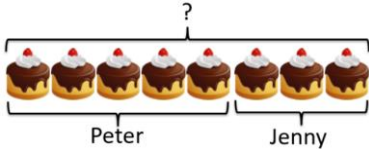

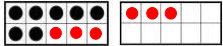


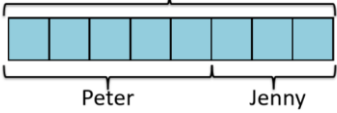
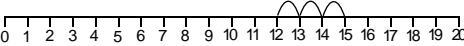
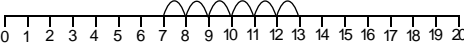




CALCULATION PROGRESSION: ADDITION

Pre-learning 1

Understanding addition to 20


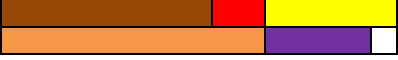
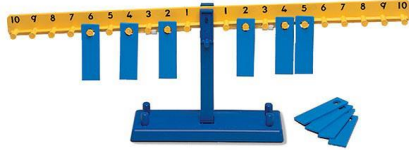




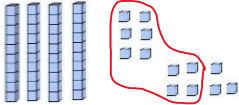
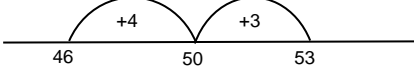
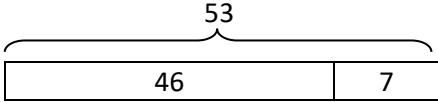
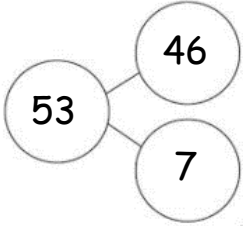

concrete	pictorial	abstract
<p><u>Number bonds to 20</u></p> <p>Using objects to represent a problem:</p>  <p>Bead string:</p> <p><i>Count on in ones.</i></p>  <p>Ten frames:</p>  <p>Cuisenaire rods:</p> <p><i>Use to make all possible number bonds for different length rods.</i></p>  <p>Balance:</p> <p><i>To reinforce the meaning of =</i></p> 	<p><u>Number bonds to 20</u></p> <p>Bar model in ones:</p>  <p>Number line:</p>  	<p><u>Number bonds to 20</u></p> <p>$5 + 3 = 8$</p> <p>$12 + 3 = 15$</p> <p>$7 + 6 = 13$</p> <p>$4 + 3 = 7$</p> <p>$7 = 4 + 3$</p> <p>Number sentences presented in different ways:</p> <p>$17 + 3 = 20$</p> <p>$20 = 17 + 3$</p> <p>$17 + \square = 20$</p> <p>$\square + 3 = 20$</p>



CALCULATION PROGRESSION: ADDITION

Pre-learning 2

TO+O, TO+T & TO+TO

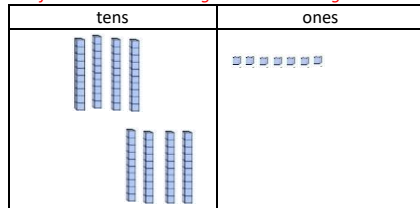
concrete	pictorial	abstract
<p><u>Several one-digit numbers</u></p> <p>Cuisenaire rods: <i>Find different ways of making the same total.</i></p>  <p><i>Reinforce the meaning of = by finding different combinations of numbers that make the same total.</i></p>  <p>Balance: <i>To reinforce the meaning of =</i></p> 	<p><u>Several one-digit numbers</u></p> <p>Draw sets of objects:</p>  <p><i>Look for numbers that total 10.</i></p> 	<p><u>Several one-digit numbers</u></p> <p>$4 + 2 + 3 = 9$</p> <p>$8 + 2 + 5 = 10 + 4 + 1$</p> <p>$6 + 4 + 2 = 2 + 4 + 5 + \square$</p>
<p><u>Two-digit + ones</u></p> <p>Bead string: <i>Start at 46, add 4 to jump to the next multiple of 10 then add the rest.</i></p>  <p>Ten frames: <i>Given ten frames showing 46. Add 7 counters by adding 4 to complete the ten frame, then add the rest.</i></p>  <p>Base ten blocks: <i>Make 46, add 7 ones and regroup ten ones to make a ten stick.</i></p> 	<p><u>Two-digit + ones</u></p> <p>Number line – counting to the next multiple of ten first:</p>  <p>Bar model:</p>  <p>Part-part-whole model:</p> 	<p><u>Two-digit + ones</u></p>  <p><i>Partition the 7 in this way because 6 and 4 makes 10.</i></p> <p>$46 + 7 = 46 + 4 + 3$ $= 53$</p> <p><i>Family of four</i></p> <p>$46 + 7 = 53$ $7 + 46 = 53$ $53 - 7 = 46$ $53 - 46 = 7$</p>

Two-digit + tens

Base ten blocks:

Make the starting number, then add on the tens.

Reinforce that the ones digit does not change.



Counting:

Count on in tens from different starting points:

3, 13, 23, 33, 43, 53, ...

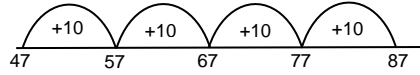
47, 57, 67, 77, 87, ...

Two-digit + tens

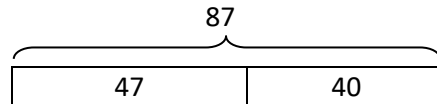
Drawing base ten:



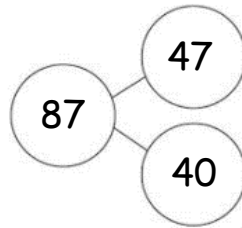
Number line – counting on in tens:



Bar model:



Part-part-whole model:



Two-digit + tens

$$3 + 50 = 53$$

$$47 + 40 = 87$$

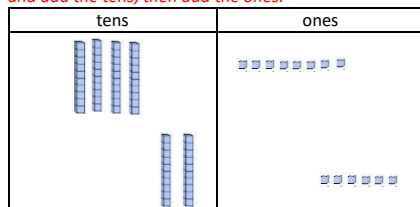
Two-digit + two-digit

Bead string:

Show the largest number. Partition the smaller number and add the tens, then add the ones.

Base ten blocks:

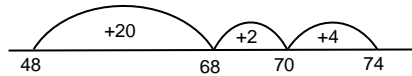
Make the largest number. Partition the other number and add the tens, then add the ones.



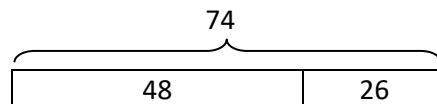
Two-digit + two-digit

Number line:

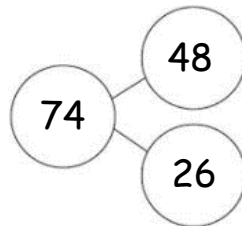
Partition the smaller number, add the tens then add the ones.



Bar model:



Part-part-whole model:




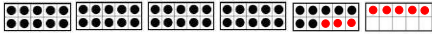
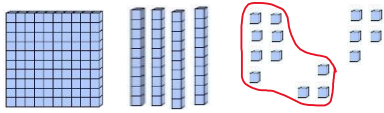
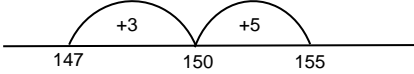
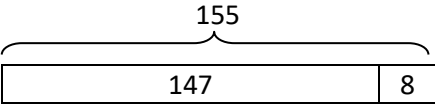
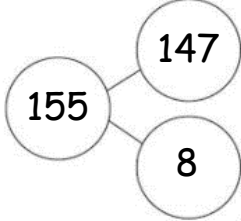
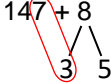
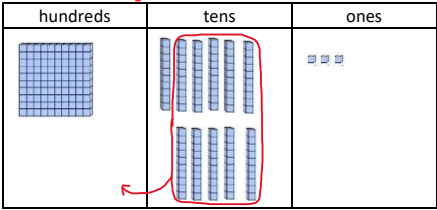
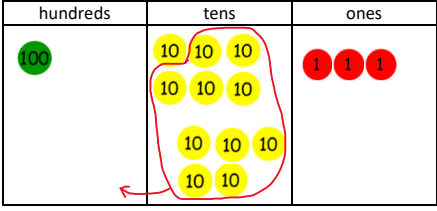

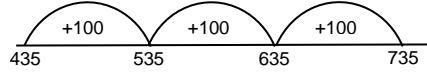
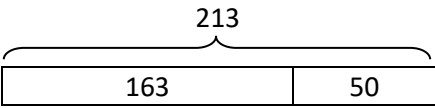
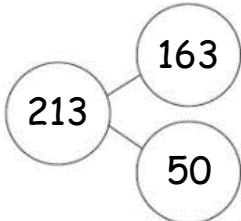
Two-digit + two-digit

$$48 + 26 = 48 + 20 + 6 = 74$$



CALCULATION PROGRESSION: ADDITION

Y3 HTO+O, HTO+T, HTO+H & HTO+HTO

concrete	pictorial	abstract
<p><u>Three-digit + ones</u></p> <p>Bead string (for TO+O): Start at 47, add 3 to jump to the next multiple of 10 then add the rest.</p>  <p>Ten frames (for TO+O): Given ten frames showing 47. Add 8 counters by adding 3 to complete the ten frame, then add the rest.</p>  <p>Base ten blocks: Make 147, add 3 ones to complete a ten stick then add the rest.</p> 	<p><u>Three-digit + ones</u></p> <p>Number line – counting to the next multiple of ten first:</p>  <p>Bar model:</p>  <p>Part-part-whole model:</p> 	<p><u>Three-digit + ones</u></p> <p>$147 + 8$</p>  <p>Partition the 8 in this way because 7 and 3 makes 10.</p> <p>$147 + 8 = 147 + 3 + 5$ $= 155$</p> <p>Family of four</p> <p>$147 + 8 = 155$ $8 + 147 = 155$ $155 - 8 = 147$ $155 - 147 = 8$</p>
<p><u>Three-digit + tens or hundreds</u></p> <p>Base ten blocks: Make the starting number, then add on the tens or hundreds. Exchange when a column reaches ten blocks.</p>  <p>Place value counters:</p> <p>Make the starting number, then add on the tens or hundreds. Exchange when a column reaches ten counters.</p>  <p>Counting: Count on in tens or hundreds: 163, 173, 183, 193, 203, 213, ... 435, 535, 635, 735, ...</p>	<p><u>Three-digit + tens or hundreds</u></p> <p>Drawing base ten:</p>  <p>Number line – counting on in tens or hundreds:</p>  <p>Bar model:</p>  <p>Part-part-whole model:</p> 	<p><u>Three-digit + tens or hundreds</u></p> <p>$163 + 50 = 213$ $435 + 300 = 735$</p>

Three-digit + two-digit (including money)

Base ten blocks:

Make the first number, add the tens then add the ones.

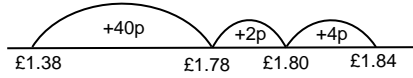
Coins:

Make both amounts, put them together and count the money.

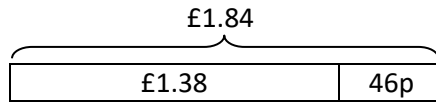
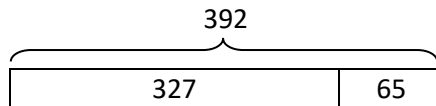
Three-digit + two-digit (including money)

Number line:

Partition the smaller number, add the tens then add the ones.



Bar model:



Three-digit + two-digit (including money)

$$327 + 65 = 327 + 60 + 5 = 392$$

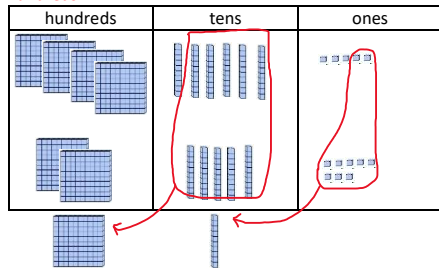
$$£1.38 + 46p = £1.38 + 40p + 6p = £1.84$$

Three-digit + three-digit column method

Start with no carrying, then carry once, then carry twice.

Base ten blocks:

Make the first number. Add the ones (exchanging where needed), add the tens (exchanging if needed), add the hundreds.



Place value counters:

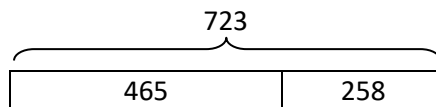
As above using counters instead of blocks.



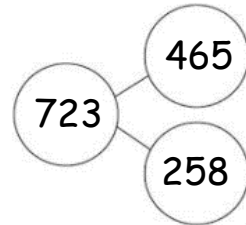
Three-digit + three-digit column method

Start with no carrying, then carry once, then carry twice.

Bar model:



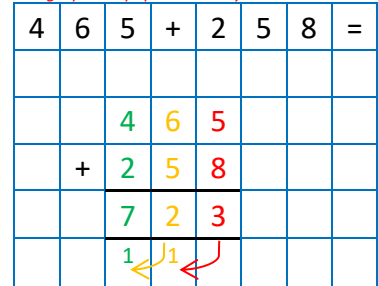
Part-part-whole model:



Three-digit + three-digit column method

Start with no carrying, then carry once, then carry twice.

Using squared paper to aid layout:





CALCULATION PROGRESSION: ADDITION


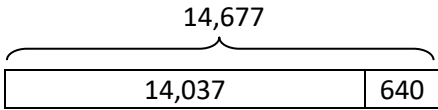
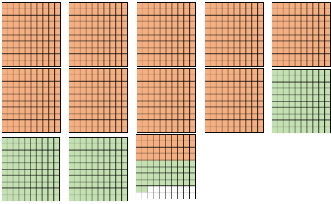
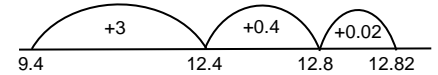
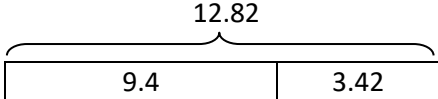
Y4 HTO+HTO, ThHTO+ThHTO & decimals up to 2d.p. (in context)

concrete	pictorial	abstract																																																												
<p>Mental calculations Make decisions about when it is appropriate to calculate mentally (with jottings if necessary).</p> <p>Base ten blocks: <i>To help with the relative size of each column, use blocks on a place value mat to make the first number then add on to the appropriate columns.</i></p> <p>Place value counters: <i>Use place value counters on a place value mat to keep track of which columns to add on to and which remain the same.</i></p>	<p>Mental calculations Make decisions about when it is appropriate to calculate mentally (with jottings if necessary).</p> <p>Bar model:</p> <div style="text-align: center;"> $\overbrace{\begin{array}{ c c } \hline 647 & 230 \\ \hline \end{array}}^{877}$ </div>	<p>Mental calculations Make decisions about when it is appropriate to calculate mentally (with jottings if necessary).</p> <p>$647 + 230 = 647 + 200 + 30 = 877$</p> <p>$3,536 + 1,300 = 3,536 + 1,000 + 300 = 4,836$</p> <p><i>Family of four</i> $647 + 230 = 877$ $230 + 647 = 877$ $877 - 230 = 647$ $877 - 647 = 230$</p>																																																												
<p>Decimals Calculate with decimal tenths in the context of measurement.</p> <p>Strips of paper: <i>Cut strips of paper to the length required and place them next to each other to 'build' the bar model.</i></p> <p>Tenth strips:</p> <div style="display: flex; justify-content: space-around;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td></tr> <tr><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td></tr> </table> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td></tr> <tr><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td><td style="width: 10px; height: 10px;"></td></tr> </table> </div> <p><i>Use a strip of ten to represent 1 'whole'. Using several strips, shade in both numbers in different colours to reinforce counting up to the next whole number.</i></p> <p>Counting: Count on in decimal tenths from different starting points: 3.6, 3.7, 3.8, 3.9, 4, 4.1, ...</p>																																									<p>Decimals Calculate with decimal tenths in the context of measurement.</p> <p>Number line – count on the ones, then the tenths:</p> <div style="text-align: center;"> </div> <p>Bar model:</p> <div style="text-align: center;"> $\overbrace{\begin{array}{ c c } \hline 6.8m & 3.4m \\ \hline \end{array}}^{10.2m}$ </div>	<p>Decimals Calculate with decimal tenths in the context of measurement.</p> <p>$6.8m + 3.4m = 10.2m$</p> <p>$4.3kg + 2.6kg = 6.9kg$</p> <p>$1.7l + 3.5l = 5.2l$</p>																				
<p>Column method</p> <p>Base ten blocks: <i>Make the first number. Add the ones (exchanging where needed), add the tens (exchanging if needed), add the hundreds (exchanging if needed), add the thousands.</i></p> <p>Place value counters: <i>As above using counters instead of blocks.</i></p>	<p>Column method</p> <p>Bar model:</p> <div style="text-align: center;"> $\overbrace{\begin{array}{ c c } \hline 1,456 & 1,738 \\ \hline \end{array}}^{3,192}$ </div>	<p>Column method</p> <p><i>Using squared paper to aid layout:</i></p> <table border="1" style="border-collapse: collapse; text-align: center; width: 100%;"> <tr><td colspan="10">$1,456 + 1,738 =$</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td>1</td><td>4</td><td>5</td><td>6</td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td>+</td><td>1</td><td>7</td><td>3</td><td>8</td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td>3</td><td>1</td><td>9</td><td>4</td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td>1</td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td></tr> </table>	$1,456 + 1,738 =$																						1	4	5	6						+	1	7	3	8							3	1	9	4							1		1					
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<p>Money Note: It is important to think about whether a written method is appropriate. If the amounts are easier to calculate mentally, then a mental method (with or without a number line) should be used.</p> <p>Coins and notes: <i>As above using money (could be modelled using blocks or counters instead).</i></p>	<p>Money Note: It is important to think about whether a written method is appropriate. If the amounts are easier to calculate mentally, then a mental method (with or without a number line) should be used.</p> <p>Bar model:</p> <div style="text-align: center;"> $\overbrace{\begin{array}{ c c } \hline \pounds 4.21 & \pounds 3.87 \\ \hline \end{array}}^{\pounds 8.08}$ </div>	<p>Money Note: It is important to think about whether a written method is appropriate. If the amounts are easier to calculate mentally, then a mental method (with or without a number line) should be used.</p> <p><i>Calculate in pence, then convert to pounds and pence:</i></p> <table border="1" style="border-collapse: collapse; text-align: center; width: 100%;"> <tr><td colspan="10">$\pounds 4.21 + \pounds 3.87 = \pounds 8.08$</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td>4</td><td>2</td><td>1</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td>+</td><td>3</td><td>8</td><td>7</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td>8</td><td>0</td><td>8</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>	$\pounds 4.21 + \pounds 3.87 = \pounds 8.08$																						4	2	1							+	3	8	7								8	0	8								1							
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CALCULATION PROGRESSION: ADDITION

Y5 Include numbers with more than four digits and decimals up to 3d.p.

concrete	pictorial	abstract																																																
<p><u>Mental calculations</u> Make decisions about when it is appropriate to calculate mentally (with jottings if necessary).</p> <p>Place value flip book: <i>Model adding to one column by turning that digit on a flip book. Consider what to do when the digit is 9.</i></p> 	<p><u>Mental calculations</u> Make decisions about when it is appropriate to calculate mentally (with jottings if necessary).</p> <p>Bar model:</p> 	<p><u>Mental calculations</u> Make decisions about when it is appropriate to calculate mentally (with jottings if necessary).</p> <p>$14,677 + 640 = 14,037 + 600 + 40 = 14,677$</p> <p>$23,565 + 15,000 = 23,565 + 10,000 + 5,000 = 38,565$</p>																																																
<p><u>Mental calculations (decimals)</u> Make decisions about when it is appropriate to calculate mentally (with jottings if necessary).</p> <p>10x10 grids:</p>  <p><i>Using a 10x10 grid as 1 'whole', shade in the numbers in two colours to show combining the whole numbers and the decimal parts.</i></p>	<p><u>Mental calculations (decimals)</u> Make decisions about when it is appropriate to calculate mentally (with jottings if necessary).</p> <p>Number line – count on the ones, then the tenths, then the hundredths:</p>  <p>Bar model:</p> 	<p><u>Mental calculations (decimals)</u> Make decisions about when it is appropriate to calculate mentally (with jottings if necessary).</p> <p>$9.4 + 3.42 = 9.4 + 3 + 0.4 + 0.02 = 12.82$</p> <p><i>Family of four</i> $9.4 + 3.42 = 12.82$ $3.42 + 9.4 = 12.82$ $12.82 - 3.42 = 9.4$ $12.82 - 9.4 = 3.42$</p>																																																
<p><u>Column method</u></p>	<p><u>Column method</u></p>	<p><u>Column method</u></p> <p><i>Using squared paper to aid layout:</i></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td colspan="8" style="text-align: center;">$68,742 + 9,449 =$</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td>6</td><td>8</td><td>7</td><td>4</td><td>2</td><td></td></tr> <tr><td></td><td>+</td><td></td><td>9</td><td>4</td><td>4</td><td>9</td><td></td></tr> <tr><td></td><td></td><td>7</td><td>8</td><td>1</td><td>9</td><td>1</td><td></td></tr> <tr><td></td><td></td><td>1</td><td>1</td><td></td><td>1</td><td></td><td></td></tr> </table>	$68,742 + 9,449 =$																		6	8	7	4	2			+		9	4	4	9				7	8	1	9	1				1	1		1		
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<p><u>Column method (decimals)</u></p> <p>Place value counters: <i>Use decimal place value counters to model addition of decimals. This will reinforce the importance of lining up the columns and the need to add zeros so all the numbers have the same number of decimal places.</i></p>	<p><u>Column method (decimals)</u></p>	<p><u>Column method (decimals)</u></p> <p><i>Stress the importance of lining up the decimal points and add zeros as place holders so all the numbers have the same number of decimal places.</i></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td colspan="8" style="text-align: center;">$68.74 + 4.708 =$</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td>6</td><td>8</td><td>.</td><td>7</td><td>4</td><td>0</td></tr> <tr><td></td><td>+</td><td></td><td>4</td><td>.</td><td>7</td><td>0</td><td>8</td></tr> <tr><td></td><td></td><td>7</td><td>3</td><td>.</td><td>4</td><td>4</td><td>8</td></tr> <tr><td></td><td></td><td>1</td><td>1</td><td></td><td></td><td></td><td></td></tr> </table>	$68.74 + 4.708 =$																		6	8	.	7	4	0		+		4	.	7	0	8			7	3	.	4	4	8			1	1				
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Y6 Include numbers with more than four digits and decimals

concrete	pictorial	abstract
Practise the skills from Y5 with larger numbers and decimals with differing numbers of decimal places.		