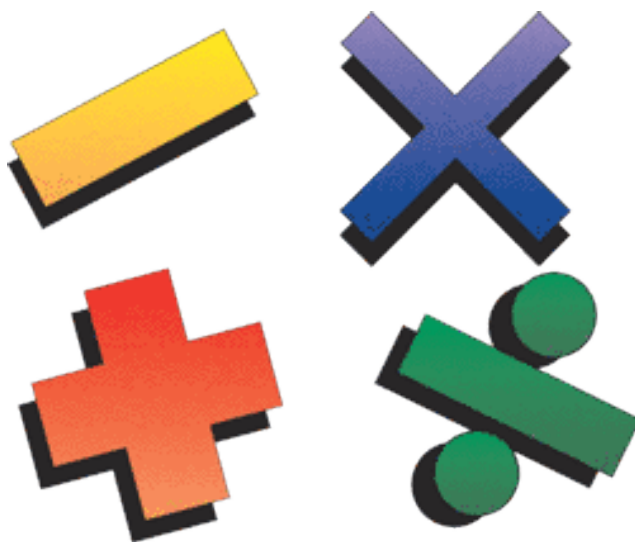




Hadleigh
Junior
School



Calculation policy



Addition - Year 3

Missing number problems using a range of equations as in Year 1 and 2 but with appropriate, larger numbers.

Partition into tens and ones

Partition both numbers and recombine.

Count on by partitioning the second number only e.g.

$$247 + 125 = 247 + 100 + 20 + 5$$

$$= 347 + 20 + 5$$

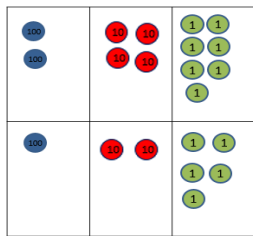
$$= 367 + 5$$

$$= 372$$

Children need to be secure adding multiples of 100 and 10 to any three-digit number including those that are not multiples of 10.

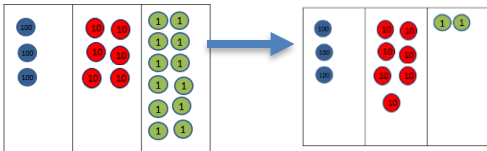
Towards a written method

Introduce expanded column addition modelled with place value counters



$$\begin{array}{r} 247 \\ + 125 \\ \hline 12 \\ 60 \\ 300 \\ \hline 372 \end{array} \quad \begin{array}{l} (7 + 5) \\ (40 + 20) \\ (200 + 100) \end{array}$$

Leading to children understanding the exchange between tens and ones.



Some children may begin to use a formal columnar algorithm (see Year 4) initially introduced alongside the expanded method. The formal method should be seen as a more streamlined version of the expanded method, not a new method.

Problem Solving

Teachers will introduce written problems alongside these methods to ensure pupils begin to apply their knowledge.

Addition - Year 4

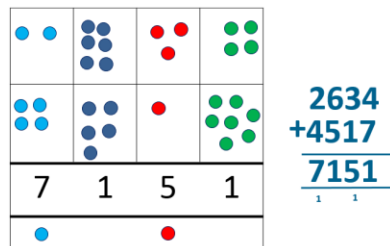
Missing number/digit problems:

Mental methods should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving.

Written methods (progressing to 4-digits)

Compact written method

Extend to numbers with at least four digits.



Children should be able to make the choice of reverting to expanded methods if experiencing any difficulty.

Extend to up to two places of decimals (same number of decimals places) and adding several numbers (with different numbers of digits).

$$\begin{array}{r} 72.8 \\ + 54.6 \\ \hline 127.4 \\ 1 \quad 1 \end{array}$$

Problem Solving

Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding. This will include work with decimals.

Addition - Year 5/6

Missing number/digit problems:

Mental methods should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving. Children should practise with increasingly large numbers to aid fluency e.g. $12462 + 2300 = 14762$

Written methods (progressing to more than 4-digits)

As year 4, progressing when understanding of the expanded method is secure, children will move on to the formal columnar method for whole numbers and decimal numbers as an efficient written algorithm.

789 + 642 becomes

$$\begin{array}{r} 789 \\ + 642 \\ \hline 1431 \end{array}$$

Answer: 1431

$$\begin{array}{r} 172.83 \\ + 54.68 \\ \hline 227.51 \\ 1 \quad 1 \quad 1 \end{array}$$

Place value counters may be used alongside the columnar method to develop understanding of addition with decimal numbers.

Problem Solving

Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding. This will include work with decimals.

Subtraction -Year 3

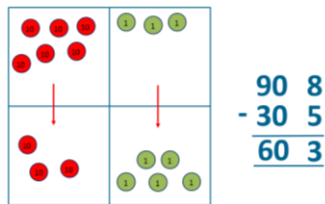
Missing number problems e.g. $\square = 43 - 27$; $145 - \square = 138$; $274 - 30 = \square$; $245 - \square = 195$; $532 - 200 = \square$; $364 - 153 = \square$

Mental methods should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving (see Y1 and Y2).

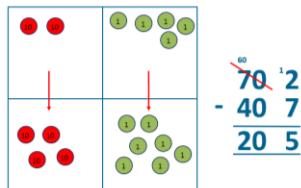
Children should make choices about whether to use complementary addition or counting back, depending on the numbers involved.

Written methods (progressing to 3-digits)

Introduce expanded column subtraction with no decomposition, modelled with place value counters



For some children this will lead to exchanging, modelled using place value counters.



A number line and expanded column method may be compared next to each other. Some children may begin to use a formal columnar algorithm, (see Year 4) initially introduced alongside the expanded method. The formal method should be seen as a more streamlined version of the expanded method, not a new method.

Problem Solving

Teachers will introduce written problems alongside these methods to ensure pupil's begin to apply their knowledge.

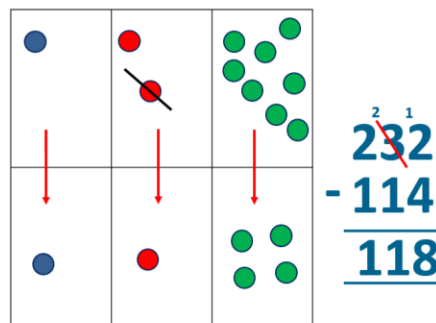
Subtraction - Year 4

Missing number/digit problems: $456 + \square = 710$; $1\square7 + 6\square = 200$; $60 + 99 + \square = 340$; $200 - 90 - 80 = \square$; $225 - \square = 150$; $\square - 25 = 67$; $3450 - 1000 = \square$; $\square - 2000 = 900$

Mental methods should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving.

Written methods (progressing to 4-digits)

If understanding of the expanded method is secure, children will move on to the formal method of decomposition, which again can be initially modelled with place value counters.



Problem Solving

Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding. This will include work with decimals.

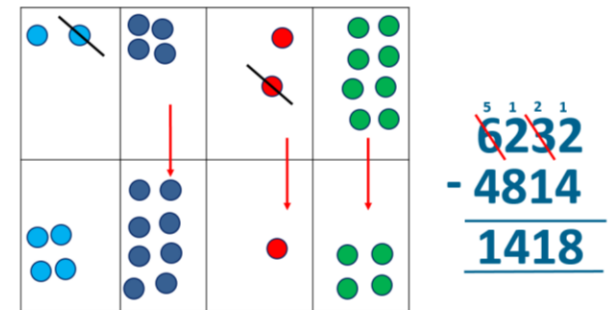
Subtraction - Year 5/6

Missing number/digit problems: $6.45 = 6 + 0.4 + \square$; $119 - \square = 86$; $1\,000\,000 - \square = 999\,000$; $600\,000 + \square + 1000 = 671\,000$; $12\,462 - 2\,300 = \square$

Mental methods should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving.

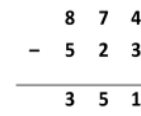
Written methods (progressing to more than 4-digits)

When understanding of the expanded method is secure, children will move on to the formal method of decomposition, which can be initially modelled with place value counters.



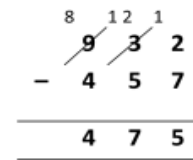
Progress to calculating with decimals, including those with different numbers of decimal places.

874 - 523 becomes



Answer: 351

932 - 457 becomes



Answer: 475

Problem Solving

Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding. This will include work with decimals.

Multiplication - Year 3

Mental methods

Doubling 2 digit numbers using partitioning
Demonstrating multiplication on a number line – jumping in larger groups of amounts
 $13 \times 4 = 10$ groups 4 = 3 groups of 4

Written methods (progressing to $2d \times 1d$)

Developing written methods using understanding of visual images

Understand how to link partitioning a 2-digit number with multiplying.

Each person has 23 flowers.

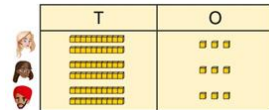
Each person has 2 tens and 3 ones.



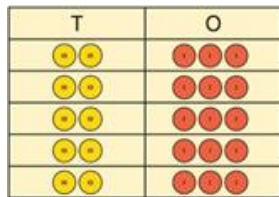
There are 3 groups of 2 tens.

There are 3 groups of 3 ones.

Use place value equipment to model the multiplication context.



Give children opportunities to explore this and deepen understanding using place value counters.
 $5 \times 23 =$



Children may begin to explore the expanded written method.

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 24 \text{ (4 x 6)} \\ 120 \text{ (20 x 6)} \\ \hline 144 \end{array}$$

Problem Solving

Teachers will introduce written problems alongside these methods to ensure pupils begin to apply their knowledge.

Multiplication - Year 4

Mental methods

Counting in multiples of 6, 7, 9, 25 and 1000, and steps of $1/100$.

Solving practical problems where children need to scale up. Relate to known number facts. (e.g. how tall would a 25cm sunflower be if it grew 6 times taller?)

Written methods (progressing to $3d \times 2d$)

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 24 \text{ (4 x 6)} \\ 120 \text{ (20 x 6)} \\ \hline 144 \end{array}$$

When children are confident in using the expanded method for short multiplication they may move onto the short method.

Short multiplication

24×6 becomes

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \\ 2 \end{array}$$

Answer: 144

Problem Solving

Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding.

Multiplication - Year 5/6

Mental methods

X by 10, 100, 1000 using moving digits ITP

Use practical resources and jottings to explore equivalent statements (e.g. $4 \times 35 = 2 \times 2 \times 35$)

Recall of prime numbers up to 19 and identify prime numbers up to 100 (with reasoning)

Solving practical problems where children need to scale up. Relate to known number facts.

Identify factor pairs for numbers

Written methods (progressing to $4d \times 2d$)

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 24 \text{ (4 x 6)} \\ 120 \text{ (20 x 6)} \\ \hline 144 \end{array}$$

Expanded method for short multiplication then

Short multiplication

24×6 becomes

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \\ 2 \end{array}$$

Answer: 144

342×7 becomes

$$\begin{array}{r} 342 \\ \times 7 \\ \hline 2394 \\ 21 \end{array}$$

Answer: 2394

2741×6 becomes

$$\begin{array}{r} 2741 \\ \times 6 \\ \hline 16446 \\ 42 \end{array}$$

Answer: 16 446

Long multiplication using place value counters

Children to explore how the area method supports an understanding of long multiplication (for $2d \times 2d$) before moving onto the expanded method for long multiplication.

	10	8
10	100	80
3	30	24

Expanded method for long multiplication moving to the compact method including $4d \times 2d$

$$\begin{array}{r} 24 \\ \times 16 \\ \hline 24 \text{ (4 x 6)} \\ 120 \text{ (20 x 6)} \\ 40 \text{ (4 x 10)} \\ 200 \text{ (20 x 10)} \\ \hline 384 \end{array}$$

Problem Solving

Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding. This will include work with decimals.

Division - Year 3

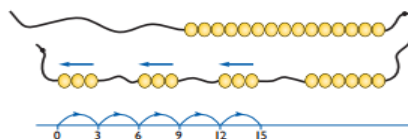
$\div$ = signs and missing numbers

Continue using a range of equations as in year 2 but with appropriate numbers.

Grouping using a number line

Group from zero in jumps of the divisor to find our 'how many groups of 3 are there in 15?'

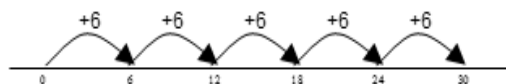
$$15 \div 3 = 5$$



Grouping

How many 6's are in 30?

$30 \div 6$ can be modelled as:



Sharing – 49 shared between 4. How many left over?

Grouping – How many 4s make 49. How many are left over?

Place value counters can be used to support children apply their knowledge of grouping.

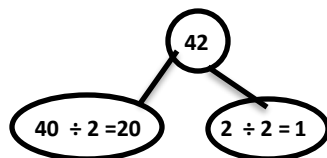
For example:

$60 \div 10$ = How many groups of 10 in 60?

$600 \div 100$ = How many groups of 100 in 600?

Children begin to record written division by partitioning e.g.

$$42 \div 2 = 21$$



Problem Solving

Teachers will introduce written problems alongside these methods to ensure pupils begin to apply their knowledge.

Division - Year 4

$\div$ = signs and missing numbers

Continue using a range of equations as in year 3 but with appropriate numbers.

Sharing, Grouping and using a number line

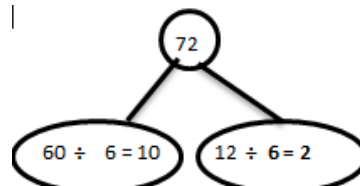
Children will continue to explore division as sharing and grouping, and to represent calculations on a number line until they have a secure understanding. Children should progress in their use of written division calculations:

- Using tables facts with which they are fluent
 - Experiencing a logical progression in the numbers they use, for example:
 - Dividend just over 10x the divisor, e.g. $84 \div 7$
 - Dividend just over 10x the divisor when the divisor is a teen number, e.g. $173 \div 15$ (learning sensible strategies for calculations such as $102 \div 17$)
 - Dividend over 100x the divisor, e.g. $840 \div 7$
 - Dividend over 20x the divisor, e.g. $168 \div 7$
- All of the above stages should include calculations with remainders as well as without. Remainders should be interpreted according to the context. (i.e. rounded up or down to relate to the answer to the problem)

Children continue to use partitioning to record division calculations.

This moves on to partitioning numbers in different ways.

$$72 \div 6$$



And with larger numbers such as $128 \div 6$

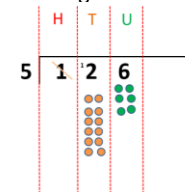
Problem Solving

Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding.

Division – Year 5/6

Formal Written Methods – introduced in Year 5 onwards

Short division to be modelled for understanding using place value counters as shown below. Calculations with 2 and 3-digit dividends.



$\div$ = signs and missing numbers

Continue using a range of equations but with appropriate numbers

Sharing and Grouping and using a number line

Children will continue to explore division as sharing and grouping, and to represent calculations on a number line as appropriate.

Formal Written Methods – long and short division. Remainders to be expressed as whole numbers and decimals.

Short division

$98 \div 7$ becomes

$$\begin{array}{r} 14 \\ 7 \overline{) 98} \\ \underline{7} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

Answer: 14

$432 \div 5$ becomes

$$\begin{array}{r} 86 \text{ r } 2 \\ 5 \overline{) 432} \\ \underline{40} \\ 32 \\ \underline{30} \\ 2 \end{array}$$

Answer: 86 remainder 2

Long division – chunking method and coin box

			2	2
1	2	2	6	4
	-	1	2	0
		1	4	4
	-	1	2	0
			2	4
	-		2	4
				0

Children note following chunks (the coins) to support calculating.

$$1 \times 12 = 12$$

$$2 \times 12 = 24$$

$$5 \times 12 = 60$$

$$10 \times 12 = 120$$

$$20 \times 12 = 240$$

Problem Solving

Teachers should ensure that pupils have the opportunity to apply their knowledge in a variety of contexts and problems (exploring cross curricular links) to deepen their understanding. This will include work with decimals.