbers. • Solve multi-step problems in a range of contexts, choosing appropriate combinations of operations and methods. • Estimate answers using round and approximation and determine levels of accuracy. <p>Division</p> <ul style="list-style-type: none"> • Recall and use multiplication and division facts for all numbers to 12 x 12 for more complex calculations • 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. Use short division • Perform mental calculations, including with mixed operations and large numbers. • Identify common factors, common multiples and prime numbers. • Use estimation to check answers to calculations and determine accuracy, in the context of a problem. • Use written division methods in cases where the answer has up to two decimal places. • Solve problems which require answers to be rounded to specified degrees of accuracy.
Vocabulary	
<p>Multiplication groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, array, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times... partition, grid method, total, multiple, product, inverse, square, factor, integer, decimal, short / long multiplication, „carry”, tenths, hundredths, decimal</p> <p>Division share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, „carry”, remainder, multiple, divisible by, factor, inverse, quotient, prime number, prime factors, composite number (non-prime), common factor</p>	

Year 6: Multiplication

	Concrete	Pictorial	Abstract																																																																
Multiplying up to a 4-digit number by a single digit number	<p>Use equipment to explore multiplications.</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 25%;">Th</th> <th style="width: 25%;">H</th> <th style="width: 25%;">T</th> <th style="width: 25%;">O</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>4 groups of 2,345</p> <p><i>This is a multiplication:</i></p> <p>$4 \times 2,345$ $2,345 \times 4$</p>	Th	H	T	O					<p>Use place value equipment to compare methods.</p> <p style="text-align: center;">Method 1</p> <p style="text-align: center;">Method 2</p> <p style="text-align: center;">Method 3</p> <table style="margin: 10px auto; border-collapse: collapse;"> <tr> <td style="padding: 0 10px;">3,000</td> <td style="padding: 0 10px;">200</td> <td style="padding: 0 10px;">20</td> <td style="padding: 0 10px;">5</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">4</td> <td style="border: 1px solid black; padding: 2px;">12,000</td> <td style="border: 1px solid black; padding: 2px;">800</td> <td style="border: 1px solid black; padding: 2px;">80</td> </tr> <tr> <td colspan="4" style="padding: 2px;">20</td> </tr> </table> <p>$12,000 + 800 + 80 + 20 = 12,900$</p> <p style="text-align: center;">Method 4</p> <table style="margin: 10px auto; border-collapse: collapse;"> <tr> <td style="padding: 0 10px;">3</td> <td style="padding: 0 10px;">2</td> <td style="padding: 0 10px;">2</td> <td style="padding: 0 10px;">5</td> </tr> <tr> <td style="padding: 0 10px;">x</td> <td style="padding: 0 10px;"></td> <td style="padding: 0 10px;"></td> <td style="padding: 0 10px;">4</td> </tr> <tr> <td colspan="4" style="border-top: 1px solid black; padding: 2px 0 2px 10px;">12900</td> </tr> <tr> <td colspan="4" style="border-top: 1px solid black; border-bottom: 1px solid black; padding: 2px 0 2px 10px;">12900</td> </tr> </table>	3,000	200	20	5	4	12,000	800	80	20				3	2	2	5	x			4	12900				12900				<p>Understand area model and short multiplication.</p> <p>Compare and select appropriate methods for specific multiplications.</p> <p style="text-align: center;">Method 3</p> <table style="margin: 10px auto; border-collapse: collapse;"> <tr> <td style="padding: 0 10px;">3,000</td> <td style="padding: 0 10px;">200</td> <td style="padding: 0 10px;">20</td> <td style="padding: 0 10px;">5</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">4</td> <td style="border: 1px solid black; padding: 2px;">12,000</td> <td style="border: 1px solid black; padding: 2px;">800</td> <td style="border: 1px solid black; padding: 2px;">80</td> </tr> <tr> <td colspan="4" style="border: 1px solid black; padding: 2px;">20</td> </tr> </table> <p>$12,000 + 800 + 80 + 20 = 12,900$</p> <p style="text-align: center;">Method 4</p> <table style="margin: 10px auto; border-collapse: collapse;"> <tr> <td style="padding: 0 10px;">3</td> <td style="padding: 0 10px;">2</td> <td style="padding: 0 10px;">2</td> <td style="padding: 0 10px;">5</td> </tr> <tr> <td style="padding: 0 10px;">x</td> <td style="padding: 0 10px;"></td> <td style="padding: 0 10px;"></td> <td style="padding: 0 10px;">4</td> </tr> <tr> <td colspan="4" style="border-top: 1px solid black; padding: 2px 0 2px 10px;">12900</td> </tr> <tr> <td colspan="4" style="border-top: 1px solid black; border-bottom: 1px solid black; padding: 2px 0 2px 10px;">12900</td> </tr> </table>	3,000	200	20	5	4	12,000	800	80	20				3	2	2	5	x			4	12900				12900			
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Multiplying up to a 4-digit number by a 2-digit number		<p>Use a grid method alongside written multiplication.</p> <p style="text-align: center;">Method 1</p> <table style="margin: 10px auto; border-collapse: collapse;"> <tr> <td style="padding: 0 10px;"></td> <td style="padding: 0 10px;">1,000</td> <td style="padding: 0 10px;">200</td> <td style="padding: 0 10px;">30</td> <td style="padding: 0 10px;">5</td> </tr> <tr> <td style="padding: 0 10px;">20</td> <td style="border: 1px solid black; padding: 2px;">20,000</td> <td style="border: 1px solid black; padding: 2px;">4,000</td> <td style="border: 1px solid black; padding: 2px;">600</td> <td style="border: 1px solid black; padding: 2px;">100</td> </tr> <tr> <td style="padding: 0 10px;">1</td> <td style="border: 1px solid black; padding: 2px;">1,000</td> <td style="border: 1px solid black; padding: 2px;">200</td> <td style="border: 1px solid black; padding: 2px;">30</td> <td style="border: 1px solid black; padding: 2px;">5</td> </tr> </table> <p style="margin-top: 10px;"> $\begin{array}{r} 1\ 2\ 3\ 5 \\ \times\ 2\ 1 \\ \hline 5\ 1 \times 5 \\ 3\ 0\ 1 \times 30 \\ 2\ 0\ 0\ 1 \times 200 \\ 1\ 0\ 0\ 0\ 1 \times 1,000 \\ 6\ 0\ 0\ 20 \times 30 \\ 4\ 0\ 0\ 0\ 20 \times 200 \\ 2\ 0\ 0\ 0\ 0\ 20 \times 1,000 \\ \hline 2\ 5\ 9\ 3\ 5 \end{array}$ </p>		1,000	200	30	5	20	20,000	4,000	600	100	1	1,000	200	30	5	<p>Use compact column multiplication with understanding of place value at all stages.</p> <table style="margin: 10px auto; border-collapse: collapse;"> <tr> <td style="padding: 0 10px;"></td> <td style="padding: 0 10px;">1</td> <td style="padding: 0 10px;">2</td> <td style="padding: 0 10px;">3</td> <td style="padding: 0 10px;">5</td> <td style="padding: 0 10px;"></td> </tr> <tr> <td style="padding: 0 10px;">x</td> <td style="padding: 0 10px;"></td> <td style="padding: 0 10px;">2</td> <td style="padding: 0 10px;">1</td> <td style="padding: 0 10px;"></td> <td style="padding: 0 10px;"></td> </tr> <tr> <td colspan="6" style="border-top: 1px solid black; padding: 2px 0 2px 10px;">1235</td> </tr> <tr> <td colspan="6" style="border-top: 1px solid black; padding: 2px 0 2px 10px;">24700</td> </tr> <tr> <td colspan="6" style="border-top: 1px solid black; padding: 2px 0 2px 10px;">25935</td> </tr> </table> <p style="margin-top: 10px;"> $\begin{array}{l} 1 \times 1,235 \\ 20 \times 1,235 \\ 21 \times 1,235 \end{array}$ </p>		1	2	3	5		x		2	1			1235						24700						25935																								
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Using knowledge of factors and partitions to compare methods for multiplications

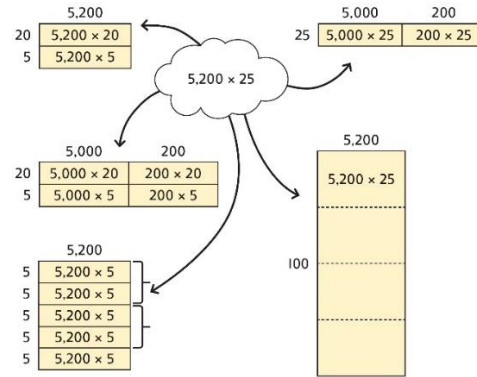
Use equipment to understand square numbers and cube numbers.



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

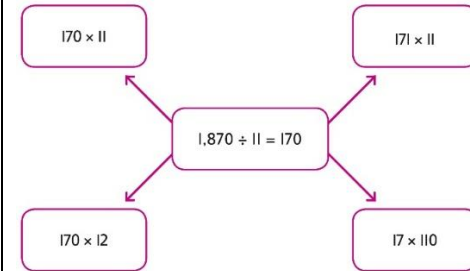
$$5 \times 5 \times 5 = 5^3 = 25 \times 5 = 125$$

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.

$$15 \times 16$$

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

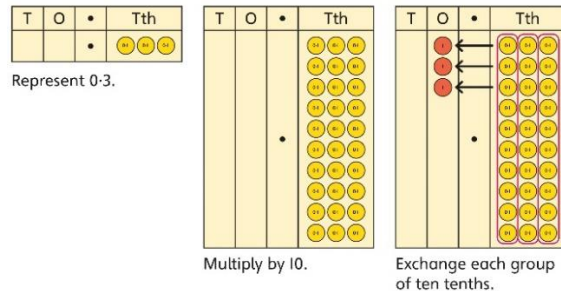
$$= 3 \times 8 \times 2 \times 5$$

$$= 24 \times 10$$

$$= 240$$

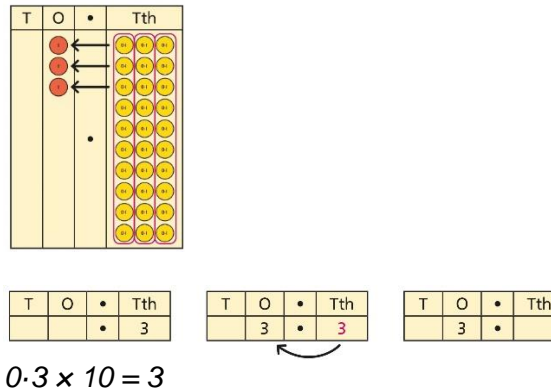
Multiplying by 10, 100 and 1,000

Use place value equipment to explore exchange in decimal multiplication.



$0.3 \times 10 = ?$
 0.3 is 3 tenths.
 10×3 tenths are 30 tenths.
 30 tenths are equivalent to 3 ones.

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



$$0.3 \times 10 = 3$$

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

$$8 \times 100 = 800$$

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

$$= 2,400$$

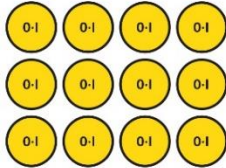
$$2.5 \times 10 = 25$$

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

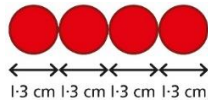
$$= 50$$

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.

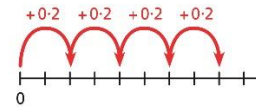
$$3 \times 3 = 9$$

$$3 \times 0.3 = 0.9$$

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:

$$1.8 \times 4 = ?$$

$$18 \times 0.4 = ?$$

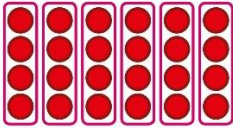
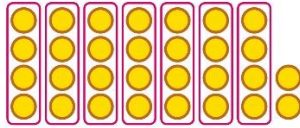
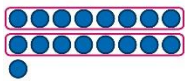
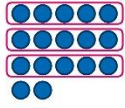
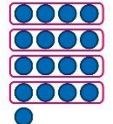
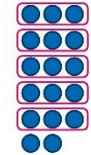
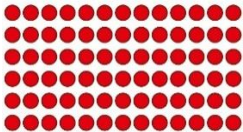
$$180 \times 0.4 = ?$$

$$18 \times 0.04 = ?$$

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

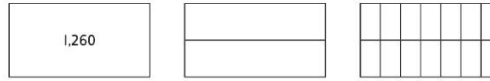
	Concrete	Pictorial	Abstract																																																		
Understanding factors	<p>Use equipment to explore different factors of a number.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>$24 \div 4 = 6$</p> </div> <div style="text-align: center;">  <p>$30 \div 4 = 7 \text{ remainder } 2$</p> </div> </div> <p><i>4 is a factor of 24 but is not a factor of 30.</i></p>	<p>Recognise prime numbers as numbers having exactly two factors. Understand the link with division and remainders.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>$17 \div 2 = 8 \text{ r } 1$</p> </div> <div style="text-align: center;">  <p>$17 \div 3 = 5 \text{ r } 2$</p> </div> <div style="text-align: center;">  <p>$17 \div 4 = 4 \text{ r } 1$</p> </div> <div style="text-align: center;">  <p>$17 \div 5 = 3 \text{ r } 2$</p> </div> </div>	<p>Recognise and know primes up to 100. Understand that 2 is the only even prime, and that 1 is not a prime number.</p> <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <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>	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
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																																												
Dividing by a single digit	<p>Use equipment to make groups from a total.</p> <div style="text-align: center;">  </div> <p><i>There are 78 in total. There are 6 groups of 13. There are 13 groups of 6.</i></p>	<div style="display: flex; justify-content: space-between;"> <table border="1" style="width: 30%; text-align: center; border-collapse: collapse;"> <tr><td>H</td><td>T</td><td>O</td></tr> <tr><td>●</td><td>●●●</td><td>●●</td></tr> </table> <div style="width: 30%;"> <p>How many groups of 6 are in 100?</p> $6 \overline{) 100} \begin{matrix} 0 \\ 16 \\ 2 \end{matrix}$ </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <table border="1" style="width: 30%; text-align: center; border-collapse: collapse;"> <tr><td>H</td><td>T</td><td>O</td></tr> <tr><td>●</td><td>●●●●</td><td>●●</td></tr> </table> <div style="width: 30%;"> <p>How many groups of 6 are in 13 tens?</p> $6 \overline{) 130} \begin{matrix} 0 \\ 21 \\ 2 \end{matrix}$ </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <table border="1" style="width: 30%; text-align: center; border-collapse: collapse;"> <tr><td>H</td><td>T</td><td>O</td></tr> <tr><td></td><td>●●●●●</td><td>●●●●</td></tr> </table> <div style="width: 30%;"> <p>How many groups of 6 are in 12 ones?</p> $6 \overline{) 12} \begin{matrix} 0 \\ 2 \\ 2 \end{matrix}$ </div> </div>	H	T	O	●	●●●	●●	H	T	O	●	●●●●	●●	H	T	O		●●●●●	●●●●	<p>Use short division to divide by a single digit.</p> $6 \overline{) 100} \begin{matrix} 0 \\ 16 \\ 2 \end{matrix}$ $6 \overline{) 130} \begin{matrix} 0 \\ 21 \\ 2 \end{matrix}$ $6 \overline{) 12} \begin{matrix} 0 \\ 2 \\ 2 \end{matrix}$ <p>Use an area model to link multiplication and division.</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>?</p> <table border="1" style="width: 60px; height: 20px; border-collapse: collapse;"> <tr><td style="width: 20px;">6</td><td style="width: 40px;">132</td></tr> </table> <p>$6 \times ? = 132$</p> </div> <div style="text-align: center;"> <table border="1" style="width: 200px; height: 40px; border-collapse: collapse;"> <tr> <td style="width: 60px;">10</td> <td style="width: 60px;">10</td> <td style="width: 20px;">1</td> <td style="width: 20px;">1</td> </tr> <tr> <td>6</td> <td>60</td> <td>60</td> <td>6</td> </tr> </table> <table border="1" style="width: 100%; height: 20px; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 120px;">20</td> <td style="width: 20px;">2</td> </tr> <tr> <td>6</td> <td>120</td> </tr> </table> <p>$132 = 120 + 12$</p> <p>$132 \div 6 = 20 + 2 = 22$</p> </div> </div>	6	132	10	10	1	1	6	60	60	6	20	2	6	120																		
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6	60	60	6																																																		
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6	120																																																				

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.

$$1,260 \div 14 = ?$$



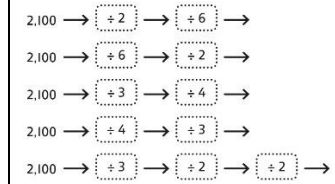
$$1,260 \div 2 = 630$$

$$630 \div 7 = 90$$

$$1,260 \div 14 = 90$$

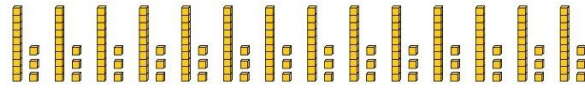
Use factors and repeated division where appropriate.

$$2,100 \div 12 = ?$$



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 grid method alongside written division to model the process.

$$377 \div 13 = ?$$

$$\begin{array}{r} 13 \overline{) 377} \\ \underline{130} \\ 247 \\ \underline{130} \\ 117 \\ \underline{117} \\ 0 \end{array}$$

$$\begin{array}{r} 10 \\ 13 \overline{) 377} \\ \underline{130} \\ 247 \\ \underline{130} \\ 117 \\ \underline{117} \\ 0 \end{array}$$

$$\begin{array}{r} 10 \\ 13 \overline{) 377} \\ \underline{130} \\ 130 \\ \underline{117} \\ 0 \end{array}$$

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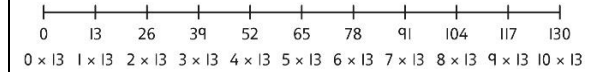
$$\begin{array}{r} 10 \\ 13 \overline{) 377} \\ \underline{130} \\ 130 \\ \underline{117} \\ 0 \end{array}$$

$$377 \div 13 = 29$$

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.

$$377 \div 13 = ?$$



$$\begin{array}{r} 13 \overline{) 377} \\ - 130 \\ \hline 247 \\ - 130 \\ \hline 117 \\ - 117 \\ \hline 0 \end{array}$$

$$377 \div 13 = 29$$

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

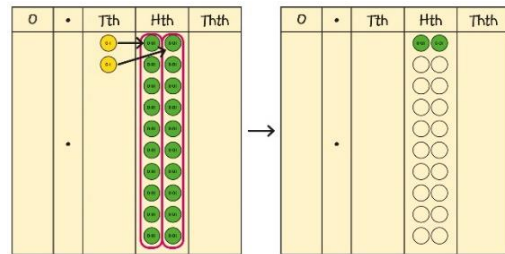
$$\begin{array}{r} 3 \\ 21 \overline{) 798} \\ - 630 \\ \hline 168 \\ - 168 \\ \hline 0 \end{array}$$

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

Divisions with a remainder explored in problem-solving contexts.

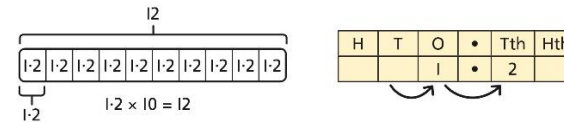
Dividing by 10, 100 and 1,000

Use place value equipment to explore division as exchange.

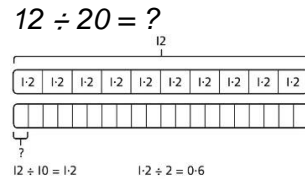


0.2 is 2 tenths.
 2 tenths is equivalent to 20 hundredths.
 20 hundredths divided by 10 is 2 hundredths.

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.



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

$$40 \div 50 = \square$$

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

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

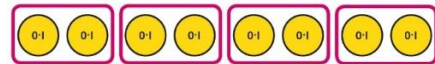
$$40 \div 5 = 8$$

$$8 \div 10 = 0.8$$

So, $40 \div 50 = 0.8$

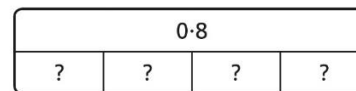
Dividing decimals

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.



$$4 \times 2 = 8 \qquad 8 \div 4 = 2$$

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

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

$$8 \overline{) 4.24}$$

$$0. $$

$$8 \overline{) 4.24}$$

$$0.5 $$

$$8 \overline{) 4.24}$$

$$0.53 $$

$$8 \overline{) 4.24}$$