



Calculation Policy for Mathematics Years 3 -6

About our Calculation Policy

The following calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school. Please note that early learning in number and calculation in F2 follows the 'Development Matters' EYFS document, and this calculation policy is designed to build on progressively from the content and methods established in the Early Years Foundation Stage.

Age stage expectations

The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014. **However it is vital that pupils are taught according to their developmental stage; therefore a lower achieving set maybe working a year behind the age stage expectation and an upper achieving set a year above in terms of the choice of method.**

Providing a context for calculation:

It is important that any type of calculation is given a real life context or problem solving approach to help build children's understanding of the purpose of calculation, and to help them recognise when to use certain operations and methods in mathematical problems. This must be a priority within calculation lessons.

Choosing a calculation method:

Children need to be taught and encouraged to use the following processes in deciding what approach they will take to a calculation, to ensure they select the most appropriate method for the numbers involved:

Can I do it in my head using a
mental strategy?

Could I use some jottings to
help me?

Should I use a written method to
work it out?

Remember, if using a
written method:

Approximate,

Calculate,

Check it !

Addition



Year 3 Add numbers with up to 3-digits

Introduce informal column method:

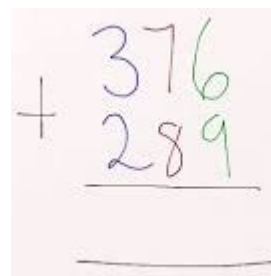
Step 1:

	2	3	6
+		7	3
			9
	1	0	0
	2	0	0
	3	0	9

Add most significant digits first
in preparation for the compact
method.

Step 2: Introduce formal column method

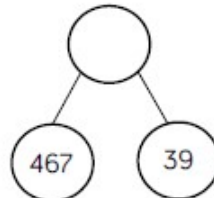
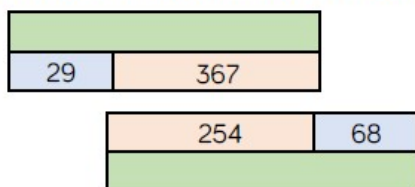
$$461 + 27 = 488$$



Children will also need to be shown addition using these different representations: Base 10, bar model, whole part whole, place value grids.

H	T	O

H	T	O



Key vocabulary: *add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, ones, partition, plus, addition, column,*

Key skills for addition at Y3:

- Read and write numbers to 1000 in numerals and words.
- Add 2-digit numbers mentally, incl. those exceeding 100.
- **Add a three-digit number and ones mentally ($175 + 8$)**
- **Add a three-digit number and tens mentally ($249 + 50$)**
- **Add a three-digit number and hundreds mentally ($381 + 400$)**
- Estimate answers to calculations, using inverse to check answers.
- Solve problems, including missing number problems, using number facts, place value, and more complex addition.
- Recognise place value of each digit in 3-digit numbers (hundreds, tens, ones.)
- Continue to practise a wide range of mental addition strategies, ie. number bonds, adding the nearest multiple of 10, 100, 1000 and adjusting, using near doubles, partitioning and recombining.

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g $163 + \square = 200$



Addition



Year 4 Add numbers with up to 4 digits

Move from informal column addition to the compact column method, **adding ones first**, and 'carrying' numbers **underneath** the calculation. Also include money and measures contexts.

e.g. $3517 + 396 = 3913$

- Reinforce correct place value by reminding them the actual value is 5 hundred add 3 hundreds, not 5 add 3.

	3	5	1	7
+		3	9	6
	3	9	1	3

- Add ones first
- 'Regroup' numbers underneath the bottom line.

Use and apply this method to money and measurement values.

1,000s	100s	10s	1s
  	 	   	 
 	 		  

See different representations of addition, such as:

Place value boards and counters

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

Key skills for addition at Y4:

- Select most appropriate method: mental, jottings or written and explain why.
- Recognise the place value of each digit in a four-digit number.
- Round any number to the nearest 10, 100 or 1000.
- Estimate and use inverse operations to check answers.
- Solve 2-step problems in context, deciding which operations and methods to use and why.
- Find 1000 more or less than a given number.
- Continue to practise a wide range of mental addition strategies, ie. number bonds, add the nearest multiple of 10, 100, 1000 and adjust, use near doubles, partitioning and recombining.
- Add numbers with up to 4 digits using the formal written method of column addition
- Solve 2-step problems in contexts, deciding which operations and methods to use and why.
- Estimate and use inverse operations to check answers to a calculation.

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g. $163 + \square = 200$



Addition



Year 5 Add numbers with more than 4 digits

including money, measures and decimals with different numbers of decimal places.

The decimal point should be aligned in the same way as the other place value columns, and must remain in the same column in the answer row.

$$\begin{array}{r} \pounds 23.59 \\ + \quad 7.55 \\ \hline \pounds 31.14 \end{array}$$

Numbers should exceed 4 digits.

$$\begin{array}{r} 23,481 \\ + \quad 1,362 \\ \hline 24,843 \end{array}$$

Pupils should be able to add **more than two values**, carefully aligning place value columns.

$$\begin{array}{r} 19.01 \\ + 3.65 \\ \hline 23.66 \end{array}$$

Empty decimal places can be filled with zero to show the place value in each column.

Children should:

Say '6 tenths add 7 tenths' to reinforce place value.

• Understand the place value of **tenths and hundredths** and use this to align numbers with different numbers of decimal places.

Represent additions using place value format:

Th	H	T	O	Th	H	T	O
•••	•••	••	•••	••	•	••	•••
••	••	••	••	••	••		••

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

Key skills for addition at Y5:

- Add numbers mentally with increasingly large numbers, using and practising a range of mental strategies ie. add the nearest multiple of 10, 100, 1000 and adjust; use near doubles, inverse, partitioning and re-combining; using number bonds.
- Use rounding to check answers and accuracy.
- Solve multi-step problems in contexts, deciding which operations and methods to use and why.
- Read, write, order and compare numbers to at least 1 million and determine the value of each digit.
- Round any number up to 1, 000, 000 to the nearest 10, 100, 1000, 10,000 and 100,000.
- Add numbers with more than 4 digits using formal written method of columnar addition.

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g. $1623 + \square = 2000$



Addition

Year 6 Add several numbers of increasing complexity



	2	3	.	3	6	1
		9	.	0	8	0
	5	9	.	7	7	0
+		1	.	3	0	0
<hr/>						
	9	3	.	5	1	1
	2	1		2		

Adding several numbers with different numbers of decimal places (including money and measures):

- Tenths, hundredths and thousandths should be correctly aligned, with the decimal point lined up vertically including in the answer row.

Empty decimal places should be filled with zero to show the place value in each column.

	8	1	,	0	5	9
		3	,	6	6	8
		1	5	,	3	0
+	2	0	,	5	5	1
<hr/>						
	1	2	0	,	5	7
		1		1	1	1

Adding several numbers with more than 4 digits.

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

Key skills for addition at Y6:

- Perform mental calculations, including with mixed operations and large numbers, using and practising a range of mental strategies.
- Solve multi-step problems in context, deciding which operations and methods to use and why.
- Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.
- Read, write, order and compare numbers up to 10 million and determine the value of each digit.
- Round any whole number to a required degree of accuracy.
- Pupils understand how to add mentally with larger numbers and calculations of increasing complexity.

** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways **

E.g. $16,923 + \square = 20,000$



Subtraction

Year 3 Subtracting with 2 and 3-digit numbers.

Introduce **partitioned column subtraction** method.

STEP 1: introduce this method with examples where **no exchanging** is required.

$$89 - 35 = \underline{54}$$

$$\begin{array}{r} 80 + 9 \\ - 30 + 5 \\ \hline 50 + 4 \end{array}$$

When learning to 'exchange', explore 'partitioning in different ways' so that pupils understand that when you exchange, the **VALUE** is the same ie $72 = 70+2 = 60+12 = 50+22$ etc. Emphasise that the **value hasn't changed**, we have just partitioned it in a different way.

STEP 2: introduce 'exchanging' through practical subtraction. Make the larger number with Base 10, then subtract 47 from it.

$$72 - 47$$



$$\begin{array}{r} 60 \\ 70 + 2 \\ - 40 + 7 \\ \hline 20 + 5 = \underline{25} \end{array}$$

Before subtracting '7' from the 72 blocks, they will need to exchange a row of 10 for ten ones. Then subtract 7, and subtract 4 tens.

STEP 3: Once pupils are secure with the understanding of 'exchanging', they can use the partitioned column method to subtract any 2 and 3-digit numbers.

$$\begin{array}{r} 238 - 146 = 92 \\ \begin{array}{r} 100 \\ 200 + 30 + 8 \\ - 100 + 40 + 6 \\ \hline 0 + 90 + 2 \end{array} \end{array}$$

Subtracting money: partition into e.g. £1 + 30p + 8p

Counting

on as a mental strategy for subtraction:

Continue to reinforce counting **on** as a strategy for **close-together numbers** (e.g. 121–118), and also for numbers that are 'nearly' multiples of 10, 100, 1000 or £s, which make it easier to count on (e.g. 102–89, 131–79, or calculating change from £1 etc.).

Key vocabulary: *equal*

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

exchange, decrease, hundreds, value, digit

Key skills for subtraction at Y3:

- Subtract mentally a: 3-digit number and ones, 3-digit number and tens, 3-digit number and hundreds .
- Estimate answers and use inverse operations to check.
- Solve problems, including missing number problems.
- Find 10 or 100 more or less than a given number.
- Recognise the place value of each digit in a 3-digit number .
- Counting up differences as a mental strategy when numbers are close together or near multiples of 10 (see examples above)
- Read and write numbers up to 1000 in numerals and words.
- Practise mental subtraction strategies, such as subtracting near multiples of 10 and adjusting (e.g. subtracting 19 or 21), and select most appropriate methods to subtract, explaining why.

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g. $625 - \square = 223$

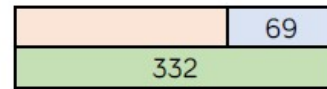
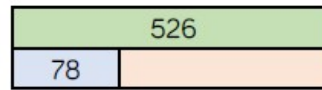
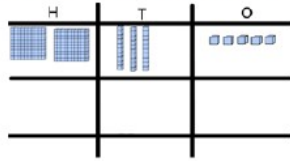


Subtraction

Year 3 Subtracting with 2 and 3-digit numbers.

Show subtraction using Base 10. Represent subtraction using the Bar Model

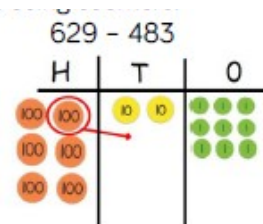
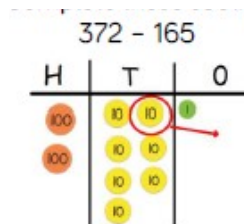
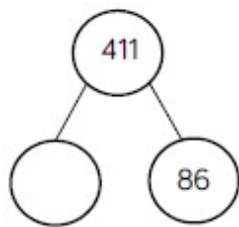
Represent $235 - 29$ using Base 10.



traction using
Part Whole Model

Represent
Represent subtraction using
place value boards/counters

sub-



Introduce **compact column subtraction** method showing exchanges.

$$\begin{array}{r} 683 \\ - 234 \\ \hline \end{array}$$

$$\begin{array}{r} 237 \\ - 195 \\ \hline \end{array}$$

$$\begin{array}{r} 507 \\ - 451 \\ \hline \end{array}$$

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 exchange, decrease, hundreds, value, digit

Key skills for subtraction at Y3:

- Subtract mentally a: 3-digit number and ones, 3-digit number and tens, 3-digit number and hundreds .
- Estimate answers and use inverse operations to check.
- Solve problems, including missing number problems.
- Find 10 or 100 more or less than a given number.
- Recognise the place value of each digit in a 3-digit number .
- Counting up differences as a mental strategy when numbers are close together or near multiples of 10 (see examples above)
- Read and write numbers up to 1000 in numerals and words.
- Practise mental subtraction strategies, such as subtracting near multiples of 10 and adjusting (e.g. subtracting 19 or 21), and select most appropriate methods to subtract, explaining why.

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g $625 - \square = 223$

Subtraction

Year 4 Subtract with up to 4-digit numbers

Partitioned column subtraction with 'exchanging' (decomposition):

$$\begin{array}{r} 2754 - 1562 = 1192 \\ \hline 2000 + \cancel{700}^{600} + 50 + 4 \\ - 1000 + 500 + 60 + 2 \\ \hline 1000 + 100 + 90 + 2 \end{array}$$

Compact column subtraction

$$\begin{array}{r} 2754 \\ - 1562 \\ \hline 1192 \end{array}$$

Give plenty of opportunities to apply this to money and measures.

Mental strategies

A variety of mental strategies must be taught and practised, including counting on to find the difference where numbers are closer together, or where it is easier to count on.

As introduced in Y3, but moving towards more complex numbers and values. Use **place value counters** to reinforce 'exchanging'.

Subtracting money: partition into £1 + 30 + 5 for example.

To introduce the compact method, ask children to perform a subtraction calculation with the familiar partitioned column subtraction then display the compact version for the calculation they have done. Ask pupils to consider how it relates to the method they know, what is similar and what is different, to develop an understanding of it.

Always encourage children to consider the best method for the numbers involved—mental, counting on, counting back or written method.

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 exchange, decrease, hundreds, value, digit, **inverse**

Key skills for subtraction at Y4:

- Subtract by counting on where numbers are close together or they are near to multiples of 10, 100 etc.
- Children select the most appropriate and efficient methods for given subtraction calculations.
- Estimate and use inverse operations to check answers.
- Solve addition and subtraction 2-step problems, choosing which operations and methods to use and why.
- Solve simple measure and money problems involving fractions and decimals to two decimal places.
- Find 1000 more or less than a given number.
- Count backwards through zero, including negative numbers.
- Recognise place value of each digit in a 4-digit number Round any number to the nearest 10, 100 or 1000
- Solve number and practical problems that involve the above, with increasingly large positive numbers.

Videos: Progression in Subtraction - suite of videos (NCETM planning tool)

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g. $6235 - \square = 2233$

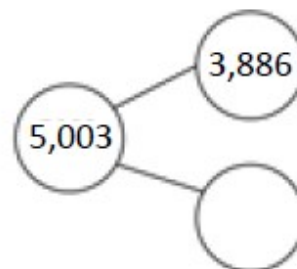
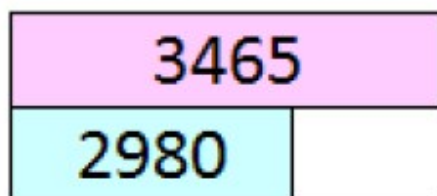


Subtraction

Year 4 Subtract with up to 4-digit numbers



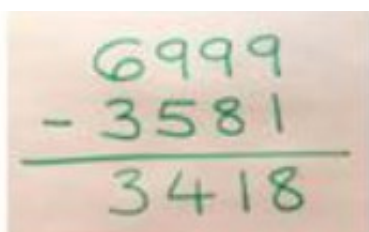
Represent subtraction in different ways, such as: Bar model, Part Whole method and the Adjusting method.



Teach-

ers discretion:

Adjusting method— $7000 - 3582 = 3418$



The best way to explain the Adjusting method is with a number line. E.g $8 - 3 = 5$ the distance between the two numbers is the same as $7 - 2$, essentially all we have done is taken 1 value off each number. When taking a value off a number that ends in numerous 0's, it is easier (no decomposition) to take 1 off the value of each number. E.g $7000 - 3582$ becomes $6999 - 3581$.

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 exchange, decrease, hundreds, value, digit, **inverse***

Key skills for subtraction at Y4:

- Subtract by counting on where numbers are close together or they are near to multiples of 10, 100 etc.
- Children select the most appropriate and efficient methods for given subtraction calculations.
- Estimate and use inverse operations to check answers.
- Solve addition and subtraction 2-step problems, choosing which operations and methods to use and why.
- Solve simple measure and money problems involving fractions and decimals to two decimal places.
- Find 1000 more or less than a given number.
- Count backwards through zero, including negative numbers.
- Recognise place value of each digit in a 4-digit number Round any number to the nearest 10, 100 or 1000
- Solve number and practical problems that involve the above, with increasingly large positive numbers.

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**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g $6235 - \square = 2233$

Subtraction

Year 5 Subtract with at least 4-digit numbers

including money, measures, decimals. Compact column subtraction (with 'exchanging').

$$\begin{array}{r} \overset{2}{\cancel{3}} \overset{10}{\cancel{1}} \overset{0}{\cancel{0}} \overset{8}{\cancel{8}} \overset{6}{\cancel{6}} \\ - \quad \quad 2 \quad 1 \quad 2 \quad 8 \\ \hline 2 \quad 8, \quad 9 \quad 2 \quad 8 \end{array}$$

Subtracting with larger integers.

Subtract with decimal values, including mixtures of integers and decimals, aligning the decimal point.

Children who are still not secure with number facts and place value will need to remain on the partitioned column method until ready for the compact method.

$$\begin{array}{r} \overset{6}{\cancel{7}} \overset{10}{\cancel{1}} \overset{6}{\cancel{6}} \overset{8}{\cancel{8}} \cdot \overset{0}{\cancel{0}} \\ - \quad \quad 3 \quad 7 \quad 2 \cdot 5 \\ \hline 6 \quad 7 \quad 9 \quad 6 \cdot 5 \end{array}$$

Teachers

dis-

Show a 'zero' in any empty decimal places to aid understanding of what to subtract in that column.

Create lots of opportunities for subtracting and finding differences with money and measures.

creation: Adjusting method:

$$80,000 - 14,675 = \text{same}$$

$$79,999 - 14,674 = \text{same}$$

Represent subtraction using place value for those more visual learners:

Th	H	T	O
●●	●●●●	●●●●	●●●●●●

Tth	Th	H	T	O
●●●●	●●●●	●●●●	●●●●	●●●●●●

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, exchange, decrease, hundreds, value, digit, inverse, **tenths, hundredths, decimal point, decimal**

Key skills for subtraction at Y5:

- Subtract numbers mentally with increasingly large numbers.
- Use rounding and estimation to check answers to calculations and determine, in a range of contexts, levels of accuracy.
- Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.
- Read, write, order and compare numbers to at least 1 million and determine the value of each digit.
- Count forwards or backwards in steps of powers of 10 for any given number up to 1 million.
- Interpret negative numbers in context, counting forwards and backwards with positive and negative integers through zero.
- Round any number up to 1 million to the nearest 10, 100, 1000, 10,000 and 100,000.

Videos: Progression in Subtraction - suite of videos (NCETM planning tool)

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g. $62,035 \square - = 20,233$



Subtraction

Year 6 Subtracting with increasingly large and more complex numbers and decimal values.

$$\begin{array}{r} \cancel{9} \cancel{8} \cancel{1}^9, 6 \ 9 \ 9 \\ - \quad 8 \ 9, 9 \ 4 \ 9 \\ \hline 6 \ 0, 7 \ 5 \ 0 \end{array}$$

Using the compact column method to subtract more complex integers

$$\begin{array}{r} \cancel{9} \cancel{1}^5 \cdot \cancel{4}^1 1 \ 9 \text{ kg} \\ - \quad 3 \ 6 \cdot 0 \ 8 \text{ kg} \\ \hline 6 \ 9 \cdot 3 \ 3 \ 1 \text{ kg} \end{array}$$

Using the compact column method to subtract money and measures, including decimals with different numbers of decimal places.

Teachers discretion

Use the Adjusting method as a way to teach children to subtract larger numbers which involve repeated decomposition.

$$1,000,000 - 456,543 =$$

$$999,999 - 456,542 =$$

$$9 \ 9 \ 9 \ 9 \ 9$$

$$\underline{4 \ 5 \ 6 \ 5 \ 4 \ 2} -$$

$$\underline{5 \ 4 \ 3 \ 4 \ 5 \ 7}$$

Pupils should be able to apply their knowledge of a range of mental strategies, mental recall skills, and informal and formal written methods when selecting **the most appropriate method** to work out subtraction problems.

Empty decimal places can be filled with **zero** to show the place value in each column.

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 exchange, decrease, hundreds, value, digit, inverse, tenths, hundredths, decimal point, decimal*

Key skills for subtraction at Y6:

- Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.
- Read, write, order and compare numbers up to 10 million and determine the value of each digit
- Round any whole number to a required degree of accuracy
- Use negative numbers in context, and calculate intervals
- across zero.
- Children need to utilise and consider a range of mental subtraction strategies, jottings and written methods before choosing how to calculate.

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g. $62,035 \square - = 20,233$



Multiplication

Year 3 Multiply 2-digits by a single digit number

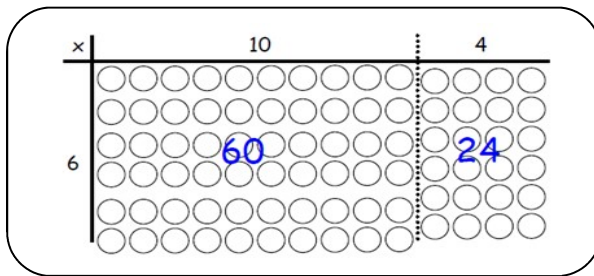


Represent this in different ways, using different equipment or numerals (grid method)

Arrays

Base 10 (24×4)

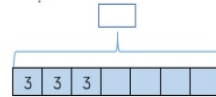
Bar model



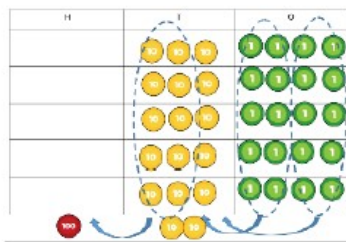
Place value boards and counters



There are 7 tricycles in the playground.
How many wheels are there altogether?
Complete the bar model to find the answer.

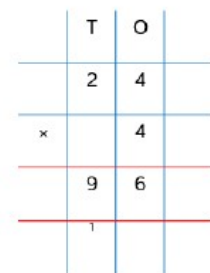


Short Method



5×35

To do this, children
be able to:



must

- Partition numbers into tens and ones
- Multiply multiples of ten by a single digit (e.g. 20×4) using their knowledge of multiplication facts and place value
- Recall and work out multiplication facts in the 2, 3, 4, 5, 8 and 10 times tables.
- Work out multiplication facts not known by repeated addition or other taught mental strategies (e.g. by commutative law, working out near multiples and adjusting, using doubling etc.) Strategies to support this are repeated addition using a number line, bead bars and arrays:

Doubling
diamond
method
(WW)

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times, _times as big as, once, twice, three times..., partition, grid method, multiple, product, tens, ones, value

Key skills for multiplication:

- Recall and use multiplication facts for the 2, 3, 4, 5, 8 and 10 multiplication tables, and multiply multiples of 10.
- Write and calculate number statements using the multiplication tables they know, including 2-digit \times single digit, drawing upon mental methods, and progressing to reliable written methods.
- Solve multiplication problems, including missing number problems.
- Develop mental strategies using commutativity (e.g. $4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$)
- Solve simple problems in contexts, deciding which operations and methods to use.
- Develop efficient mental methods to solve a range of problems e.g using commutativity ($4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$) and for missing number problems $\square \times 5 = 20$, $3 \times \square = 18$, $\square \times \square = 32$

Video clips: [Teaching the grid method as an interim step](#) (partitioning and counters to introduce grid)

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g. $23 \times \square = 69$

Multiplication

Year 4 Multiply 2 and 3-digits by a single digit, using all multiplication tables up to 12×12



Use Base 10 to develop understanding or numerals (grid method) of multiplication.

Formal short method

Use Place value counters to aid multiplication

Natasha

2	3	4	
x		6	
1	4	0	4

understanding of multiplication

Children should be able to:

- Approximate before they calculate, and make this a regular part of their calculating, going back to the approximation to check the reasonableness of their answer. e.g:
 346×9 is approximately $350 \times 10 = 3500$
 Record an approximation to check the final answer against.
- Multiply multiples of ten and one hundred by a single-digit, using their multiplication table knowledge.
- Recall all times tables up to 12×12

Doubling diamond method (WW)

Approximate,
Calculate,
Check it mate!

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, array, column, row, commutative, groups of, sets of, lots of, equal groups, times, multiply, times as big as, once, twice, three times... partition, grid method, total, multiple, product, sets of, **inverse**

Key skills for multiplication at Y4:

- Count in multiples of 6, 7, 9, 25 and 1000
- Recall multiplication facts for **all multiplication tables up to 12×12** .
- Recognise place value of digits in up to 4-digit numbers
- Use place value, known facts and derived facts to multiply mentally, e.g. multiply by 1, 10, 100, by 0, or to multiply 3 numbers.
- Use commutativity and other strategies mentally $3 \times 6 = 6 \times 3$, $2 \times 6 \times 5 = 10 \times 6$, $39 \times 7 = 30 \times 7 + 9 \times 7$.
- Solve problems with increasingly complex multiplication in a range of contexts.
- Count in multiples of 6, 7, 9, 25 and 1000
- Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones)

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g. $123 \times \square = 369$

Multiplication

Year 5 Multiply up to 4-digits by 1 or 2_digits.



Introducing column multiplication

- Introduce by comparing a place value counter method calculation to a short multiplication method, to see how the steps are related, but notice how there are less steps involved in the column method (see video).
- Children need to be taught to approximate first, e.g. for 72×38 , they will use **rounding**: 72×38 is approximately $70 \times 40 = 2800$, and use the approximation to check the reasonableness of their answer against.

Short multiplication for multiplying by a single digit

Introduce place value counters/grid for multiplying by 2 digits

TH	H	T	O
1000		100	10
1000		100	10
1000		100	10

TH	H	T	O
1	0	2	3
x			3

Pupils could be asked to work out a given calculation using the place value counters, and then compare it to 'your' column method. What are the similarities and differences? Unpick the steps and show how it reduces the steps needed.

Step 1 – build the length and the width using the multiplication calculation	Step 2 – Multiply the length by the width	Step 3 – Find the total of your area															
$44 \times 32 =$ <table> <tr> <td>30</td><td>40</td><td>4</td></tr> </table>	30	40	4	$44 \times 32 =$ <table> <tr> <td>30</td><td>40</td><td>4</td></tr> <tr> <td>2</td><td></td><td></td></tr> </table>	30	40	4	2			$44 \times 32 =$ <table> <tr> <td>30</td><td>40</td><td>4</td></tr> <tr> <td>2</td><td>80</td><td>8</td></tr> </table>	30	40	4	2	80	8
30	40	4															
30	40	4															
2																	
30	40	4															
2	80	8															

The grid could be used to introduce long multiplication, as the relationship can be seen in the answers in each row.

Demonstrate long multiplication for multiplying by 2 digits

Approximate,
Calculate,
Check it mate!

$$\begin{array}{r} 23 \\ \times 14 \\ \hline 92 \quad (23 \times 4) \\ 230 \quad (23 \times 10) \\ \hline \end{array}$$

With each row's
number sentence
written.

$$\begin{array}{r} 47 \\ \times 36 \\ \hline 282 \\ 1410 \\ \hline 1692 \end{array}$$

Without each row's
number sentence
Written.

Key vocabulary groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times..., partition, grid method, total, multiple, product, inverse, square, factor, integer, decimal, short/long multiplication, 'carry'

Key skills for multiplication at Y5:

Identify multiples and factors, using knowledge of **multiplication tables to 12x12**.

Solve problems where larger numbers are decomposed into their factors

Multiply and divide integers and decimals by 10, 100 and 1000

Recognise and use square and cube numbers and their notation

Solve problems involving combinations of operations, choosing and using calculations and methods appropriately.

Video clips:

Doubling
diamond
method
(WW)

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways**

E.g $23 \times \square = 299$

**

Multiplication



Year 6 Multiply 4 digits by 1 or 2 digits

4 digit numbers by a 1 digit number

$$\begin{array}{r} 3652 \\ \times 8 \\ \hline 29216 \end{array}$$

4 digit numbers by a 2 digit number

$$\begin{array}{r} 1234 \\ \times 16 \\ \hline 7404 \\ 12340 \\ \hline 19744 \end{array}$$

(1234 × 6)
(1234 × 10)

Multiplying decimals with up to 2 decimal places

Remind children that the single digit belongs in the ones column.

$$\begin{array}{r} 3.19 \\ \times 8 \\ \hline 25.52 \end{array}$$

Line up the decimal points in the question and the answer.

to:

- Use rounding and place value to make approximations before calculating and use these to check answers against.
- Use **short multiplication** (see Y5) to multiply numbers with **more than 4-digits** by a **single digit**; to multiply money and measures, and to **multiply decimals** with up to 2d.p. by a **single digit**.
- Use **long multiplication** (see Y5) to multiply numbers with **at least 4 digits** by a 2-

Doubling diamond method (WW)

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, array, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times... partition, grid method, total, multiple, product, inverse, square, factor, integer, decimal, short / long multiplication, 'carry', **tenths, hundredths, decimal**

Key skills for multiplication at Y6:

- Recall multiplication facts for all times tables up to **12 × 12 (as Y4 and Y5)**.
- Multiply multi-digit numbers, up to 4-digit × 2-digit using long multiplication.
- Perform mental calculations with mixed operations and large numbers.
- Solve multi-step problems in a range of contexts, choosing appropriate combinations of operations and methods.
- Estimate answers using round and approximation and determine levels of accuracy.
- Round any integer to a required degree of accuracy.

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

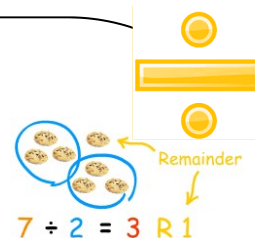
E.g 3652 × = 29216



Division

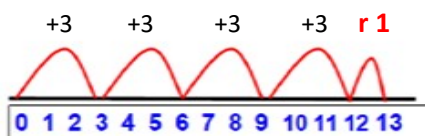
Year 3 Divide 2-digit numbers by a single digit

Children to be shown division using different representations such as:



Grouping on a number line:

$$13 \div 3 = 4 \text{ r } 1$$



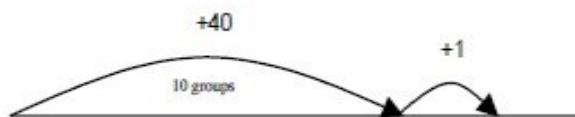
STEP 1: Children continue to work out unknown division facts by grouping on a number line from zero. They are also now taught the concept of **remainders**, as in the example. This should be introduced practically and with arrays, as well as being translated to a number line. Children should work towards calculating some basic division facts with remainders mentally for the 2s, 3s, 4s, 5s, 8s and 10's

Bar model, Base 10 and part-whole model, place value counters and grouping.

STEP 2: Children divide on a number line by chunking

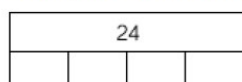
$$41 \div 4 = 10 \text{ r } 1$$

$$41 = (10 \times 4) + 1$$

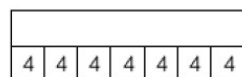


Real life contexts need to be used routinely to help pupils gain a full understanding, and the ability to recognise the place of division and how to apply it to problems.

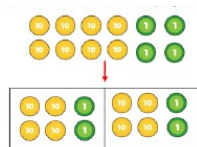
Halving diamond method (WW)



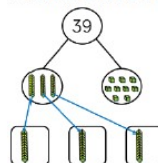
$$24 \div 4 = \square$$



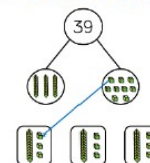
$$\square \div 4 = \square$$



Step 1: Share the tens



Step 2: Share the ones



Key Vocabulary: *share, share equally, one each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple*

Key number skills needed for division at Y3:

- Recall and use multiplication and division facts for the 2, 3, 4, 5, 8 and 10 multiplication tables (through doubling, connect the 2, 4 and 8s).
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.
- Solve problems, in contexts, and including missing number problems, involving multiplication and division.
- Pupils develop efficient mental methods, for example, using multiplication and division facts (e.g. using $3 \times 2 = 6$, $6 \div 3 = 2$ and $2 \times 6 = 12$, so $12 \div 3 = 4$ and $4 \times 3 = 12$).
- Pupils develop reliable written methods for division, starting with calculations of 2-digit numbers by 1-digit numbers and progressing to the formal written method of short division.

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g. $40 \div \square = 10$

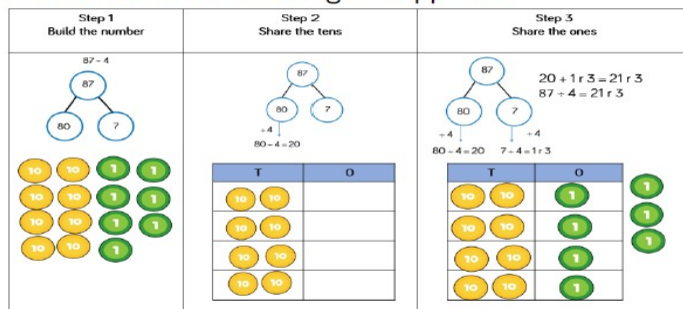


Division

Year 4 Divide up to 3-digit numbers by a single digit using short division, including remainders.

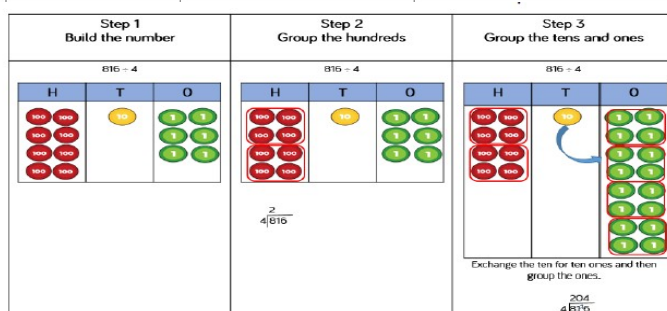
STEP 1: Dividing a 2-digit number

Phoebe solves $87 \div 4$ using this approach

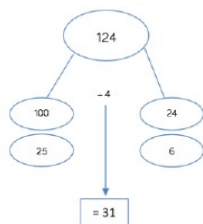


This approach uses the part whole model, partitioning and counters to understand division including remainders.

The second approach uses place value counters as a way for children to understand how to exchange the 10 to then group the ones.



The third approach uses the part whole model to show division before moving onto the bus stop method.



$$\begin{array}{r} 27 \\ 3 \overline{)81} \end{array}$$

Step 2: Bus stop!

$$\begin{array}{r} 218 \\ 4 \overline{)872} \end{array}$$

Real life contexts need to be used routinely to help pupils gain a full understanding, and the ability to recognise the place of division and how to apply it to problems.

Halving diamond method (WW)

Key Vocabulary: share, share equally, one each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'regroup', multiple, divisible by, factor

Key number skills needed for division at Y4:

- Recall multiplication and division facts for all numbers up to 12×12 .
- Use place value, known and derived facts to multiply and divide mentally, including: multiplying and dividing by 10 and 100 and 1.
- Pupils practise to become fluent in the formal written method of short division with exact answers when dividing by a one-digit number
- Pupils practise mental methods and extend this to three-digit numbers to derive facts, for example $200 \times 3 = 600$ so $600 \div 3 = 200$
- Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as three cakes shared equally between 10 children.

Video clip: [Pupil demonstrating 3-digit short demonstration without remainders](#)

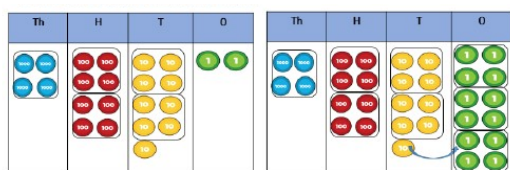
**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g $872 \div \square = 218$



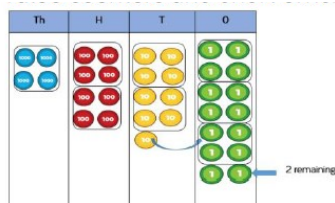
Division

Year 5 Divide up to 4 digits by a single digit, including those **with remainders**.



$$\begin{array}{r} 1223 \\ 4 \overline{) 4892} \end{array}$$

Use place value counters and grid to demonstrate dividing by grouping. Link to short division (bus stop)



$$\begin{array}{r} 1223 \\ 4 \overline{) 4894} \text{ r}2 \end{array}$$

Use place value counters and grid to demonstrate dividing by grouping with remainders.

$$\begin{array}{r} 0663 \text{ r}5 \\ 8 \overline{) 5309} \end{array}$$

The answer to $5309 \div 8$ could be expressed as **663 and five eighths**

Include **money** and **measure** contexts.

Approximate,
Calculate,
Check it mate!

Key Vocabulary: *share, share equally, one each, two each..., group, equal 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, inverse, quotient, prime number, prime factors, composite number (non-prime)*

Key number skills needed for division at Y5:

Halving
diamond
method
(WW)

- Recall multiplication and division facts for all numbers up to 12×12 (as in Y4).
- Multiply and divide numbers mentally, drawing upon known facts.
- Identify multiples and factors, including finding all factor pairs of a number, and common factors of two number.
- Solve problems involving multiplication and division where larger numbers are decomposed into their factors.
- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.
- Use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers.
- Work out whether a number up to 100 is prime, and recall prime numbers to 19.
- 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
- Use multiplication and division as inverses.
- Interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (e.g. $98 \div 4 = 24 \text{ r}2 = 24\frac{2}{4} = 24.5 \approx 25$).
- Solve problems involving combinations of all four operations, including understanding of the equals sign, and including

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g. $5309 \div \square = 663 \text{ r}5$



Division

Year 6 Divide by 2-digit numbers including decimals by chunking.

Step 1:

Introduce long division by the 'Key Facts Box' for dividing by 2

- Find out 'How many 36s are in 972?'
- Teach pupils to write a 'useful list' first at the side that will help them decide what chunks to use, e.g.:

'Useful' list:

- $1 \times = 36$
- $2 \times = 72$
- $10 \times = 360$
- $5 \times = 180$
- $100 \times = 3600$

- From their key facts information children see how close they can get through grouping their keys facts together.
- 'Can we use 20 lots first to get to 720?'
- 'Can I add another 5 lots of 36 on top of that to get to 900?'
- 'Can I add another 2 lots of 36 on top of that to get the last 72?'
- Altogether I have used 27 x of 36 without a remainder.

$$\begin{array}{r} 720 \text{ (} 20 \times 36 \text{)} \\ 180 \text{ (} 5 \times 36 \text{)} \\ \underline{72} \text{ (} 2 \times 36 \text{)} \\ 972 \text{ (} 27 \times 36 \text{)} \\ 1 \end{array}$$

Where remainders occur, pupils should express them as fractions, decimals or use rounding, depending upon the problem.

Step 2:

Dividing a decimal number

$$\begin{array}{r} 28.8 \\ 15 \overline{) 432.0} \\ \underline{30} \\ 132 \\ \underline{120} \\ 120 \\ \underline{120} \\ 0 \end{array}$$

Answer: 28.8

Approximate,
Calculate,
Check it mate!

Halving diamond method (WW)

Key Vocabulary: *As previously, & common factor*
Key number skills needed for division at Y6:

- Recall and use multiplication and division facts for all numbers to 12×12 for more complex calculations
- 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. Use short division where appropriate.
- Perform mental calculations, including with mixed operations and large numbers.
- Identify common factors, common multiples and prime numbers.
- Solve problems involving all 4 operations.
- Use estimation to check answers to calculations and determine accuracy, in the context of a problem.
- Use written division methods in cases where the answer has up to two decimal places.
- Solve problems which require answers to be rounded to specified degrees of accuracy.

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g. $5309 \div \square = 663r5$



Division

Year 6 Divide by 2-digit numbers including decimals by drop down method.

Introduce **long division by drop down** for dividing by 2 digits.

$$\begin{array}{r}
 194 \text{ r } 22 \\
 24 \overline{) 4678} \\
 \underline{48} \\
 72 \\
 \underline{72} \\
 96 \\
 \underline{96} \\
 120 \\
 \underline{120} \\
 144 \\
 \underline{144} \\
 168 \\
 \underline{168} \\
 192 \\
 \underline{192} \\
 216
 \end{array}$$

- Write the multiples of the divisor
- Underline the first two digits in the dividend
- Work out how many lots of the divisor goes into the target number (write this in the quotient)
- Subtract the 'lots of' number to get a remainder.
- Drop down then next digit.
- Repeat step 2-5 until all digits have been dropped down.

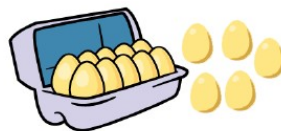
Ensure children are introduced and understand the difference between:

- Dividend
- Divisor
- Quotient

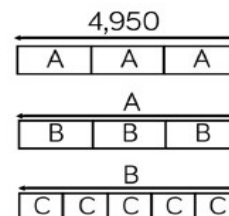
Where **remainders** occur, pupils should express them as fractions, decimals or use rounding, depending upon the problem.

Ensure children are introduced to division problems being represented in different ways (including rounding up or down after a question)

Eggs are put into boxes holding a dozen.
A farmer wants to put 648 eggs into boxes.
How many boxes will he have filled?



Work out the value of C
(The bar models are not drawn to scale)



Halving
diamond
method
(WW)

Key Vocabulary: *As previously, & common factor*
Key number skills needed for division at Y6:

- Recall and use multiplication and division facts for all numbers to 12 x 12 for more complex calculations
- 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. Use short division where appropriate.
- Perform mental calculations, including with mixed operations and large numbers.
- Identify common factors, common multiples and prime numbers.
- Solve problems involving all 4 operations.
- Use estimation to check answers to calculations and determine accuracy, in the context of a problem.
- Use written division methods in cases where the answer has up to two decimal places.
- Solve problems which require answers to be rounded to specified degrees of accuracy.

**** Calculations must be represented with a missing number problem, so children can make links to inverse operations, as well as seeing the questions represented in different ways ****

E.g 5309 \div \square = 663r5

