Holland Junior School
Calculation Policy

Date written: September 2022
Review date: September 2025

Vision
The Pioneer Academy promotes and achieves excellence. It recognises the importance of outstanding teaching and learning by actively encouraging creativity and innovation, whilst having consistent standards of behaviour and attendance. Treating everyone as equal, whilst celebrating diversity, is a non-negotiable; protecting all through safeguarding, health and safety and welfare is paramount

Aims
This calculation policy has been written in line with the programmes of study taken from the revised National Curriculum for Mathematics (2014). It provides guidance on appropriate calculation methods and progression. The content is set out in yearly blocks under the following headings: addition, subtraction, multiplication and division. Statements taken directly from the programmes of study are listed in bold at the beginning of each section.

The document is organised according to age related expectation, however it may be necessary for teachers to consult with lower year groups for children in order to meet their needs at the stage these children are working at.

Under the new maths curriculum (2014) the expectation is "By the end of year 6, pupils should be fluent in written methods for all 4 operations, including long multiplication and division, and in working with fractions, decimals and percentages." This policy outlines the different stages a child will undertake during their maths learning in order to achieve this national expectation. As well as this, the policy aims:

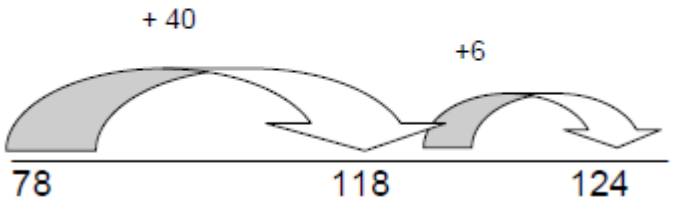
- To ensure consistency and progression in our approach to calculation
- To ensure that children develop an efficient, reliable, formal written method of calculation for all operations
- To ensure that children can use these methods accurately with confidence and understanding.

Addition Year 3

Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, ones, partition, addition, column, tens boundary, hundreds, boundary, increase, vertical, 'carry', expanded, compact

Key Skills for addition at Year 3
-add numbers mentally, including: a three-digit number and 1s**,** a three-digit number and 10s**,** a three-digit number and 100s
-add numbers with up to 3 digits, using formal written methods of columnar addition and subtraction
-estimate the answer to a calculation and use inverse operations to check answers solve problems, including missing number problems, using number facts, place value, and more complex addition
In year 3 children will further develop the use of the empty number line with calculations that bridge 100.

78 + 46 = 124



Once children have secured their understanding of place value, they should begin to record their additions in columns.

First they will be introduced to the expanded written method with the calculation presented both horizontally and vertically (in columns). Initially this will involve calculations where it has not been necessary to bridge across the tens or hundreds.

Children who are very secure and confident with 3-digit expanded column addition, should be moved onto the compact column addition method, involving carrying. A comparison of the partitioning addition method to compact method is useful to show minimising the number of steps involved.

Column addition (no exchanging) with up to three-digits

```
 40 +  1
+20 +  8
 60 +  9 = 69
```

Expanded recording without exchange

```
 40 +  3
 20 +  8
 70 +  1  = 71
 10
```

Expanded recording with exchange

```
100 + 40 + 1
+ 100 + 20 + 8
200 + 60 + 9 = 269
```

Expanded recording

```
  HTU
  141
+ 128
  269
```

Compact (column) recording

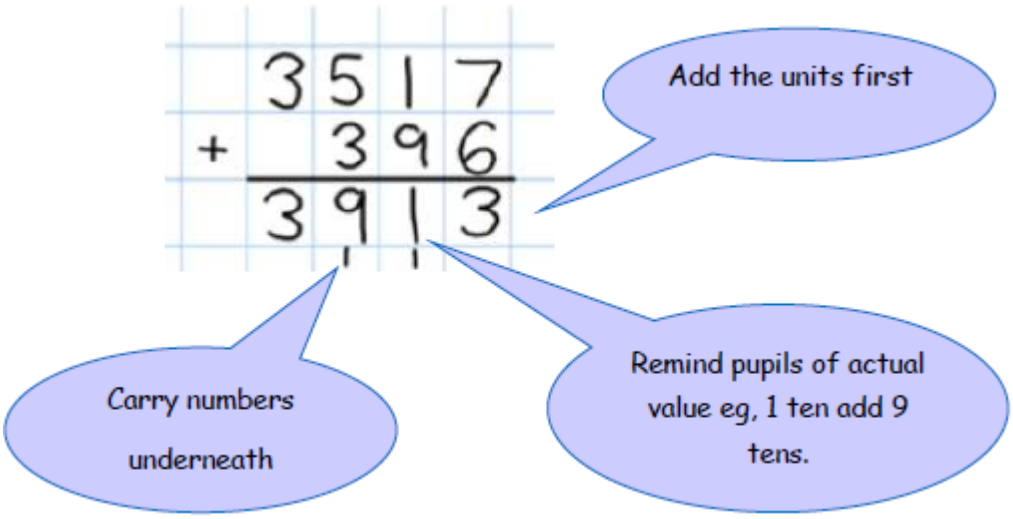
```
  143
+ 128
  271
    1
```

Column addition (with exchanging)

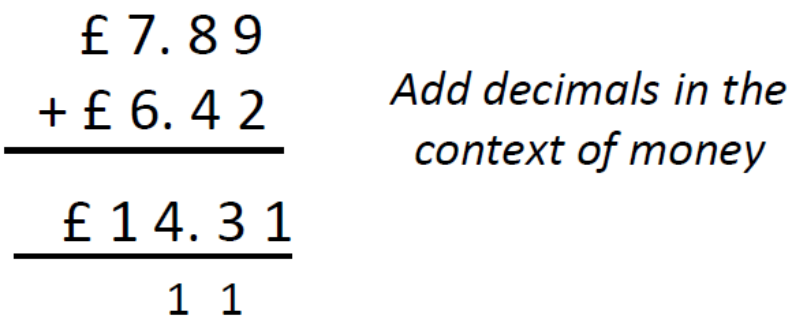
Year 4

Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, ones, partition, addition, column, tens boundary, hundreds, boundary, increase, vertical, 'carry', expanded, compact, thousands, hundreds, digits, inverse

Key Skills for addition at Year 4
-add numbers with up to 4 digits using the formal written methods of columnar addition
-estimate and use inverse operations to check answers to a calculation
-solve addition two step word problems in context, deciding which operations and methods to use and why
In year 4 children will continue to practise both mental methods and column addition with increasingly larger numbers (up to 4 digits) to aid fluency. The children should be confident adding vertically starting with the ones column and carrying underneath the calculation.



Add the ones first.
Children should be given the opportunity to add numbers including money and measure amounts with 2 decimal places.



Year 5

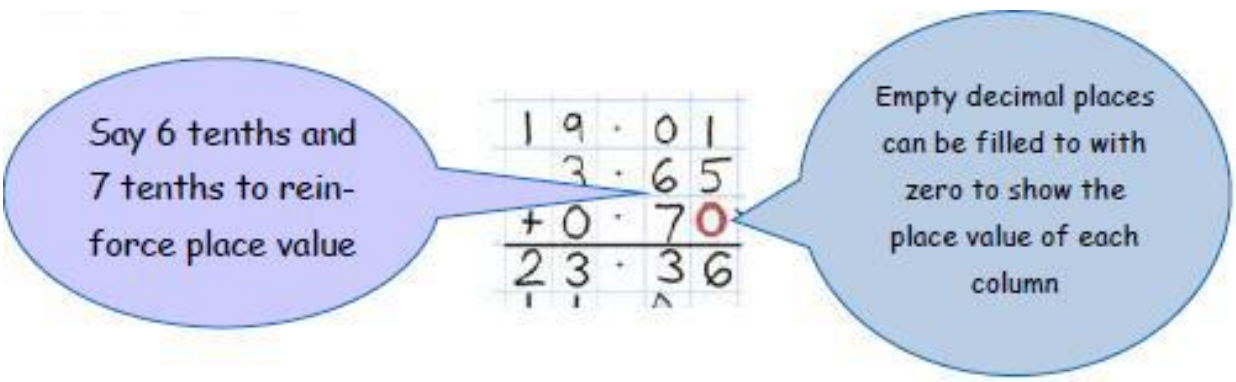
Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, ones, partition, addition, column, tens boundary, hundreds, boundary, increase, vertical, 'carry', expanded, compact, thousands, hundreds, digits, inverse, decimal places, decimal point, tenths, hundredths, thousandths.

Key Skills for addition at Year 5

-add whole numbers with more than 4 digits, including using formal written methods (columnar addition)
-add numbers mentally with increasingly large numbers
-use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
-solve addition multi-step problems in contexts, deciding which operations and methods to use and why

By year 5 children should be confidently using a formal written column method to add to find the total of 3 or more numbers. Children should understand the place value of tenths and hundredths and use this to align numbers with differing numbers of decimal place.

Opportunities for children to practise and apply the formal written method throughout the year should be provided including multi-step problems in contexts.

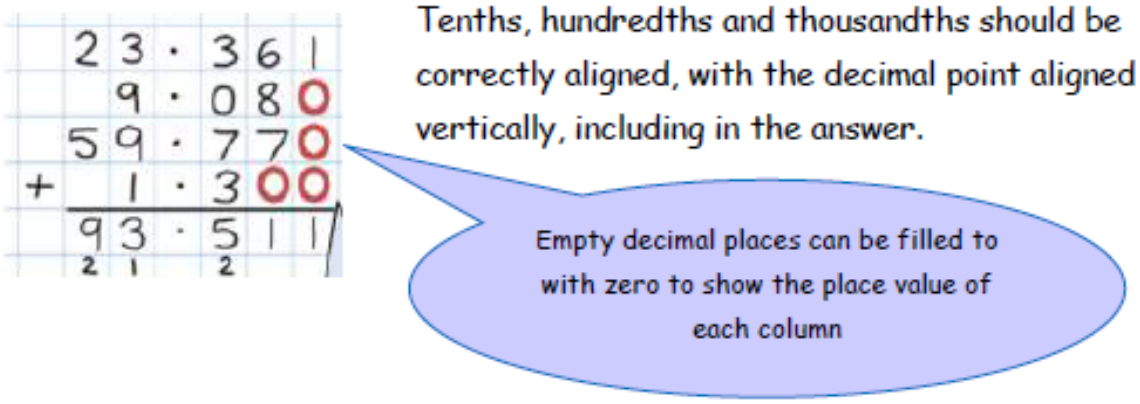


Year 6

Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, ones, partition, addition, column, tens boundary, hundreds boundary, increase, vertical, 'carry', expanded, compact, additive, commutative, thousands, hundreds, digits, inverse, decimal places, decimal point, tenths, hundredths, thousandths, place holder

Key Skills for addition at Year 6
No objectives have been included in the programmes of study explicitly related to written methods for addition in Year 6. However, there is an expectation that children will continue to practise and use the formal written method for larger numbers and decimals and use these methods when solving problems, when appropriate (see previous year's guidance for methods).

Year 6 children will be expected to add several numbers of increasing complexity including money, measure and decimals with different numbers of decimal places.



Our aim is that by the end of Y6, children use mental methods (with jottings) when appropriate, but for calculations that they cannot do in their heads, they use an efficient formal written method accurately and with confidence.

Subtraction Year 3

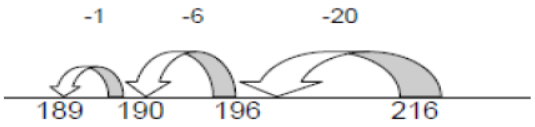
Key vocabulary: equal to, take, take-away, less, minus, subtract, how many left, leaves, distance between, how many more, how many fewer/less than, most, least count back, how much less is…, difference, count on, strategy, partition, tens, ones, take and make, exchange, digit, value, hundreds

Key Skills for addition at Year 3
-subtract numbers mentally, including: a three-digit number and 1s**,** a three-digit number and 10s**,** a three-digit number and 100s
-subtract numbers with up to 3 digits, using formal written methods of columnar subtraction
-solve problems, including missing number problems, using number facts, place value, and more complex subtraction

In year 3 children are expected to subtract up to 3 digits. At first children may want to further develop the use of empty number lines to solve calculations which bridge 100. As children grow in confidence with this method, they should be encouraged to use more efficient jumps.

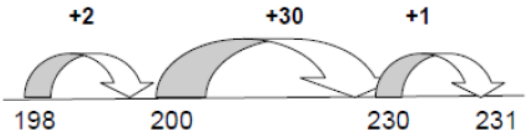
This should then be extended to include larger numbers where children will need to think about whether to count back (Subtraction A) or to count on to find the difference (Subtraction B) between two given 3 digit numbers.

216 – 27 = 189



SUBTRACTION A

231 – 198 = 33



SUBTRACTION B

By the end of year 3 children should be recording their subtractions in columns. Initially this will be through partitioning the numbers in their subtraction sentence using an expanded written method with the calculation presented both horizontally and vertically (in columns). Once children are confident using the expanded written method (including exchanging), they will be introduced to the formal written subtraction method.

no exchange

68 - 23

60 8
− 20 3
40 + 5 = 45

with exchange

63 - 28

~~50~~ 60 10+3
− 20 8
30 + 5 = 35

148 -121

100 40 8
− 100 20 1
0 + 20 + 7 = 27

Column subtraction (no exchange)

148
- 121
27

Column subtraction (with exchange)

723 -317

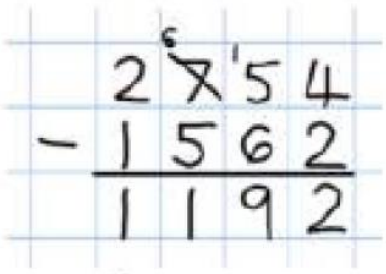
$7\overset{1}{\not{2}}\,\overset{1}{3}$
- 3 1 7
4 0 6

Year 4

Key vocabulary: equal to, take, take-away, less, minus, subtract, how many left, leaves, distance between, how many more, how many fewer/less than, most, least count back, how much less is…, difference, count on, strategy, partition, tens, ones, take and make, exchange, digit, value, hundreds, inverse

Key Skills for subtraction at Year 4
-subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
-estimate and use inverse operations to check answers to a calculation
-solve subtraction two-step problems in contexts, deciding which operations and methods to use and why

In year 4 children should be confidently using the formal written method to subtract numbers with up to 4 digits (including calculations where they need to exchange).



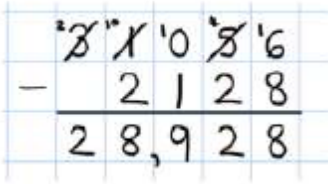
Children should understand that subtraction is the inverse of addition and use this to help them check answers to a calculation.

Year 5

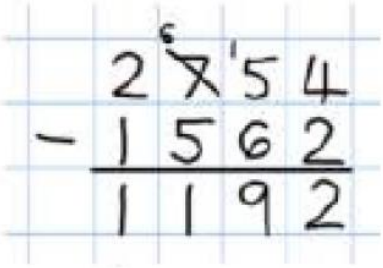
Key vocabulary: equal to, take, take-away, less, minus, subtract, how many left, leaves, distance between, how many more, how many fewer/less than, most, least count back, how much less is…, difference, count on, strategy, partition, tens, ones, take and make, exchange, digit, value, hundreds, inverse, tenths, hundredths, decimal point, decimal

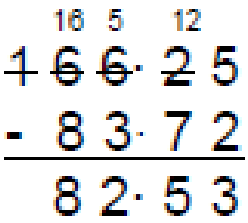
Key Skills for subtraction at Year 5
-subtract whole numbers with more than 4 digits, including using formal written methods (columnar subtraction)
-subtract numbers mentally with increasingly large numbers
-use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
-solve subtraction multi-step problems in contexts, deciding which operations and methods to use and why

By year 5 children should be confidently using a formal written column method to subtract with more than 4 digits.



Children should be given the opportunity to subtract with decimal values, including mixtures of integers and decimals where children need to think carefully about how to align the decimal point. These decimal numbers should be taken from different contexts e.g. money amounts or units of measure.



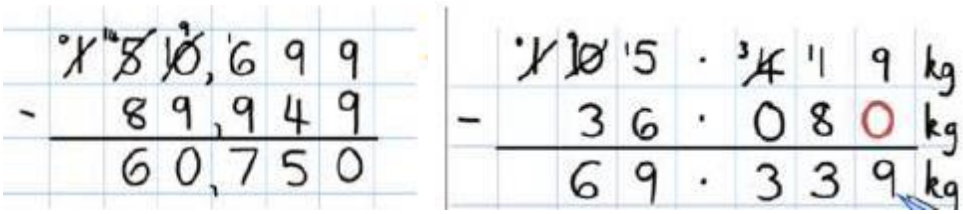


Year 6

Key vocabulary: equal to, take, take-away, less, minus, subtract, leaves, distance between, how many more, how many fewer/less than, most, least count back, how many left, how much less is…, difference, count on, strategy, partition, tens, ones, take and make, exchange, digit, value, hundreds, inverse, tenths, hundredths, decimal point, decimal, regroup, place holder

Key Skills for subtraction at Year 6
No objectives have been included in the programmes of study explicitly related to written methods for subtraction in Year 6. However, there is an expectation that children will continue to practice and use the formal written method for larger numbers and decimals and use these methods when solving problems, when appropriate (see previous years' guidance for methods).

Year 6 children will be expected to subtract with increasingly large and more complex numbers and decimal values. These will include money amounts and measure especially with numbers with a different number of decimal places.



Our aim is that by the end of Year 6 children use mental methods (with jottings) when appropriate, but for calculations that they cannot do in their heads, they use an efficient formal written method accurately and with confidence.

Multiplication Year 3

Key vocabulary: doubling, double, how many are there altogether, add, equals, is it the same/equal, Is it fair, groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times as big as, once, twice, three times..., partition, grid method, multiple, product, tens, ones, value

Key Skills for multiplication at Year 3

-recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables

-write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to a formal written method

Once children understand the concept of multiplication as repeated addition (and can demonstrate this on empty number lines and with arrays), they should progress to using a partitioning method to multiply. They should start with multiplying a 2 digit number by a 1 digit number and partition the 2 digit number into tens and ones to break down the multiplication into manageable steps.

e.g. 13 x 8 =

10 3

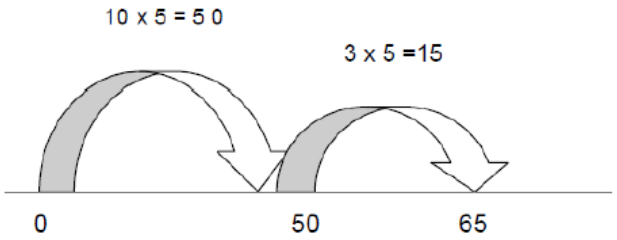
10 x 8 = 80

3 x 8 = 24

80 + 24 = 104

Partitioning to multiply could also be demonstrated on a number line and a grid method.

13 x 5 = 65



Eg. 23 x 8 = 184

X	20	3
8	160	24

160 + 24 = 184

This will lead into expanded short multiplication which should then be refined in preparation for formal short multiplication.

13 x 8 = 104

```
10 + 3
x   8
  24   (3 x 8)
+ 80   (10 x 8)
 104
```

→

```
  1 3
x   8
  2 4   (3 x 8)
+ 8 0   (10 x 8)
  1 0 4
```

→

```
  1 3
x   8
  1 0 4
    2
```

Year 4

Key vocabulary: doubling, double, how many are there altogether, add, equals, is it the same/equal, Is it fair, groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times as big as, once, twice, three times..., partition, grid method, multiple, product, tens, ones, value, inverse

Key Skills for multiplication at Year 4

-recall multiplication facts for multiplication tables up to 12 × 12

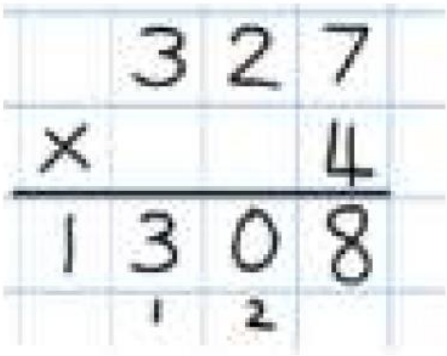
-use place value, known and derived facts to multiply mentally, including: multiplying by 0 and 1 and multiplying together 3 numbers

-multiply two-digit and three-digit numbers by a one-digit number using a formal written layout

By the end of year 4 children should know their multiplication facts for ALL multiplication tables up to 12 x 12. This is extremely important if they are to develop their understanding, fluency and speed when using the formal written method to multiply.

As well as being able to recall their times tables up to 12 x 12, children should be able to approximate before they calculate and make this a regular part of their calculating, going back to their approximation to consider the reasonableness of their answer. They should also be practicing mental methods to derive facts (for example 600 ÷ 3 = 200 can be derived from 2 x 3 = 6).

By the end of lower key stage two, pupils should be developing their use of the formal written method to multiply two and three digit numbers by another one digit number. If they are confident with this method, they should be given opportunities to deepen and apply their understanding through solving problems and investigating.



Year 5

Key Vocabulary: doubling, double, how many are there altogether, add, equals, is it the same/equal, Is it fair, groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times as big as, once, twice, three times..., partition, grid method, multiple, product, tens, ones, value, inverse, square, factor, integer, decimal, short/long multiplication, 'carry'

Key Skills for multiplication at Year 5
-multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers

Year 5 pupils should now be ready to be introduced to long multiplication (multiplication of 2 two digit numbers). Long multiplication could be demonstrated alongside the grid method in order that children can see how the steps are related. Children should be able to recognise that there are less steps involved in the long method of multiplication proving it the most efficient method to use.

X	10	8
10	100	80
3	30	24

	1	8
×	1	3
1	8	0
	5	4
2	3	4

56 x 27 = 1512

$$\begin{array}{r} 56 \\ \times\ 27 \\ \hline 392 \\ +\ 1120 \\ \hline 1512 \\ 1 \end{array}$$

(7x56)
(20x56)

When children are confident with long multiplication, they should be extended with three-digit numbers multiplied by a two-digit number.

124 x 26 = 3224

$$\begin{array}{r} 124 \\ \times\ 26 \\ \hline 7^{1}4^{2}4 \\ +\ 2480 \\ \hline 3224 \\ 1\ 1 \end{array}$$

(6x124)
(20x124)

Year 6

Key vocabulary: doubling, double, how many are there altogether, add, equals, is it the same/equal, Is it fair, groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, sets of, equal groups, times as big as, once, twice, three times..., partition, grid method, multiple, product, tens, ones, value, inverse, square, factor, integer, decimal, short/long multiplication, 'carry,' tenths, hundredths, decimal, multiplier, multiplicand, commutative, multiplicative, Base 10, place holder

Key Skills for multiplication at Year 6

-multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication

When children are confident using the short and long formal method to multiply whole numbers, they should be extended to think about how they can apply this to multiply a decimal number (up to 2 decimal places) by a single digit number. Initially this may be in the context of money and measures.

Throughout year 6 children should continue to practise and develop the formal short multiplication method and formal long multiplication method with larger numbers and decimals.

	3.	2	4
		x	6
1	9.	4	4
	1	2	

	1	3	2	4
		x	2	6
	7	9	4	4
2	6	4	8	0
	1	1	2	
3	4	4	2	4
1	1	1		

	3.	2	4
	x	2	6
1	9.	4	4
6	4.	8	0
	1	2	
8	4.	2	4
1	1		

It is our aim is that by the end of Year 6 children use mental methods (with jottings) when appropriate, but for calculations that they cannot do in their heads, they use an efficient formal written method accurately and with confidence.

Division Year 3

Key vocabulary: half, share, share equally, fair, equal, same as, altogether, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over inverse, short division, 'carry', remainder, multiple

Key Skills for division at Year 3
-recall and use division facts for the 3, 4 and 8 multiplication tables
-write and calculate mathematical statements for division using the multiplication tables that they know, including for two-digit numbers divided by one-digit numbers, using mental and progressing to formal written methods

In year 3 children will start to develop a reliable written method to solve division. Once children can confidently use an empty number line to count forwards and back to solve simple divisions, children should be introduced to a formal layout for a written method of division. At first children should use their multiplication and division facts from the multiplication tables that they know (2, 3, 4, 5, 8 and 10).

24 ÷ 3 = 8

This can also be recorded as…

$$3 \overline{)\,24}\quad 8$$

'Twenty four divided by three equals eight.'

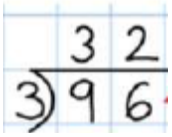
'How many threes are there in twenty four?'

Year 4

Key vocabulary: half, share, share equally, fair, equal, same as, altogether, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple, divisible by, factor

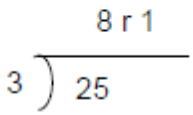
Key Skills for division at Year 4
-recall division facts for multiplication tables up to 12 × 12
-use place value, known and derived facts to divide mentally
-divide two digit and three digit numbers by a one-digit number using formal written layout (not explicitly stated in the programmes of study but implied in the non-statutory guidance)

In year 4 children will develop their understanding of a formal written method for division and will be expected to divide 2 and 3 digit numbers by a one-digit number. Initially carefully selected numbers should be introduced with examples requiring no remainders in the answer or which need to be carried. Each digit must be a multiple of the divisor.

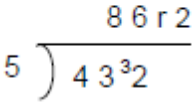


Once children can confidently use the written method to divide 2 and 3 digit numbers by a one digit number, remainders should be introduced.

25 ÷ 3 = 8 r1



432 ÷ 5 = 86 r2



Year 5

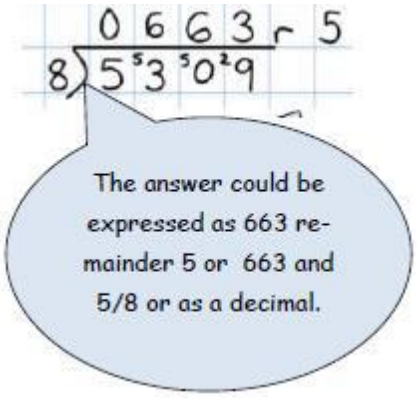
Key vocabulary: half, share, share equally, fair, equal, same as, altogether, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple
divisible by, factor, quotient, prime number, prime factors, composite number (non-prime)

Key Skills for division at Year 5
-divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context
By year 5 children should have developed their confidence in using the formal written method of short division to divide larger numbers by a one digit number including divisions which leave a remainder. Children should be given opportunities to solve divisions in a real life context, including using money and measures, so that pupils know when to round their answers (with remainders) up or down.

A box holds 6 eggs.

How many boxes are needed to hold 52 eggs?

In year 5 children should start to consider how to interpret remainders from their divisions according to the context. They should understand that they can record their remainder as a number, fraction (the remainder divided by the divisor) or a decimal.

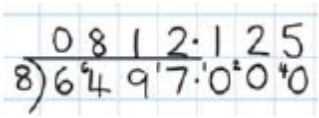


Year 6

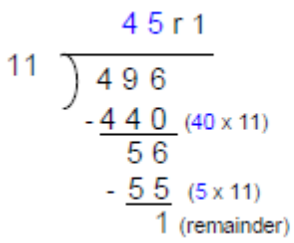
Key vocabulary: share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, regrouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple, divisible by, factor, quotient, prime number, prime factors, composite number (non-prime), divisor, dividend, place holder

Key Skills for division at Year 6
-divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
-divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context

In year 6 children will continue to develop their use of a formal written method for short division. They will be expected to divide numbers with up to 4 digits by a one and two digit number. Children should be confident dealing with remainders and interpreting these within the given context to record them in different ways (including as decimals).



Children will also be introduced to the formal written method for long division in year 6 which is used when the divisor has two or more figures and a series of workings is made as successive groups of digits of the dividend are divided by the divisor.



Multiples of the divisor (11) have been subtracted from the dividend (496)

'40 (lots of 11) + 5 (lots of 11) = 45 (lots of 11)'

'1 is the remainder'

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

It may be helpful for children to write a 'useful list' (of multiples of the divisor) first at the side which will help solve long divisions with tricky and larger divisors. Children will need to select the most effective method for each division they meet, considering whether to use the standard, formal written method of long division or whether the calculation can be solved with the short method.

Our aim is that by the end of Year 6, children use mental methods (with jottings) when appropriate, but for calculations that they cannot do in their heads, they use an efficient formal written method accurately and with confidence.