Overview of Strategies and Methods – Year 6

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* × *6* or *40 000* ÷ *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.

Addition

Year 6 Mental Methods

Using place value

Count in 0·1s, 0·01s, 0·001s

e.g. *Know what 0·001 more than 6·725 is*

Partitioning

e.g. *9·54 + 3·23 as 9 + 3, 0·5 + 0·2 and 0·04 + 0·03, to give 12·77*

Counting on

Add two decimal numbers by adding the 1s, then the 0·1s/0·01s/0·001s

e.g. *6·314 + 3·006 as 6·314 + 3 (9·314) + 0·006 = 9·32*

Add near multiples of 1

e.g. *6·345 + 0·999*

e.g. *5·673 + 0·9*

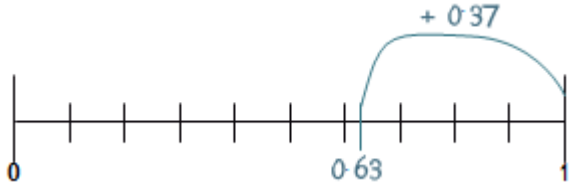
Count on from large numbers e.g. *16 375 + 12 003 as 28 375 + 3*

Using number facts

Number bonds to 1 and to the next multiple of 1

e.g. *0·63 + 0·37*

e.g. *2·355 + 0·645*



Add to the next 10 e.g. *4·62 + 5·38*

Year 6 Written Methods

Compact column addition for adding several large numbers and decimal numbers with up to 2 decimal places

Compact column addition with money

e.g. *£14·64 + £28·78 + £12·26*

£14·64
+ £28·78
£12·26
11·1
£55·68

Add unlike fractions, including mixed numbers

e.g. *1/4 + 2/3 = 11/12*

e.g. *2 1/4 + 1 1/3 = 3 7/12*

Subtraction

Year 6 Mental Methods

Taking away

Use place value to subtract decimals e.g.

7·782 – 0·08

e.g. *16·263 – 0·2*

Take away multiples of powers of 10 e.g.

132 956 – 400

e.g. *686 109 – 40 000*

e.g. *7·823 – 0·5*

Partitioning or counting back e.g.

3964 – 1051

e.g. *5·72 – 2·01*

Subtract near multiples of powers of 10 e.g.

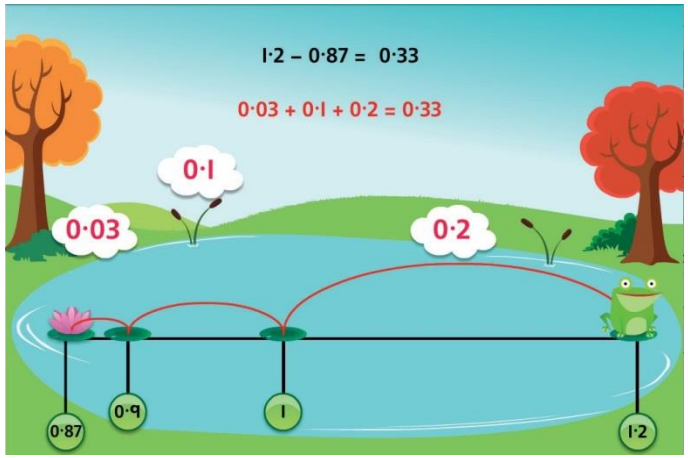
360 078 – 99 998

e.g. *12·831 – 0·99*

Counting up

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

e.g. *1·2 – 0·87*



Year 6 Written Methods

Compact column subtraction for large numbers e.g. *34 685 – 16 458*

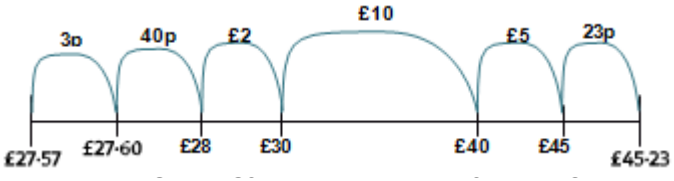
	2	14		7	15
	~~3~~	~~4~~	6	~~8~~	~~5~~
–	1	6	4	5	8
	1	8	2	2	7

Use counting up for subtractions where the larger number is a multiple or near multiple of 1000 or 10 000

Use counting up subtraction when dealing with money

e.g. *£100 – £78·56*

e.g. *£45·23 – £27·57*



Subtract unlike fractions, including mixed numbers

e.g. *3/4 – 1/3 = 5/12*
e.g. *2 3/4 – 1 1/3 = 1 5/12*

NB Counting up subtraction provides a default method for ALL children, however, compact column subtraction (decomposition) should be the focus method for teaching.

Subtraction

Year 6 Mental Methods

Using number facts

Derived facts from number bonds to 10 and 100 e.g.

0·1 – 0·075 using 75 + 25 = 100

e.g. *5 – 0·65 using 65 + 35 = 100*

Number bonds to £1, £10 and £100 e.g.

£7·00 – £4·37

e.g. *£100 – £66·20 using 20p + 80p = £1 and £67 + £33 = £100*

Year 6 Written Methods

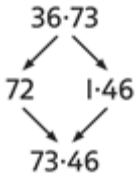
Multiplication

Year 6 Mental Methods

Doubling and halving

Double decimal numbers with up to 2 places using partitioning

e.g. *double 36·73*



Use doubling and halving as strategies in mental multiplication

Grouping

Use partitioning as a strategy in mental multiplication, as appropriate

e.g. *3060 × 4 as 3000 × 4 (12 000) and 60 × 4 (240) = 12 240*

e.g. *8·4 × 8 as 8 × 8 (64) and 0·4 × 8 (3·2) = 67·2*

Use factors in mental multiplication

e.g. *421 × 6 as 421 × 3 (1263) doubled = 2526*

e.g. *3·42 × 5 as half of 3·42 × 10 = 17·1*

Multiply decimal numbers using near multiples by rounding e.g. *4·3 × 19 as (4·3 × 20) – 4·3 = 81·7*

Using number facts

Use times-tables facts up to 12 × 12 in mental multiplication of large numbers or numbers with up to 2 decimal places

e.g. *6 × 4 = 24 and 0·06 × 4 = 0·24*

Year 6 Written Methods

Short multiplication of 2-, 3- and 4-digit numbers by 1-digit numbers

e.g. *3743 × 6*

$$\begin{array}{r} 3\,7\,4\,3 \\ \times \quad\quad 6 \\ \hline 2\,2\,4\,5\,8 \\ \hline \end{array}$$

Long multiplication of 2-, 3- and 4-digit numbers by 2-digit numbers

e.g. *456 × 38*

$$\begin{array}{r} 4\,5\,6 \\ \times \quad 3\,8 \\ \hline 1\,3\,6\,8\,0 \\ 3\,6\,4\,8 \\ \quad 1\,1 \\ \hline 1\,7\,3\,2\,8 \\ \hline \end{array}$$

	Year 6 Mental Methods	Year 6 Written Methods
Written Multiplication		Short multiplication of decimal numbers using × 100 and ÷ 100 e.g. *13·72 × 6 as (1372 × 6) ÷ 100 = 82·32* Short multiplication of money e.g. *£13·72 × 6* £ 1 3 7 2 × 6 2 4 1 £ 8 2 3 2 Grid multiplication of numbers with up to 2 decimal places by 1-digit numbers e.g. *6·76 × 4* × 6 0·7 0·06 4 24 2·8 0·24 = 27·04 Multiply simple pairs of proper fractions e.g. 1/2 × 1/4 = 1/8 **NB Grid multiplication provides a default method for children but short multiplication should be the main method taught.**

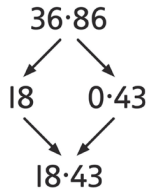
Division

Year 6 Mental Methods

Doubling and halving

Halve decimal numbers with up to 2 places using partitioning

e.g. *half of 36·86 is half of 36 (18) plus half of 0·86 (0·43)*



Use doubling and halving as strategies in mental division

Grouping

Use the 10th, 20th, 30th, … or 100th, 200th, 300th … multiples of the divisor to divide large numbers

e.g. *378 ÷ 9 as 40 × 9 (360) and 2 × 9 (18), remainder 2*

Use tests for divisibility

e.g. *135 divides by 3, as 1 + 3 + 5 = 9 and 9 is in the ×3 table*

Using number facts

Use division facts from the times-tables up to 12 × 12 to divide decimal numbers by 1-digit numbers

e.g. *1·17 ÷ 3 is 1/100 of 117 ÷ 3 (39)*

Know tests of divisibility for numbers divisible by 2, 3, 4, 5, 9, 10 and 25

Year 6 Written Methods

Before pupils can begin to use the short division method there are a number of skills and concepts that need to have been developed:

- 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) ÷ c = (a ÷ c) + (b ÷ c)

Short division

98 ÷ 7 becomes

$$\begin{array}{r} 1\ 4 \\ 7\overline{)\ 9^{2}\ 8} \end{array}$$

Answer: 14

432 ÷ 5 becomes

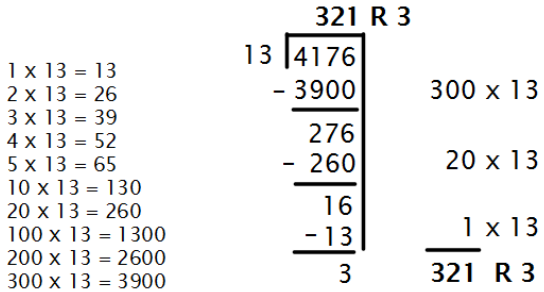
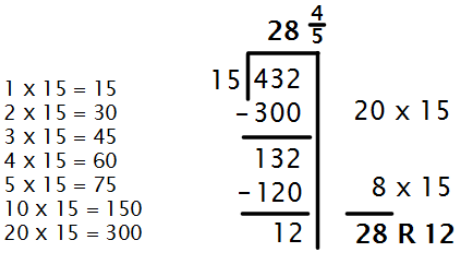
$$\begin{array}{r} 8\ \ 6\ \text{r}\,2 \\ 5\overline{)\ 4\ 3^{3}\ 2} \end{array}$$

Answer: 86 remainder 2

496 ÷ 11 becomes

$$\begin{array}{r} 4\ \ 5\ \text{r}\,1 \\ 1\ 1\overline{)\ 4\ 9^{5}\ 6} \end{array}$$

Answer: $45\frac{1}{11}$

	Year 6 Mental Methods	Year 6 Written Methods
Division		Long division of 3- and 4-digit numbers by 2-digit numbers e.g. *4176 ÷ 13* Brainstorm first, e.g. 1 x 6 = 6, 2 x 6 = 12, etc  Express remainders as fractions e.g. *432 ÷ 15 becomes*  $\frac{12}{15} = \frac{4}{5}$ Give remainders as whole numbers, fractions or decimals Use place value to divide 1- and 2-place decimals by numbers ≤ 12 e.g. *3.65 ÷ 5 as (365 ÷ 5) ÷ 100 = 0·73*