

UPPER KEY STAGE 2

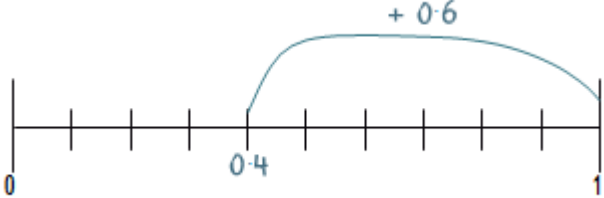
Children move on from dealing mainly with whole numbers to performing arithmetic operations with both decimals and fractions.

Addition and subtraction: Children will consolidate their use of written procedures in adding and subtracting whole numbers with up to 6 digits and also decimal numbers with up to 2 decimal places. Mental strategies for adding and subtracting increasingly large numbers will also be taught. These will draw upon children's robust understanding of place value and knowledge of number facts. Negative numbers will be added and subtracted.

Multiplication and division: Efficient and flexible strategies for mental multiplication and division are taught and practised, so that children can perform appropriate calculations even when the numbers are large, such as $40\,000 \times 6$ or $40\,000 \div 8$. In addition, it is in Years 5 and 6 that children extend their knowledge and confidence in using written algorithms for multiplication and division.

Fractions, decimals, percentages and ratio: Fractions and decimals are also added, subtracted, divided and multiplied, within the bounds of children's understanding of these more complicated numbers. Children will also calculate simple percentages and ratios.

		Year 5 Mental Methods	Year 5 Written Methods																																																																																																																																			
Addition		<p>Using place value Count in 0.1s, 0.01s e.g. <i>Know what 0.1 more than 0.51 is</i></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">10s</td> <td style="text-align: center;">1s</td> <td style="text-align: center;">0.1s</td> <td style="text-align: center;">0.01s</td> </tr> <tr> <td></td> <td style="text-align: center;">0</td> <td style="text-align: center;">5</td> <td style="text-align: center;">1</td> </tr> </table> <p>Partitioning e.g. $2.4 + 5.8$ as $2 + 5$ and $0.4 + 0.8$ and combine the totals: $7 + 1.2 = 8.2$</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>0.1</td><td>0.2</td><td>0.3</td><td>0.4</td><td>0.5</td><td>0.6</td><td>0.7</td><td>0.8</td><td>0.9</td><td>1</td></tr> <tr><td>1.1</td><td>1.2</td><td>1.3</td><td>1.4</td><td>1.5</td><td>1.6</td><td>1.7</td><td>1.8</td><td>1.9</td><td>2</td></tr> <tr><td>2.1</td><td>2.2</td><td>2.3</td><td>2.4</td><td>2.5</td><td>2.6</td><td>2.7</td><td>2.8</td><td>2.9</td><td>3</td></tr> <tr><td>3.1</td><td>3.2</td><td>3.3</td><td>3.4</td><td>3.5</td><td>3.6</td><td>3.7</td><td>3.8</td><td>3.9</td><td>4</td></tr> <tr><td>4.1</td><td>4.2</td><td>4.3</td><td>4.4</td><td>4.5</td><td>4.6</td><td>4.7</td><td>4.8</td><td>4.9</td><td>5</td></tr> <tr><td>5.1</td><td>5.2</td><td>5.3</td><td>5.4</td><td>5.5</td><td>5.6</td><td>5.7</td><td>5.8</td><td>5.9</td><td>6</td></tr> <tr><td>6.1</td><td>6.2</td><td>6.3</td><td>6.4</td><td>6.5</td><td>6.6</td><td>6.7</td><td>6.8</td><td>6.9</td><td>7</td></tr> <tr><td>7.1</td><td>7.2</td><td>7.3</td><td>7.4</td><td>7.5</td><td>7.6</td><td>7.7</td><td>7.8</td><td>7.9</td><td>8</td></tr> <tr><td>8.1</td><td>8.2</td><td>8.3</td><td>8.4</td><td>8.5</td><td>8.6</td><td>8.7</td><td>8.8</td><td>8.9</td><td>9</td></tr> <tr><td>9.1</td><td>9.2</td><td>9.3</td><td>9.4</td><td>9.5</td><td>9.6</td><td>9.7</td><td>9.8</td><td>9.9</td><td>10</td></tr> </table>	10s	1s	0.1s	0.01s		0	5	1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10	<p>Expanded column addition for money leading to compact column addition for adding several amounts of money e.g. $£14.64 + £28.78 + £12.26$ N.B. It is essential that children use £ <u>OR</u> p – not both.</p> <table style="margin-left: auto; margin-right: auto;"> <tr><td>£14</td><td>60p</td><td>4p</td></tr> <tr><td>£28</td><td>70p</td><td>8p</td></tr> <tr><td>+ £12</td><td>20p</td><td>6p</td></tr> <tr><td>£1</td><td>10p</td><td></td></tr> <tr><td colspan="3"><hr/></td></tr> <tr><td>£55</td><td>60p</td><td>8p</td></tr> </table> <p>Compact column addition to add pairs of 5-digit numbers Continue to use column addition to add towers of several larger numbers Use compact addition to add decimal numbers with up to 2 decimal places N.B. Digits carried go <u>ABOVE</u> not below the line. e.g. $15.68 + 27.86$</p> <table style="margin-left: auto; margin-right: auto;"> <tr><td>15.68</td></tr> <tr><td>+ 27.86</td></tr> <tr><td>11.1</td></tr> <tr><td><hr/></td></tr> <tr><td>43.54</td></tr> </table> <p>Add related fractions e.g. $3/4 + 1/8 = 7/8$</p>	£14	60p	4p	£28	70p	8p	+ £12	20p	6p	£1	10p		<hr/>			£55	60p	8p	15.68	+ 27.86	11.1	<hr/>	43.54
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	Year 5 Mental Methods	Year 5 Written Methods
Addition	<p>Counting on</p> <p>Add two decimal numbers by adding the 1s, then the 0.1s/0.01s e.g. $5.72 + 3.05$ as $5.72 + 3 (8.72) + 0.05 = 8.77$</p> <p>Add near multiples of 1 e.g. $6.34 + 0.99$ e.g. $5.63 + 0.9$</p> <p>Count on from large numbers e.g. $6834 + 3005$ as $9834 + 5$</p> <p>Using number facts</p> <p>Number bonds to 1 and to the next whole number e.g. $5.7 + 0.3$ e.g. $0.4 + 0.6$</p>  <p>Add to the next 10 from a decimal number e.g. $7.8 + 2.2 = 10$</p>	

Year 5 Mental Methods

Taking away

Use place value to subtract decimals

e.g. $4.58 - 0.08$

e.g. $6.26 - 0.2$

Take away multiples of powers of 10

e.g. $15\ 672 - 300$

e.g. $4.82 - 2$ e.g. $2.71 - 0.5$

e.g. $4.68 - 0.02$

Partitioning or counting back

e.g. $3964 - 1051$

e.g. $5.72 - 2.01$

Subtract near multiples of 1, 10, 100, 1000, 10 000 or £1

e.g. $86\ 456 - 9999$

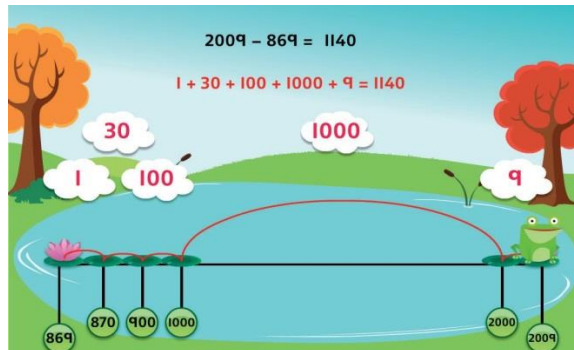
e.g. $3.58 - 1.99$

Counting up

Find a difference between two numbers by counting up from the smaller to the larger

e.g. $£12.05 - £9.59$

e.g. $2009 - 869$



Year 5 Written Methods

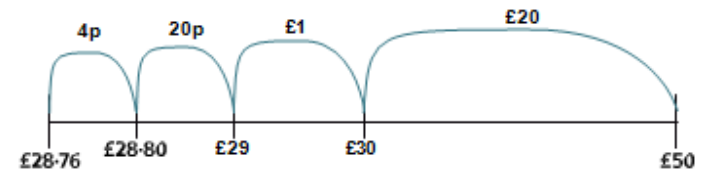
Compact column subtraction for numbers with up to 5 digits

e.g. $16\ 324 - 8516$

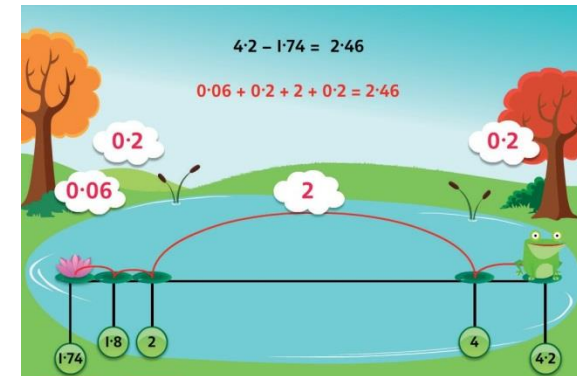


Continue to use counting up subtraction for subtractions involving money, including finding change

e.g. $£50 - £28.76$



Use counting up subtraction to subtract decimal numbers



e.g. $4.2 - 1.74$

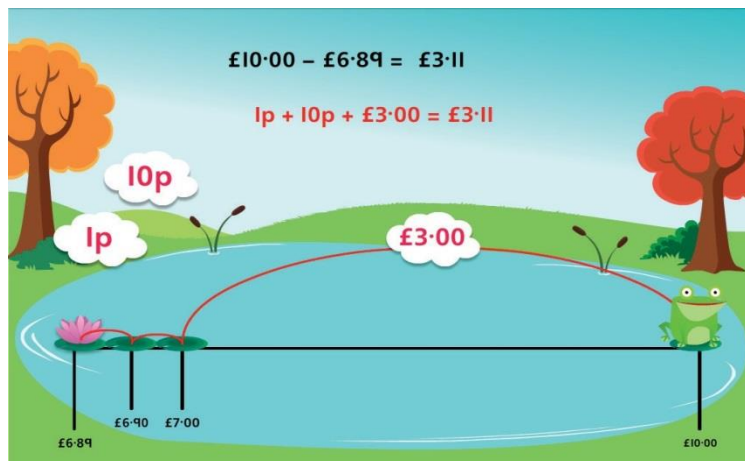
Subtract related fractions

e.g. $3/4 - 1/8 = 5/8$

NB Counting up subtraction provides a default method for ALL children

Year 5 Mental Methods

Find change using shopkeepers' addition
e.g. Buy a toy for £6.89 using £10.00



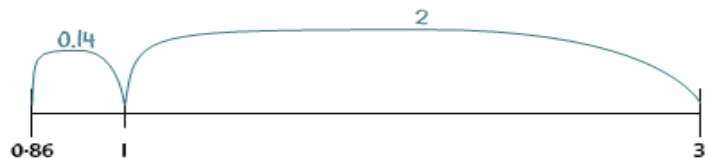
Find a difference between two amounts of money by counting up

Using number facts

Derived facts from number bonds to 10 and 100

e.g. $2 - 0.45$ using $45 + 55 = 100$

e.g. $3 - 0.86$ using $86 + 14 = 100$



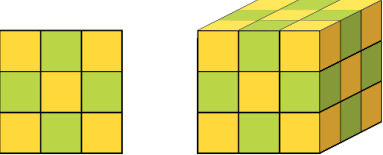

Number bonds to £1, £10 and £100

e.g. $£4.00 - £3.86$

e.g. $£100 - £66$ using $66 + 34 = 100$

Year 5 Mental Methods

	Year 5 Mental Methods	Year 5 Written Methods
Multiplication	<p>Doubling and halving</p> <p>Double amounts of money using partitioning e.g. <i>double £6.73</i></p> <div style="text-align: center;"> </div> <p>Use doubling and halving as a strategy in multiplying by 2, 4, 8, 5 and 20 e.g. 58×5 is half of 58×10 (580) = 290</p> <p>Grouping</p> <p>Multiply whole numbers and decimals by 10, 100, 1000 e.g. $3.4 \times 100 = 340$</p> <p>Use partitioning to multiply 'friendly' 2- and 3-digit numbers by 1-digit numbers e.g. 402×6 as 400×6 (2400) and 2×6 (12) = 2412</p> <div style="text-align: center;"> </div> <p>Use partitioning to multiply decimal numbers by 1-digit numbers e.g. 4.5×3 as 4×3 (12) and 0.5×3 (1.5) = 13.5</p> <p>Multiply near multiples by rounding e.g. 32×29 as $(32 \times 30) - 32 = 928$</p>	<p>Short multiplication of 2-, 3- and 4-digit numbers by 1-digit numbers e.g. 435×8</p> <div style="text-align: center;"> </div> <p>Long multiplication of 2-, 3- and 4-digit numbers by 'teen' numbers e.g. 48×16</p> <div style="text-align: center;"> </div>

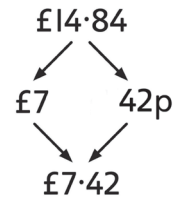
		Year 5 Mental Methods	Year 5 Written Methods									
Multiplication	Year 5 Mental Methods	<p>Using number facts</p> <p>Use times-tables facts up to 12×12 to multiply multiples of 10/100 of the multiplier</p> <p>e.g. $4 \times 6 = 24$ so $40 \times 6 = 240$ and $400 \times 6 = 2400$</p> <p>Use knowledge of factors and multiples in multiplication</p> <p>e.g. 43×6 is double 43×3</p> <p>e.g. 28×50 is half of 28×100 (2800) = 1400</p> <p>Know square numbers and cube numbers</p>	<p>Grid multiplication of numbers with up to 2 decimal places by 1-digit numbers</p> <p>e.g. 1.34×6</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">×</td> <td style="padding: 5px;"> </td> <td style="padding: 5px;">0.3</td> <td style="padding: 5px;">0.04</td> <td rowspan="2" style="padding: 0 10px;">= 8.04</td> </tr> <tr> <td style="padding: 5px;">6</td> <td style="padding: 5px;">6</td> <td style="padding: 5px;">1.8</td> <td style="padding: 5px;">0.24</td> </tr> </table> <p>Multiply fractions by 1-digit numbers</p> <p>e.g. $\frac{3}{4} \times 6 = \frac{18}{4} = 4 \frac{2}{4} = 4 \frac{1}{2}$</p>	×		0.3	0.04	= 8.04	6	6	1.8	0.24
	×		0.3	0.04	= 8.04							
6	6	1.8	0.24									
												
			NB Grid multiplication provides a default method for ALL children									

Year 5 Mental Methods

Doubling and halving

Halve amounts of money using partitioning

e.g. *half of £14.84 is half of £14 (£7) plus half of 84p (42p)*



Use doubling and halving as a strategy in dividing by 2, 4, 8, 5 and 20

e.g. $115 \div 5$ as *double 115* $(230) \div 10 = 23$

Grouping

Divide numbers by 10, 100, 1000 to obtain decimal answers with up to 3 decimal places

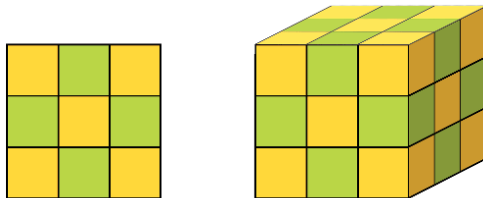
e.g. $340 \div 100 = 3.4$

Using number facts

Use division facts from the times-tables up to 12×12 to divide multiples of powers of 10 of the divisor

e.g. $3600 \div 9$ using $36 \div 9$

Know square numbers and cube numbers



Year 5 Written Methods

Use a written version of a mental strategy to divide 3-digit numbers by 1-digit numbers

e.g. $186 \div 6$ as 30×6 (180) and 1×6 (6)

Brainstorm first, e.g. $1 \times 6 = 6$, $2 \times 6 = 12$, etc

$1 \times 6 = 6$ $2 \times 6 = 12$ $3 \times 6 = 18$ $4 \times 6 = 24$ $5 \times 6 = 30$ $10 \times 6 = 60$ $20 \times 6 = 120$ $30 \times 6 = 180$	$\begin{array}{r} 31 \\ 6 \overline{)186} \\ \underline{-180} \\ 6 \\ \underline{-6} \\ 0 \end{array}$	30×6	1×6	31
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e.g. $326 \div 6$ as 50×6 (300) and 4×6 (24), remainder 2

$1 \times 6 = 6$ $2 \times 6 = 12$ $3 \times 6 = 18$ $4 \times 6 = 24$ $5 \times 6 = 30$ $50 \times 6 = 300$	$\begin{array}{r} 54 \text{ R } 2 \\ 6 \overline{)326} \\ \underline{-300} \\ 26 \\ \underline{-24} \\ 2 \end{array}$	50×6	4×6	$54 \text{ R } 2$
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	Year 5 Mental Methods	Year 5 Written Methods			
Division		<p>Before pupils can begin to use the short division method there are a number of skills and concepts that need to have been developed:</p> <ul style="list-style-type: none"> • recall fluently multiplication facts to 12 x 12, recognise multiples • visualise and understand how a four-digit number can be partitioned and recombined into multiples of 1000, 100, 10 and 1 with both concrete and abstract representations. (i.e. base 10 (concrete), place value counters or arrow cards) • visualise the relative quantity of the numbers • know the value of a digit because of its position in a number • understand the effect of multiplying by 10, 100 and 1000 • understand that multiplication and division are inverses and use this relationship to estimate and check answers • decide when it is more efficient to calculate mentally • understand the concept of a remainder after division • understand that division is (left) distributive over addition, eg $(a + b) \div c = (a \div c) + (b \div c)$ <p>Short division</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; border-right: 1px solid black; padding: 5px;"> <p>98 ÷ 7 becomes</p> $\begin{array}{r} 14 \\ 7 \overline{) 98} \\ \underline{7} \\ 20 \\ \underline{14} \\ 6 \end{array}$ <p>Answer: 14</p> </td> <td style="width: 33%; border-right: 1px solid black; padding: 5px;"> <p>432 ÷ 5 becomes</p> $\begin{array}{r} 86 \text{ r } 2 \\ 5 \overline{) 432} \\ \underline{40} \\ 32 \\ \underline{30} \\ 2 \end{array}$ <p>Answer: 86 remainder 2</p> </td> <td style="width: 33%; padding: 5px;"> <p>496 ÷ 11 becomes</p> $\begin{array}{r} 45 \text{ r } 1 \\ 11 \overline{) 496} \\ \underline{44} \\ 56 \\ \underline{55} \\ 1 \end{array}$ <p>Answer: $45 \frac{1}{11}$</p> </td> </tr> </table>	<p>98 ÷ 7 becomes</p> $\begin{array}{r} 14 \\ 7 \overline{) 98} \\ \underline{7} \\ 20 \\ \underline{14} \\ 6 \end{array}$ <p>Answer: 14</p>	<p>432 ÷ 5 becomes</p> $\begin{array}{r} 86 \text{ r } 2 \\ 5 \overline{) 432} \\ \underline{40} \\ 32 \\ \underline{30} \\ 2 \end{array}$ <p>Answer: 86 remainder 2</p>	<p>496 ÷ 11 becomes</p> $\begin{array}{r} 45 \text{ r } 1 \\ 11 \overline{) 496} \\ \underline{44} \\ 56 \\ \underline{55} \\ 1 \end{array}$ <p>Answer: $45 \frac{1}{11}$</p>
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