

Years 3&4

The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils become increasingly fluent with whole numbers and the four operations, including number facts and the concept of place value. This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers.

At this stage, pupils should develop their ability to solve a range of problems, including with simple fractions and decimal place value. Teaching should also ensure that pupils draw with increasing accuracy and develop mathematical reasoning so they can analyse shapes and their properties, and confidently describe the relationships between them. It should ensure that they can use measuring instruments with accuracy and make connections between measure and number.

By the end of year 4, pupils should have memorised their multiplication tables up to and including the 12 multiplication table and show precision and fluency in their work.

Pupils should read and spell mathematical vocabulary correctly and confidently, using their growing word reading knowledge and their knowledge of spelling.

Years 5&6

The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio.

At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems. Teaching in geometry and measures should consolidate and extend knowledge developed in number. Teaching should also ensure that pupils classify shapes with increasingly complex geometric properties and that they learn the vocabulary they need to describe them.

By the end of year 6, pupils should be fluent in written methods for all four operations, including long multiplication and division, and in working with fractions, decimals and percentages.

Pupils should read, spell and pronounce mathematical vocabulary correctly.

Year 3 Addition



Strategies

Concrete

Pictorial

Abstract

Column Addition—no regrouping (friendly numbers)
Add two or three 2 or 3digit numbers.

T | **O** Dienes or numicon

Add together the ones first, then the tens.

	Tens	Units
45		
34		
	7	9

21 + 42 =
21
+ 42

Move to using place value counters

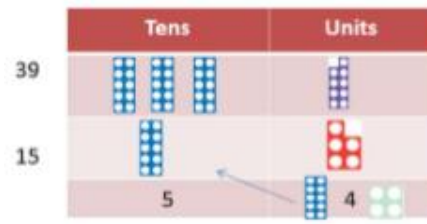
Children move to drawing the counters using a tens and one frame.

tens	ones

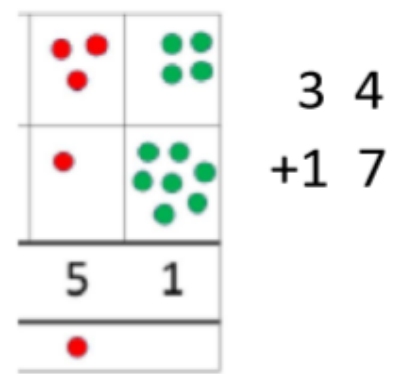
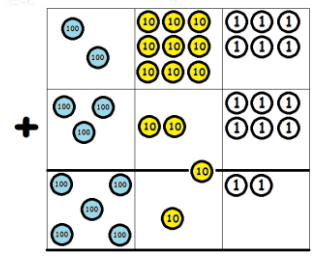
$$\begin{array}{r} 223 \\ + 114 \\ \hline 337 \end{array}$$

Add the ones first, then the tens, then the hundreds.

Column Addition with regrouping.



Exchange ten ones for a ten. Model using numicon and place value counters.



Children can draw a representation of the grid to further support their understanding, carrying the ten underneath the line

$$564 + 335 = 500 + 60 + 4$$

$$\quad \quad \quad \underline{300 + 30 + 5}$$

$$\quad \quad \quad \underline{800 + 90 + 9} = 899$$

$$489 + 215$$

$$600 + 90 + 14 = 704$$

Start by partitioning the numbers before formal column to show the exchange.

$$\begin{array}{r} 257 \\ + 318 \\ \hline 575 \end{array}$$

Estimate the answers to questions and use inverse operations to check answers



Estimating $98 + 17 = ?$
 $100 + 20 = 120$

Use number lines to illustrate estimation:

Estimate $86 + 11 =$
 $90 + 10 = 100$



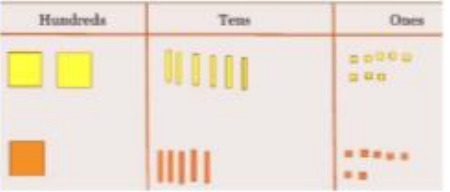
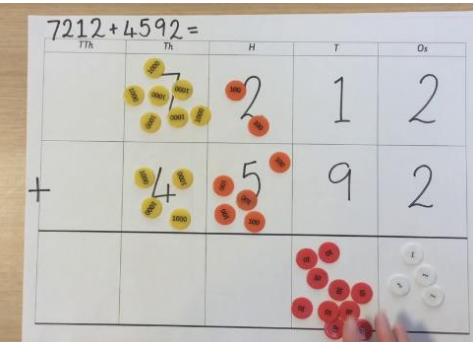
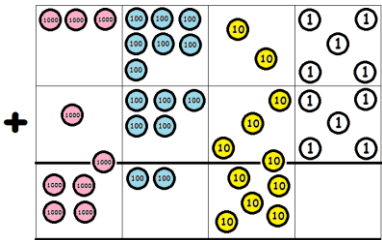
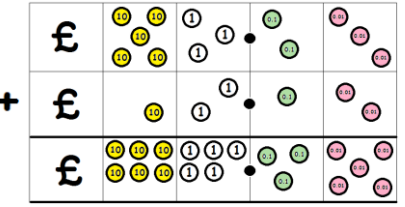
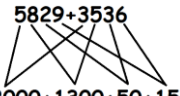

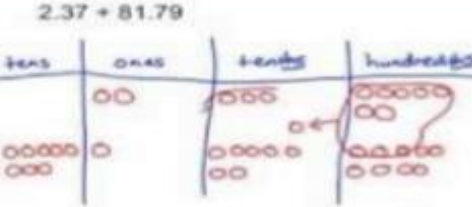
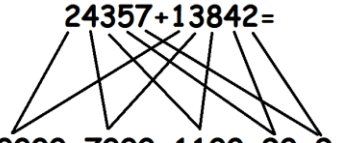
Building up known facts and using them to illustrate the inverse and to check answers:

$$98 + 18 = 116 \qquad 116 - 18 = 98$$

$$18 + 98 = 116 \qquad 116 - 98 = 18$$


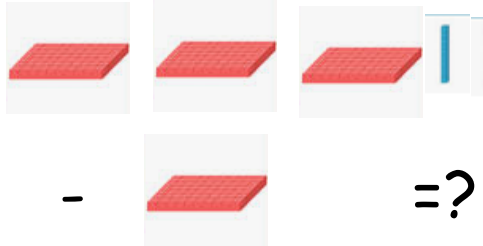
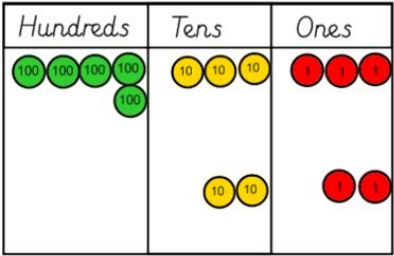
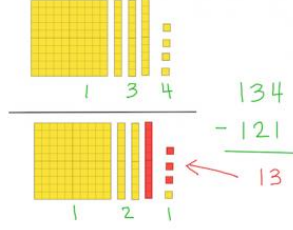
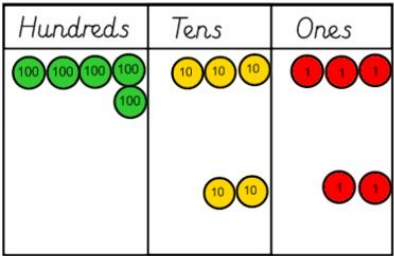
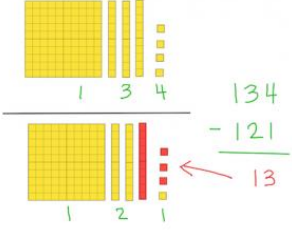
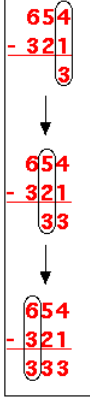
Year 4, 5 and 6 Addition



Strategies	Concrete	Pictorial	Abstract
<p>Y4—add numbers with up to 4 digits</p> <p>(to include 4+4 digits and also 4+3, 4+2 and 4+1 digits)</p>	<p>Children continue to use dienes or place value counters to add, exchanging ten ones for a ten and ten tens for a hundred and ten hundreds for a thousand.</p>  	<p>Read or draw pictorial representation using a place value grid.</p>  	<p>4625+3686=4000+600+20+5 <u>3000+600+80+6</u> <u>7000+1200+100+11=8311</u></p> <p>5829+3536</p>  <p>8000+1300+50+15=9365</p> <p>3 5 2 8 + 1 5 5 6 <u>5 0 8 4</u></p> <p>£3 1 . 5 7 + £2 6 . 2 5 <u>£5 7 . 8 2</u></p>
<p>Y5—add numbers with more than 4 digits.</p> <p>Add decimals with 2 decimal places, including money.</p> <p>(to include 5+5 digits and also 5+4, 5+3, 5+2 digits etc.)</p>	<p>As year 4</p>  <p>Introduce decimal place value counters and model exchange for addition.</p>		<p>24357+13842=</p>  <p>30000+7000+1100+90+9=38199</p> <p>5 6 7 9 3 + 1 3 5 6 7 <u>7 0 3 6 0</u></p>

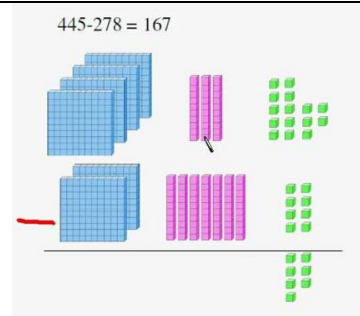
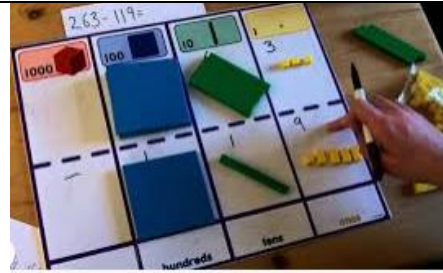
			$\begin{array}{r} 7285.84 \\ + 416.93 \\ \hline 7702.77 \end{array}$														
<p>Y6—add several numbers of increasing complexity, including adding money, measure and decimals with different numbers of decimal points.</p> <p>(Note: to include adding numbers with different numbers of digits AND different numbers of decimal digits)</p>	As Year 5	As Year 5	$\begin{array}{r} 9241462 \\ + 478557 \\ \hline 9720019 \end{array}$ <p>Example 1: $9.8 + 9.7 + 9.425 + 9.85$</p> <p>Adding Decimals</p> <table style="border: none;"> <tr> <td style="padding-right: 10px;">9.800</td> <td>* line up</td> </tr> <tr> <td>9.700</td> <td>decimals</td> </tr> <tr> <td>9.425</td> <td>* use zeros as</td> </tr> <tr> <td>+ 9.850</td> <td>placeholders</td> </tr> <tr> <td style="border-top: 1px solid black;">38.775</td> <td>ADD,</td> </tr> <tr> <td></td> <td>remembering</td> </tr> <tr> <td></td> <td>the decimal</td> </tr> </table>	9.800	* line up	9.700	decimals	9.425	* use zeros as	+ 9.850	placeholders	38.775	ADD,		remembering		the decimal
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	the decimal																
Estimate and use inverse operations to check answers to a calculation	As per Year 3																

Year 3 Subtraction

Strategies	Concrete	Pictorial	Abstract
<p>Subtract numbers mentally, including: three digit number + ones three digit number + tens three digit number + hundreds</p>	 <p>Use beads, base10 or PV counters for children to show concrete examples of counting prior to pictorial activities.</p>	 <p>Or beads/counters can also be used.</p>	<p>Expose children to missing number questions and vary the missing part of the calculation.</p> <p>$678 = ? - 1$ $688 - 10 = ?$ $678 = ? - 100$</p> <p>$746 - \square = 716$</p> <p>$\square - 8 = 310$</p> <p>$270 - \square = 230$</p>
<p>Column subtraction without regrouping (friendly numbers) up to 3 digits</p> <p>(to include 3-3digits, 3-2digits and 3-1 digits).</p>	<p>Using concrete objects</p>  	<p>Using pictorial representation</p>  	 <p>Subtract the right-hand column of digits.</p> <p>Subtract the next column of digits (moving left).</p> <p>Subtract the final column of digits (moving left).</p>

Column subtraction with regrouping (exchanging)

(to include 3-3digits, 3-2digits and 3-1 digits).



Column subtraction (shortened)

	H	T	U	
	2	4	4	
300 becomes 200, because one hundred has been exchanged into 10 tens.	-	2	7	2
	0	5	2	

I can't do 20-70 so I will exchange one hundred for 10 tens

Year 4, 5 and 6 Subtraction



Strategies	Concrete	Pictorial	Abstract
<p>Year 4: Subtract with up to 4 digits including money.</p> <p>(include subtracting numbers with different numbers of digits)</p>			$\begin{array}{r} 2441 \\ -1232 \\ \hline 1209 \end{array}$ $\begin{array}{r} \text{£}22.41 \\ -\text{£}12.32 \\ \hline \text{£}10.09 \end{array}$
<p>Year 5: To subtract with more than 4 digits including with 2 decimal places.</p> <p>(include subtracting numbers with different numbers of digits including different numbers of decimal digits)</p>	<p>As Year 4 as required</p>	<p>As Year 4 as required</p>	$\begin{array}{r} 67331 \\ -12123 \\ \hline 55208 \end{array}$ $\begin{array}{r} 456.32 \\ -242.14 \\ \hline 214.18 \end{array}$
<p>Year 6: To subtract numbers of increasing complexity, including money, measure and decimals with different numbers of decimal points.</p> <p>(include subtracting numbers with different numbers of digits including different numbers of decimal digits. Also include conversions of units involving different decimal digits.)</p>	<p>As Year 4 as required</p>	<p>As Year 4 as required</p>	$\begin{array}{r} 895264 \\ -235245 \\ \hline 660019 \end{array}$ $\begin{array}{r} 94624.21 \\ -22312.03 \\ \hline 72312.18 \end{array}$ <p>3.65km - 2804m = ?</p>

Year 3 Multiplication



Strategies	Concrete	Pictorial	Abstract
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To recall and use multiplication facts for the 3, 4 and 8 multiplication tables



$$4 \times 4 = ?$$

To calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers.

Grid Method:

Show the links with arrays to first introduce the grid method.

4 rows of 10
4 rows of 3

Move onto base ten to move towards a more compact method.

4 rows of 13

Link concrete arrays to pictorial versions of grid method using counters.

= 30

= 96

Move onto abstract versions of grid method.

x	10	5	
2	20	10	= 30

x	30	2	
3	90	6	= 96

Note: Once children have grasped the grid method - progress should be made onto formal method.

Formal Method:

Move on to place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows

26 x 4

26 x 4

Add up each column, starting with the ones making any exchanges needed. Then you have your answer.

26 x 4 = 104

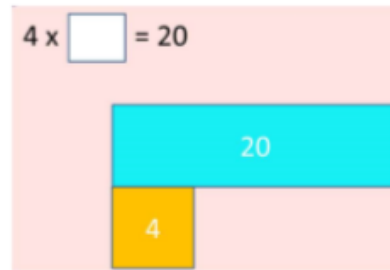
Example below: Once confident with times tables, children may be able to immediately exchange $4 \times 3 = 12$ for a ten and two ones.

x

	2	4	
x		3	
		1	
	7	2	

Solve problems, including missing number problems, integer scaling problems,

Bar models can be used (similar to fraction walls) to explore missing number problems

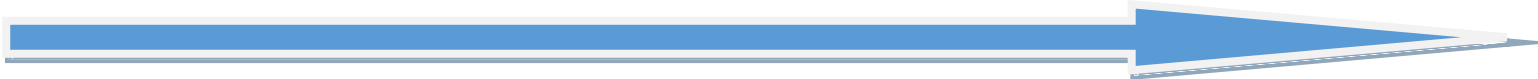


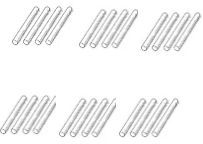
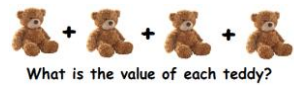
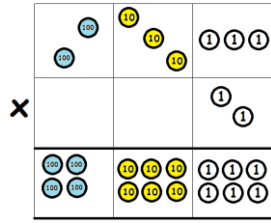
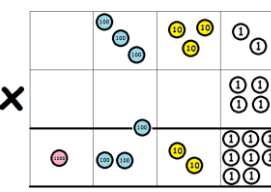

$$? \times 5 = 20$$

$$20 \div _ = 5$$

A man has 3 hats and 4 coats.
How many different outfits can he wear?

Year 4, 5 and 6 Multiplication



Strategies	Concrete	Pictorial	Abstract																																													
<p>Year 4: To recall and use multiplication facts for ALL times tables to 12x12</p>	 $12 \times 2 = 24$		$12 \times 7 = \underline{\quad}$																																													
<p>Year 4: To recap 2digitx1 digit from Y3 then move onto multiply two-digit by a one-digit number using formal written layout (no boundaries).</p>	<p>As Y3 as required</p>		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>2</td><td>3</td><td>3</td></tr> <tr><td>x</td><td></td><td>2</td></tr> <tr><td>4</td><td>6</td><td>6</td></tr> </table>	2	3	3	x		2	4	6	6																																				
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<p>Year 4: To recap 2digitx1 digit from Y3 then move onto multiply two-digit by a one-digit number using formal written layout (with boundaries crossed).</p>	<p>As Y3 as required</p>		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td></td><td>3</td><td>3</td><td>2</td></tr> <tr><td>x</td><td></td><td></td><td>4</td></tr> <tr><td>1</td><td>3</td><td>2</td><td>8</td></tr> </table>		3	3	2	x			4	1	3	2	8																																	
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<p>Year 5: To multiply numbers up to 4 digits by a one-digit number using a formal written method</p>	<p>As Y3 as required</p>		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>1</td><td>5</td><td>2</td><td>6</td></tr> <tr><td>x</td><td></td><td></td><td>2</td></tr> <tr><td>3</td><td>0</td><td>5</td><td>2</td></tr> </table>	1	5	2	6	x			2	3	0	5	2																																	
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+ 7	8	5	1	0																																												
8	3	7	4	4																																												

written method			
Year 6: Revisit to multiply numbers up to 4 digits by a two-digit number using a formal written method			As year 5
Year 6: Multiply decimals to 2 d.p. by a 1 digit number.			$ \begin{array}{r} 3.7 \\ \times 4 \\ \hline \\ \hline \\ \\ \hline \\ \hline \end{array} $ $ \begin{array}{r} 14.5 \\ \times 3 \\ \hline \\ \hline \\ \hline \end{array} $

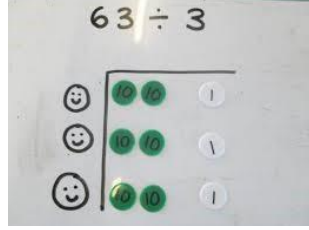
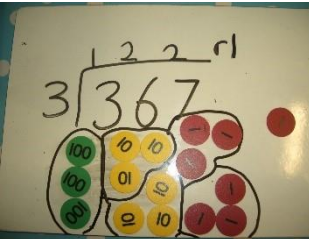
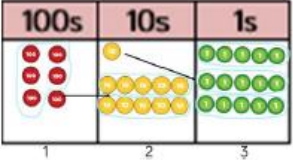
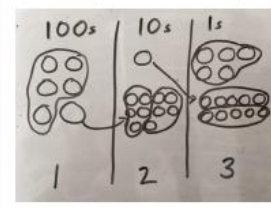
Year 3 Division



Strategies	Concrete	Pictorial	Abstract
Year 3: Recall all division facts for 3,4 and 8 tables			$24 \div 8 = \underline{\quad}$
Year 3: Recap division without remainders.	<p>Sharing using place value counters. $42 \div 3 = 14$</p>	<p>Children to represent the place value counters pictorially.</p> <p>Continued work counting 'groups' on a number line. $36 \div 6 = 6$</p>	<p>Children to be able to make sense of the place value counters and write calculations to show the process.</p> $42 \div 3$ $42 = 30 + 12$ $30 \div 3 = 10$ $12 \div 3 = 4$ $10 + 4 = 14$ $36 \div 6 = \underline{\quad}$
Year 3: Division with remainders.	<p>Divide objects between groups and how much is left over</p>	<p>Draw dots and group them to divide an amount and clearly show a remainder.</p> <p>Moving on to 'chunking' jumps and working with remainders. $41 \div 4 = 10 \text{ r}1$ (Put answer in at end)</p>	<p>Complete written divisions and show the remainder using r.</p> $29 \div 8 = 3 \text{ REMAINDER } 5$ <p>↑ ↑ ↑ ↑ dividend divisor quotient remainder</p>

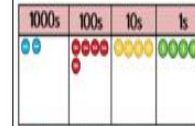
Year 4, 5 and 6 Division



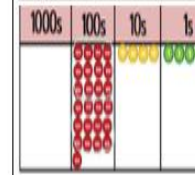
Strategies	Concrete	Pictorial	Abstract
Year 4: Recall all division facts for ALL times tables to $144 \div 12$			$132 \div 12 = \underline{\quad}$
Year 4: Short Division 2digit \div 1digit then 3 digit \div 1digit.	 	<p>Short division using place value counters to group. $615 \div 5$</p>  <ol style="list-style-type: none"> 1. Make 615 with place value counters. 2. How many groups of 5 hundreds can you make with 6 hundred counters? 3. Exchange 1 hundred for 10 tens. 4. How many groups of 5 tens can you make with 11 ten counters? 5. Exchange 1 ten for 10 ones. 6. How many groups of 5 ones can you make with 15 ones? 	$5 \overline{) 123} \begin{array}{r} 24 \\ \underline{10} \\ 23 \\ \underline{20} \\ 3 \\ \underline{3} \\ 0 \end{array}$ <p>$432 \div 5$ becomes</p> $5 \overline{) 432} \begin{array}{r} 86 \text{ r } 2 \\ \underline{40} \\ 32 \\ \underline{30} \\ 2 \end{array}$ <p>Answer: 86 remainder 2</p>

Short Division: 4 digit ÷ 1 digit.

Long division using place value counters
2544 ÷ 12



We can't group 2 thousands into groups of 12 so will exchange them.



We can group 24 hundreds into groups of 12 which leaves with 1 hundred.

$$\begin{array}{r} 212 \\ 12 \overline{) 2544} \\ \underline{24} \\ 14 \\ \underline{12} \\ 24 \\ \underline{24} \\ 0 \end{array}$$

Long Division with/without remainders.

$$\begin{array}{r} 151 \text{ r}23 \\ 25 \overline{) 3798} \\ \underline{25} \\ 129 \\ \underline{125} \\ 48 \\ \underline{25} \\ 23 \end{array}$$

Long Division: refine using decimals

432 ÷ 15 becomes

$$\begin{array}{r} 28.8 \\ 15 \overline{) 432.0} \\ \underline{30} \\ 132 \\ \underline{120} \\ 120 \\ \underline{120} \\ 0 \end{array}$$