How we teach calculations:

Calculation Policy for Mathematics

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 Reception 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

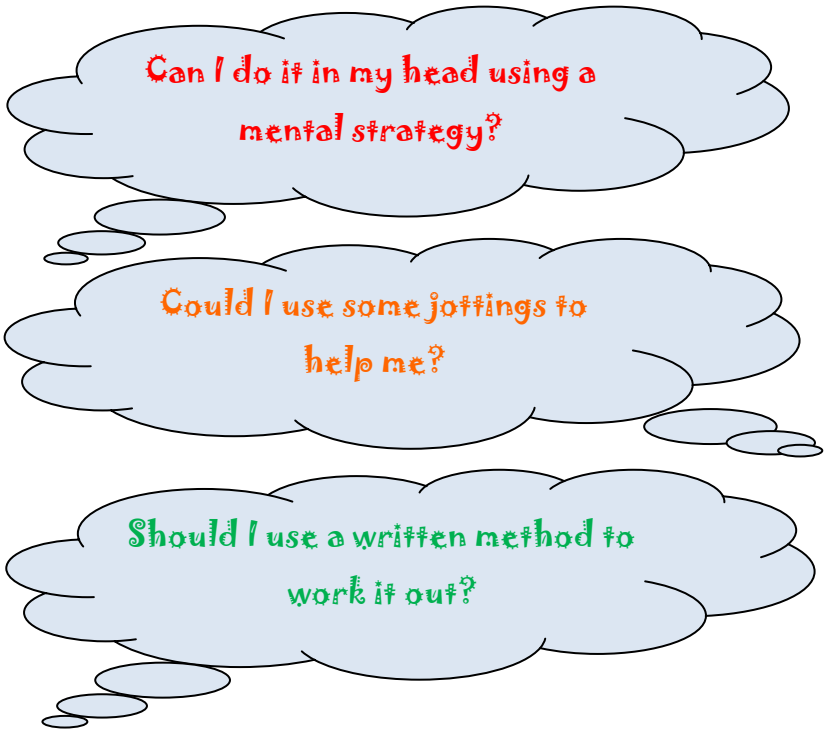
The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014, **however it is vital that pupils are taught according to the stage that they are currently working at,** being moved onto the next level as soon as they are ready, or working at a lower stage until they are secure enough to move on.

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 when faced with 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:



To work out a tricky calculation:
Approximate/ Estimate by rounding.
Calculate.
Check it mate!

Addition

Reception

Pupils will engage in a wide variety of songs and rhymes, games and activities. They will have access to a wide range of counting equipment, everyday objects, number tracks and number lines.

Pupils will begin to relate addition to combining two groups of objects first by counting all then counting on from the largest number.

They will find one more than a given number.

Pupils will be introduced to the + and = symbols. They will begin to use the vocabulary used in addition.

You have 3 teddies and I have 1 teddy. How many teddies altogether?

There is no requirement for children to make written recording of their work but children can be encouraged to make their own jottings or drawings to show what they have done.

Addition

Year 1 Add with numbers up to 20

Use numbered number lines to add, by counting on in ones. Encourage children to start with the **larger** number and count on. Can they do it in their heads?

Children should:

- Have access to a wide range of counting equipment, everyday objects, number tracks and number lines, and be shown numbers in different contexts.
- Read and write the addition (+) and equals (=) signs within number sentences.
- Add one-digit and two-digit numbers to 20 included 0.
- Interpret addition number sentences and solve missing box problems, using concrete objects and number line addition to solve them: 8 + 3 = □

  15 + 4 = _ 5 + 3 + 1 = _ _ + _ = 10 + _ = 17 7 = _ - 9

This builds on from prior learning of adding by combining two sets of objects into one group (5 cubes and 3 cubes) in Early Years.

8 + 5

Bead strings or bead bars can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.

Key vocabulary: *add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line*

Key skills for addition at Y1:

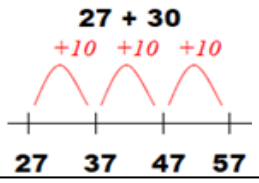
- Read and write numbers to 100 in numerals, incl. 1—20 in words
- Recall bonds to 10 and 20, and addition facts within 20
- Count to and across 100
- Count in multiples of 1 2, 5 and 10
- Use near doubles - 6 + 7 = double 6 + 1
- Using different strategies e.g. To add 9 - add 10, then take away 1.
- Solve simple 1-step problems involving addition, using objects, number lines and pictorial representations.

Addition

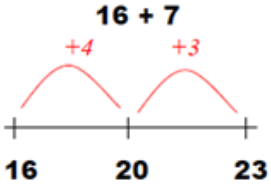
Year 2 Add with 2-digit numbers

Developing mental fluency with addition and place value involving 2-digit numbers, then establish more formal methods.

Add 2-digit numbers and tens:

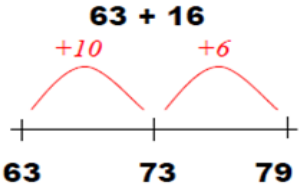


Add 2-digit numbers and units:

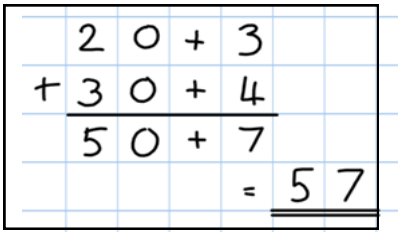


Use empty number lines, concrete equipment, hundred squares etc. to build confidence and fluency in mental addition skills.

Add pairs of 2-digit numbers, moving to the partitioned column method when secure adding tens and units:



23 + 34:



STEP 1: Only provide examples that do **NOT** cross the tens boundary until they are secure with the method itself.

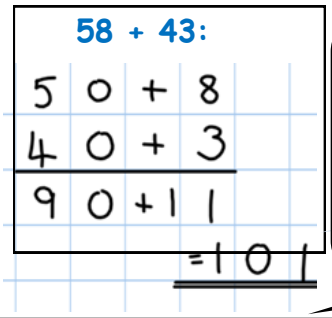
STEP 2: Now the children need to partition the tens and ones. Then add them together.

63 + 34:

60 + 30 = 90
3 + 4 = 7
90 + 7 = 97

STEP 3: Once children can add a multiple of ten to a 2-digit number mentally (e.g. 80+11), they are ready for adding pairs of 2-digit numbers that DO cross the tens boundary (e.g. 58 + 43).

58 + 43:



STEP 3: Children who are confident and accurate with this stage should move onto the expanded addition methods with 2 and 3-digit numbers (see Y3).

To support understanding, pupils may physically make and carry out the calculation with Dienes Base 10 apparatus or place value counters, then compare their practical version to the written form, to help them to build an understanding of it.

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

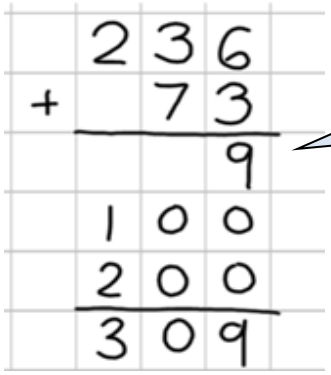
Key skills for addition at Y2:

- Add a 2-digit number and ones (e.g. 27 + 6)
- Add a 2-digit number and tens (e.g. 23 + 40)
- Add pairs of 2-digit numbers (e.g. 35 + 47)
- Add three single-digit numbers (e.g. 5 + 9 + 7)
- Show that adding can be done in any order (the commutative law).
- Recall bonds to 20 and bonds of tens to 100 (30 + 70 etc.)
- Count in steps of 2, 3 and 5 and count in tens from any number.
- Understand the place value of 2-digit numbers (tens and ones)
- Compare and order numbers to 100 using < > and = signs.
- Read and write numbers to at least 100 in numerals and words.
- Solve problems with addition, using concrete objects, pictorial representations, involving numbers, quantities and measures, and applying mental and written methods.

Addition

Year 3 Add numbers with up to 3-digits

Introduce the **expanded column addition** method:



Add the **units** first, in preparation for the compact method.

In order to carry out this method of addition:

- Children need to recognise the value of the hundreds, tens and units without recording the partitioning.
- Pupils need to be able to add in columns.

Move to the compact **column addition** method, with 'carrying':

Add **units** first.

'Carry' numbers **underneath** the bottom line.

```
 236
+ 73
 309
  1
```

Children who are very secure and confident with 3-digit expanded column addition should be moved onto the **compact column addition** method, being introduced to 'carrying' for the first time. Compare the expanded method to the compact column method to develop an understanding of the process and the reduced number of steps involved.

Remind pupils the actual value is '**three tens** add **seven tens**', not 'three add seven', which equals **ten** tens.

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

Key skills for addition at Y3:

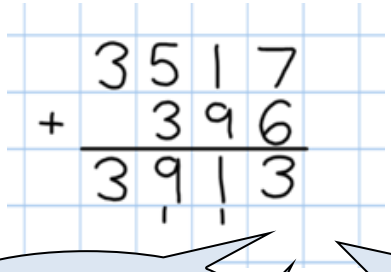
- Read and write numbers to 1000 in numerals and words.
- Add 2-digit numbers mentally, incl. those exceeding 100.
- **Add a three-digit number and ones mentally (175 + 8)**
- **Add a three-digit number and tens mentally (249 + 50)**
- **Add a three-digit number and hundreds mentally (381 + 400)**
- 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, 100 and adjusting, using near doubles, partitioning and recombining.

Addition

Year 4 Add numbers with up to 4 digits

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

e.g. 3517 + 396 = 3913



Introduce the **compact column addition** method by asking children to add the two given numbers together using the method that they are familiar with (expanded column addition—see Y3). Teacher models the compact method with carrying, asking children to discuss similarities and differences and establish how it is carried out.

Add **units** first.

'Carry' numbers **underneath** the bottom line.

Reinforce correct place value by reminding them the actual value is 5 hundreds add 3 hundreds, **not 5 add 3**, for example.

Use and apply this method to money and measurement values.

If children are struggling with the compact method then revert back to the expanded column method (Year 3) but using 4 digit numbers.

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

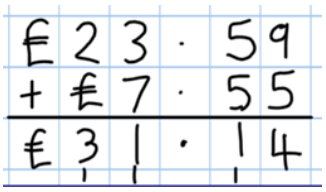
Key skills for addition at Y4:

- 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.

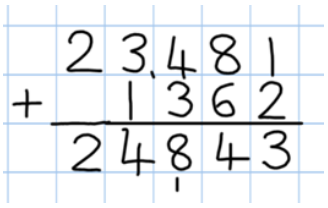
Addition

Year 5 Add numbers with more than 4 digits

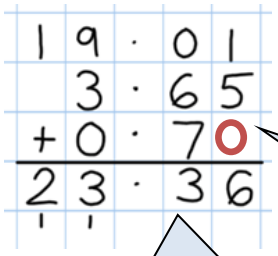
including money, measures and decimals with different numbers of decimal places.



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



Numbers should exceed 4 digits.



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

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

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

Children should:

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

Key vocabulary: *add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, 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, 100 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.

Addition

Year 5 Adding fractions

including fractions with the same denominators and denominators that are multiples of the same number.

Adding fractions with the same denominator

2/5 + 1/5 = 3/5

The denominator stays the same and you add the numerators.

There are 3 Simple Steps to add fractions:

1.Step 1: Make sure the bottom numbers (the denominators) are the same.
2.Step 2: Add the top numbers (the numerators), put the answer over the denominator.
3.Step 3: Simplify the fraction (if needed)

Adding fractions with denominators that are multiples of the same number

2/5 + 1/10 =

4/10 + 1/10 = 5/10 = 1/2

If the denominators are different then find equivalent fractions to make them the same.

Find the common denominator. If you have to multiply the denominator by 2 then multiply the numerator by 2 as well.

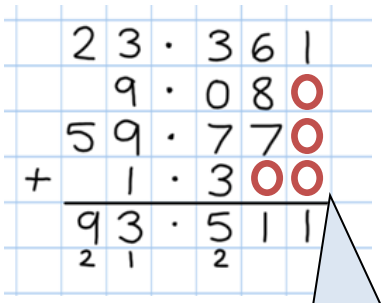
Key vocabulary: *numerator, denominator, out of, proper fractions, improper fractions, mixed numbers, equivalent, reducing, simplifying, canceling,*

Key skills for addition at Y5:

- **Add fractions with the same denominators.**
- **Add fractions with denominators of common multiples.**
- **Reducing/Simplifying/Canceling fractions.**
- **Finding equivalent fractions.**
- **Changing mixed numbers into improper fractions and vice versa.**
- **Problems involving fractions.**

Addition

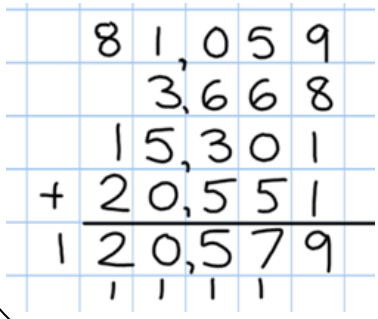
Year 6 Add several numbers of increasing complexity



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

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.
- Zeros could be added into any empty decimal places, to show there is no value to add.



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, units, 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.

Addition

Year 6 **Add fractions with different denominator including mixed numbers.**

As you may recall, a mixed number consists of an integer and a proper fraction. Any mixed number can also be written as an improper fraction, in which the numerator is larger than the denominator, as shown in the following example:

Example 1

$$3\frac{1}{8} = \frac{25}{8}$$

To add mixed numbers, we first add the whole numbers together, and then the fractions.

If the sum of the fractions is an improper fraction, then we change it to a mixed number. Here's an example. The whole numbers, 3 and 1, sum to 4. The fractions, 2/5 and 3/5, add up to 5/5, or 1. Add the 1 to 4 to get the answer, which is 5.

Example 2

$$\begin{array}{r} 3\frac{2}{5} \\ +\,1\frac{3}{5} \\ \hline 4\frac{5}{5} = 4 + 1 = 5 \end{array}$$

If the denominators of the fractions are different, then first find equivalent fractions with a common denominator before adding. For example, let's add 4 1/3 to 3 2/5. Using the techniques we've learned, you can find the least common denominator of 15. The answer is 7 11/15.

$$\begin{array}{rl} 4\frac{1}{3} & = 4\frac{5}{15} \\ +\,3\frac{2}{5} & = 3\frac{6}{15} \\ \hline & 7\frac{11}{15} \end{array}$$

Subtraction

Reception

Pupils will engage in a variety of counting songs and rhymes and practical activities.

In practical activities and through discussion they will begin to use the vocabulary associated with subtraction. Pupils will be introduced to the – and = symbols.

They will find one less than a given number.

They will begin to relate subtraction to 'taking away' using objects to count 'how many are left' after some have been taken away.

6 – 2 = 4

'Take two apples away. How many are left?'

Pupils will begin to count back from a given number.

There is no requirement for children to make written recording of their work but children can be encouraged to make their own jottings or drawings to show what they have done.

Subtraction

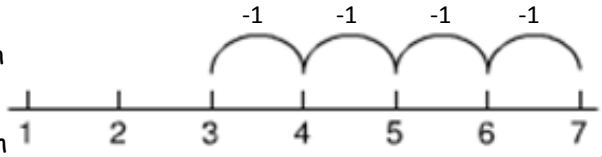
Year 1 Subtract from numbers up to 20

Children consolidate understanding of subtraction practically, showing subtraction on bead strings, using cubes etc. and in familiar contexts, and are introduced to more formal recording using number lines as below:

Read, write and interpret number sentences with - and = signs.

Subtract by taking away

Count back in ones on a numbered number line to take away, with numbers up to 20:

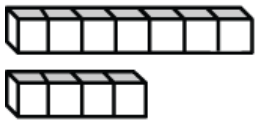


$7 - 4 = 3$

Model subtraction using hundred squares and numbered number lines/tracks and practically.

Find the difference 'distance between'

This will be introduced practically with the language '**find the distance between**' and '**how many more?**' in a range of familiar contexts.



'Seven is 3 more than four'

'I am 2 years older than my sister'

Written and mental subtraction

Children should start recalling subtraction facts up to **and within** 10 and 20, and should be able to subtract zero.

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_?*

Key skills for subtraction at Y1:

- Given a number, say **one more or one less**.
- Count to and over 100, **forward and back**, from any number.
- Represent and use **subtraction facts to 20 and within 20**.
- Subtract with **one-digit and two-digit** numbers to 20, including zero.
- Solve one-step problems that involve addition and subtraction, using concrete objects (ie bead string, objects, cubes) and pictures, and missing number problems.
- Read and write numbers from 0 to 20 in numerals and words.
- Solve simple 1 step word problems.
- Missing box/number problems. E.g. 20 - _ = 15

Subtraction

Year 2 Subtract with 2-digit numbers

Subtract on a number line by counting back, aiming to develop mental subtraction skills.

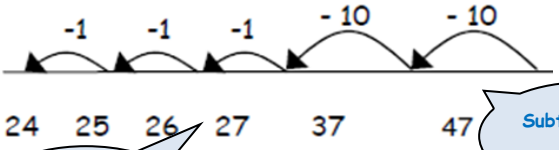
Use Dienes blocks for subtraction calculations too.

This strategy will be used for:

- **2-digit numbers subtract units** (by taking away / counting back) e.g. 36—7
- **2-digit numbers subtract tens** (by taking away / counting back) e.g. 48—30
- **Subtracting pairs of 2-digit numbers** (see below:)

Subtracting pairs of 2-digit numbers on a number line:

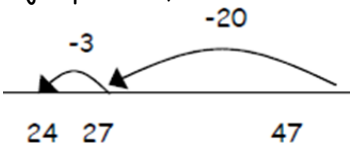
47 - 23 = 24 Partition the second number and subtract it in tens and units, as below:



Then subtract units.

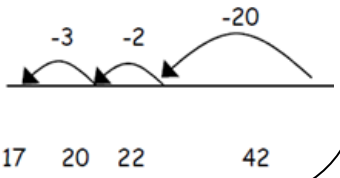
Subtract tens first.

Move towards more efficient jumps back, as below:



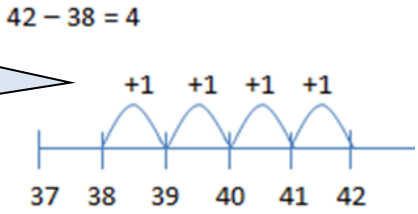
Combine methods with use of a hundred square to reinforce understanding of number value and order.

Teaching children to **bridge through ten** can help them to become more efficient, for example 42—25:



Mental strategy - subtract numbers close together by **counting on:**

Start with the smaller number and count on to the largest.



Many mental strategies are taught. Children are taught to recognise that when numbers are close together, it is more efficient to **count on** the difference. They need to be clear about the relationship between addition and subtraction.

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, units*

Key skills for subtraction at Y2:

- Recognise the place value of each digit in a two-digit number.
- Recall and use subtraction facts to 20 fluently, and derive and use related facts up to 100.
- Subtract using concrete objects, pictorial representations, 100 squares and mentally, including: a two-digit number and ones, a two-digit number and tens, and two two-digit numbers.
- Show that subtraction of one number from another cannot be done in any order.
- Recognise and use inverse relationship between addition and subtraction, using this to check calculations and missing number problems.
- Solve simple addition and subtraction problems including measures, using concrete objects, pictorial representation, and also applying their increasing knowledge of mental and written methods.
- Read and write numbers to at least 100 in numerals and in words.

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 = 54

80 9
- 30 5
50 4

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.

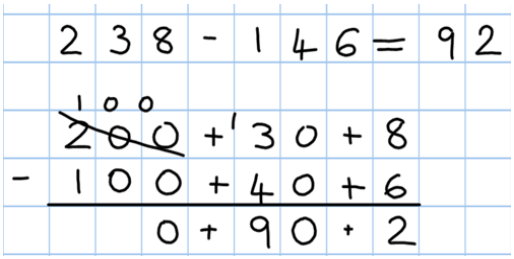
STEP 2: introduce 'exchanging' through practical subtraction. Make the larger number with Base 10, then subtract 47 from it.

72 - 47

60
70 2¹
- 40 7
20 5 = **25**

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

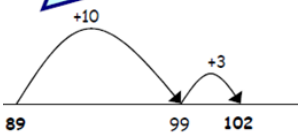
STEP 3: Once pupils are secure with the understanding of 'exchanging', they can use the partitioned column method to subtract any 2 and 3-digit numbers.



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

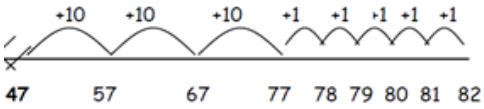
Counting on as a mental strategy for subtraction:

Because counting on in tens is the way we use a 100 square.



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.).

- Start at the smaller number and count on in **tens** first, then count on in units to find the rest of the difference:



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, units* ***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.

Approximate,
Calculate,
Check it mate!

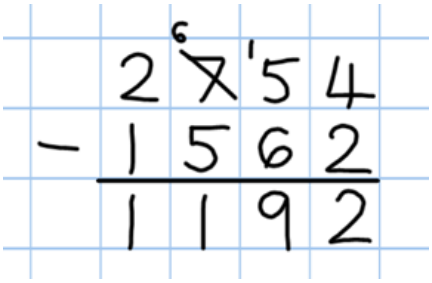
Subtraction

Year 4 Subtract with up to 4-digit numbers

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

Compact column subtraction with 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.

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

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

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 (see video below).

Approximate,
Calculate,
Check it mate!

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, units 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.

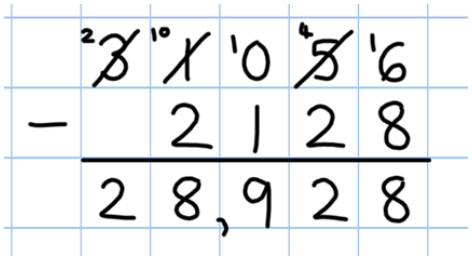
Subtraction

Year 5 Subtract with at least 4-digit numbers

including money, measures, decimals.

Compact column subtraction

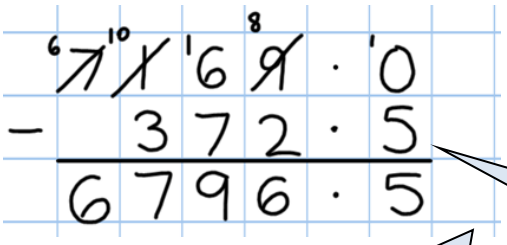
(with 'exchanging').



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.

Subtracting with larger integers.

See 'moving to the compact method' video.



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

Add 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.

Approximate,
Calculate,
Check it mate!

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, units 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 0.
- Round any number up to 1 million to the nearest 10, 100, 1000, 10 000 and 100 000.

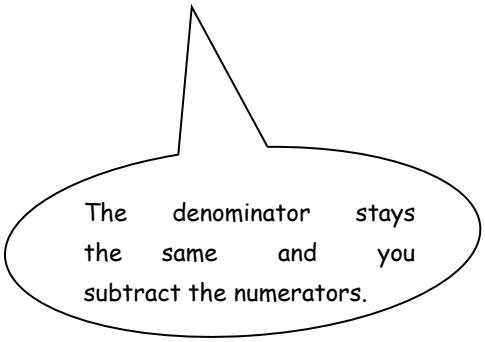
Subtraction

Year 5 Subtracting fractions

including fractions with the same denominators and denominators that are multiples of the same number.

Subtractng fractions with the same denominator

4/5 - 1/5 = 3/5



Subtracting fractions with denominators that are multiples of the same number

The main rule is that you can't do anything until the denominators are the same.

4/5 - 3/10 =

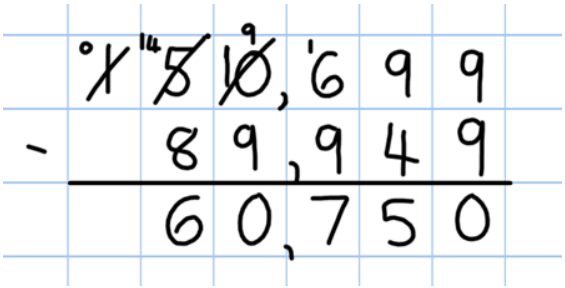
4/5 = 8/10

8/10 - 3/10 = 5/10

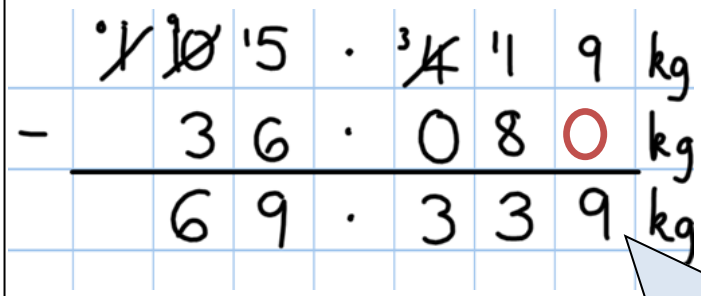
We need to find the LCD (Lowest common denominator). It's really just the LCD of 5 and 10, which is 10. Therefore we need to make this our new denominator.

Subtraction

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



Using the compact column method to subtract more complex integers



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

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

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.

Approximate,
Calculate,
Check it mate!

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, units 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.

Subtraction

Year 6 Subtracting fractions, including mixed numbers, with different denominators.

Subtracting mixed numbers is very similar to adding them. But what happens when the fractional part of the number you are subtracting is larger than the fractional part of the number you are subtracting from?

Here's an example: let's subtract 3 3/5 from 4 1/3. First you find the LCD; here it's 15.

4 1/3 - 3 3/5

4 5/15 - 3 9/15

Write both fractions as equivalent fractions with a denominator of 15.

3 + 1 5/15 - 3 9/15

3 + 20/15 - 3 9/15

Since you're trying to subtract a larger fraction from a smaller one, you need to "borrow" a one from the integer 4, change it to 15/15, and add it to the fraction.
3 20/15 - 3 9/15

11/15

Now the problem becomes 3 20/15 minus 3 9/15 and the answer is 11/15.

Adding and subtracting mixed numbers

1. $3 - \frac{1}{4}$

$$3 = 2\frac{4}{4}$$
$$-\frac{1}{4} = -\frac{1}{4}$$
$$2\frac{3}{4}$$

"Borrow" a 1 from the 3 and change to $\frac{4}{4}$.

2. $2\frac{1}{3} + 3\frac{1}{8}$

$$2\frac{1}{3} = 2\frac{8}{24}$$
$$+3\frac{1}{8} = +3\frac{3}{24}$$
$$5\frac{11}{24}$$

The LCD of 3 and 8 is 24.

Multiplication

Reception

Pupils will engage in a wide variety of songs and rhymes, games and activities.
In practical activities and through discussion they will begin to solve problems and use the vocabulary involving doubling.

'Three apples for you and three apples for me. How many apples altogether?'

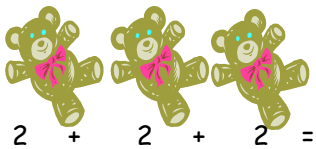
Children will be introduced to counting in 2's, 5's and 10's.

There is no requirement for children to make written recording of their work but children can be encouraged to make their own jottings or drawings to show what they have done.

Multiplication

Year 1 Multiply with concrete objects, arrays and pictorial representations.

How many legs will 3 teddies have?



2 + 2 + 2 = 6

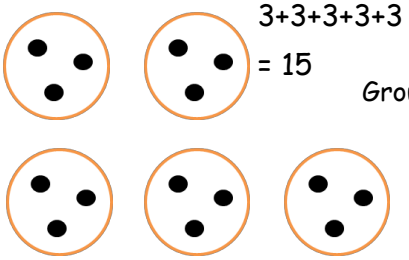
3 lots of 3

× × ×

× × ×

× × ×

There are 3 sweets in one bag.
How many sweets are in 5 bags altogether?



3+3+3+3+3

= 15

Groups of

- Give children experience of counting equal group of objects in 2s, 5s and 10s.
- Present practical problem solving activities involving counting equal sets or groups, as above.
- Solve one step problems (lots of) involving multiplication.

Key vocabulary: *groups of, lots of, times, array, altogether, multiply, count*

Key skills for multiplication at Y1:

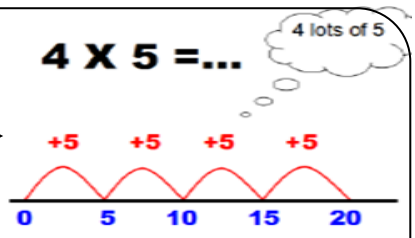
Count in multiples of 2, 5 and 10.
Solve one-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.
Make connections between arrays, number patterns, and counting in twos, fives and tens.
Begin to understand doubling using concrete objects and pictorial representations.

Multiplication

Year 2 Multiply using arrays and repeated addition (using at least 2s, 5s and 10s)

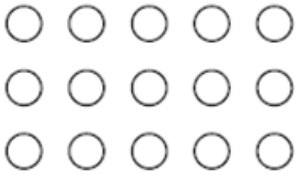
Use repeated addition on a number line:

- Starting from zero, make equal jumps up on a number line to work out multiplication facts and write multiplication statements using x and = signs.



4 X 5 = 20

Use arrays:



5 x 3 = 15

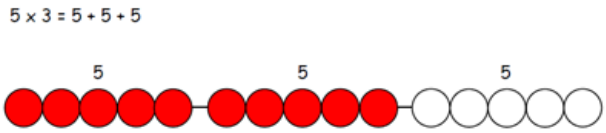
5 x 3 = 3 + 3 + 3 + 3 = **15**

3 x 5 = 5 + 5 + 5 = **15**

3 x 5 = 15

Use arrays to help teach children to understand the commutative law of multiplication, and give examples such as **3 x __ = 6**.

Use practical apparatus:



Use mental recall:

- Children should begin to **recall multiplication facts for 2, 5 and 10** times tables through practice in counting and understanding of the operation.

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...*

Key skills for multiplication at Y2:

- Count in steps of 2, 3 and 5 from zero, and in 10s from any number.
- Recall and use multiplication facts from the **2, 5 and 10** multiplication tables, including recognising odds and evens.
- Write and calculate number statements **using the x and = signs**.
- Show that multiplication can be done in any order (commutative).
- Solve a range of problems involving multiplication, using concrete objects, arrays, repeated addition, mental methods, and multiplication facts.
- Pupils use a variety of language to discuss and describe multiplication.

Multiplication

Year 3 Multiply 2-digits by a single digit number

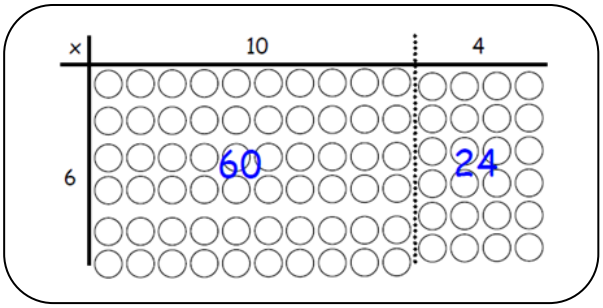
Introduce the grid method for multiplying 2-digit by single-digits:

Eg. 23 x 8 = 184

X	20	3
8	160	24

160 + 24 = 184

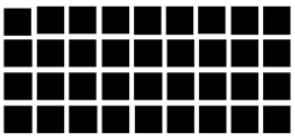
Link the layout of the grid to an array initially:



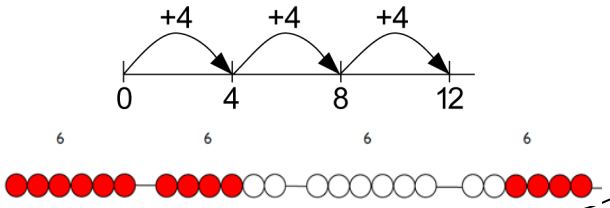
Introduce the grid method with children physically making an array to represent the calculation (e.g. make 8 lots of 23 with 10s and 1s place value counters), then translate this to grid method format (see video clip).

To do this, children must be able to:

- Partition numbers into tens and units
- Multiply multiples of ten by a single digit (e.g. 20 x 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:



9 x 4 = 36



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, units, 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 x 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 x 12 x 5 = 4 x 5 x 12 = 20 x 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 × 12 × 5 =**

Multiplication

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

Developing the grid method:

Eg. 136 x 5 = 680

X	100	30	6
5	500	150	30

500
150
+ 30
680

Encourage column addition to add accurately.

Move onto **short multiplication** (see Y5) if and when children are confident and accurate multiplying 2 and 3-digit numbers by a single digit this way, **and** are already confident in 'carrying' for written addition.

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 x 9 is approximately 350 x 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 x 12**

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 x 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 x 6 = 6 x 3 , 2 x 6 x 5 = 10 x 6 , 39x7 = 30 x 7 + 9 x 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)

Multiplication

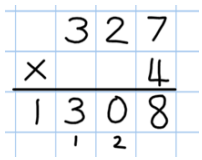
Year 5 Multiply up to 4-digits by 1 or 2 digits.

Introducing column multiplication

- Introduce by comparing a grid 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 x 38, they will use rounding: 72 x 38** is approximately 70 x 40 = **2800**, and use the approximation to check the reasonableness of their answer against.

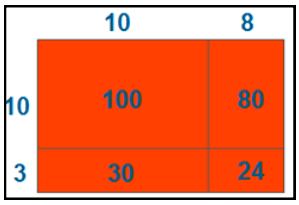
Short multiplication for multiplying by a single digit

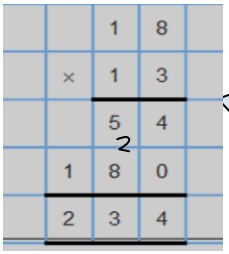
x	300	20	7
4	1200	80	28



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

Introduce long multiplication for multiplying by 2 digits





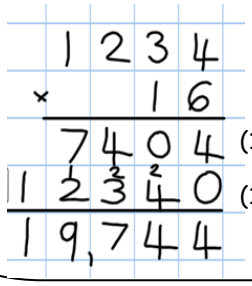
18 x 3 on the 1st row

(8 x 3 = 24, carrying the 2 for twenty, then '1' x 3).

18 x 10 on the 2nd row. Put a zero in units first, then say 8 x 1, and 1 x 1.

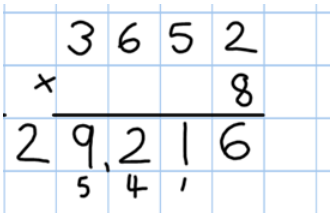
The grid could be used to introduce long multiplication, as the relationship can be seen in the answers in each row.

Moving towards more complex numbers:



(1234 x 6)

(1234 x 10)



Approximate,

Calculate,

Check it mate!

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

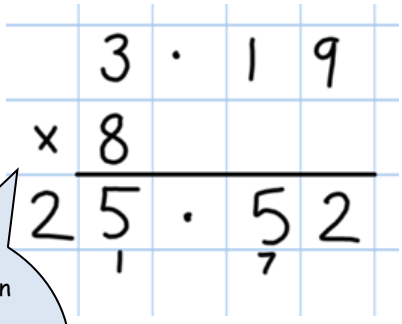
Multiply and divide integers and decimals by 10, 100 and 1000

Recognise and use square and cube numbers and their notation

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

Multiplication

Year 6 Short and long multiplication as in Y5, and multiply decimals with up to 2d.p by a single digit.



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

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

This works well for multiplying money (£.p) and other measures.

Children will be able 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-digit number.**

Approximate,
Calculate,
Check it mate!

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 x 12 (as Y4 and Y5).**
- Multiply multi-digit numbers, up to 4-digit x 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.

Multiplication

Year 6 Multiplying fractions by whole numbers and fraction pairs of proper fractions including simplifying.

To multiply fractions:

Simplify the fractions if not in lowest terms.
Multiply the numerators of the fractions to get the new numerator.
Multiply the denominators of the fractions to get the new denominator.

Simplify the resulting fraction if possible.

Example: $\frac{1}{5} \times \frac{2}{3}$

$$\frac{1}{5} \times \frac{2}{3} = \frac{1 \times 2}{5 \times 3} = \frac{2}{15}$$

To multiply fractions, first we simplify the fractions if they are not in lowest terms. Then we multiply the numerators of the fractions to get the new numerator, and multiply the denominators of the fractions to get the new denominator. Simplify the resulting fraction if possible.

Note that multiplying fractions is frequently expressed using the word "of." For example, to find one-fifth of 10 pieces of candy, you would multiply 1/5 times 10, which equals 2. Study the example problems to see how to apply the rules for multiplying fractions.

$$\frac{1}{5} \times \frac{2}{3} = \frac{1 \times 2}{5 \times 3} = \frac{2}{15}$$

Hint: If you end up with a fraction you can simplify then cancel it down.

1. Find the product of $\frac{3}{4} \times \frac{2}{3}$:

Both fractions are in lowest terms, so we don't have to simplify.

$$\frac{3}{4} \times \frac{2}{3} = \frac{3 \times 2}{4 \times 3} = \frac{6}{12} = \frac{2 \times 3}{2 \times 2 \times 3} = \frac{1}{2}$$

Multiplication

Year 6 Finding percentages of amounts and quantities.

We use the percent symbol (%) to express percent. Percents are used everywhere in real life, so you'll need to understand them well. Here are three ways to write the same thing:
15% = 15/100 = 0.15

Fifteen percent is the same as the fraction 15/100 and the decimal 0.15. They all simply mean "fifteen out of a hundred." A percent can always be written as a decimal, and a decimal can be written as a percent, like this:

0.85 = 85%

We can find any percent of a given number by changing the percent to a decimal and multiplying. One hundred percent of a number is just the number itself. Two hundred percent of a number is twice that number.

100% of 50 -> 50
200% of 50 -> 2 x 50 = 100

Let's find 30 percent of 400:

First change 30% to a decimal by moving the decimal point 2 places to the left.

30% = 0.30

Then multiply.

0.30 x 400 = 120

30% of 400 is 120.

Mental Math
There's an easy way to find 10% of a number without multiplying. Just move the decimal point in the number left by one place. Let's try it with these numbers:

895 27 10,411

10% of 895 = 89.5
10% of 27 = 2.7
10% of 10,411 = 1,041.1

Finding a Percentage of a Quantity

To find a certain percentage of a given quantity, we multiply it by the corresponding fraction.

Example 7
Find 20% of 45.

Solution:

$$20\% \text{ of } 45 = 20\% \times 45$$
$$= \frac{20}{100} \times \frac{45}{1} \qquad \left\{ \frac{20}{100} \times \frac{45}{1} = \frac{1}{5} \times \frac{45}{1} = 9 \right\}$$
$$= 9$$

Division

Reception

Children will engage in a wide variety of songs and rhymes, games and activities.

In practical activities and through discussion they will begin to solve problems involving halving and sharing.

Share the sweets between two people.

'Half of the sweets for you and half of the sweets for me.'

There is no requirement for children to make written recording of their work but children can be encouraged to make their own jottings or drawings to show what they have done.

Division

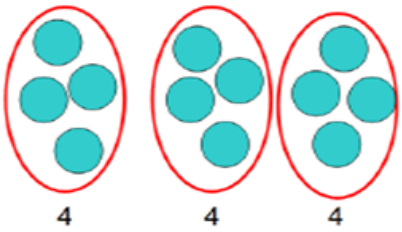
Year 1 Group and share small quantities

Using objects, diagrams and pictorial representations to solve one step problems involving **both grouping and sharing**.

How many groups of 4 can be made with 12 stars? = **3**

Grouping:

Sharing:



12 shared between 3 is 4

Example division problem in a familiar context:

There are 6 pupils on this table and there are 18 pieces of fruit to share between us. If we share them equally, how many will we each get?

Can they work it out and give a division statement… ?

"18 shared between 6 people gives you 3 each."

Pupils should :

- use lots of practical apparatus, arrays and picture representations
- Be taught to understand the difference between 'grouping' objects (How many groups of 2 can you make?) and 'sharing' (Share these sweets between 2 people)
- Be able to count in multiples of 2s, 5s and 10s.
- Find **half** of a group of objects by sharing into 2 equal groups.

Key Vocabulary: *share, share equally, one each, two each…, group, groups of, lots of, array*

Key number skills needed for division at Y1:

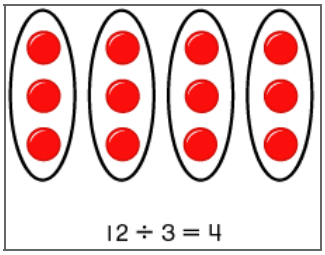
- Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations arrays with the support of the teacher
- Through grouping and sharing small quantities, pupils begin to understand, division, and finding simple fractions of objects, numbers and quantities.
- They make connections between arrays, number patterns, and counting in twos, fives and tens.

Division

Year 2 Group and share, using the ÷ and = sign

Use objects, arrays, diagrams and pictorial representations, and grouping on a number line.

Arrays:



This represents **12 ÷ 3, posed as** how many groups of 3 are in 12?

Pupils should also show that the same array can represent **12 ÷ 4 = 3** if grouped horizontally.

Know and understand sharing and grouping:

6 sweets shared between 2 people, how many do they get?

ooo ooo

Sharing

6 ÷ 2 = 3

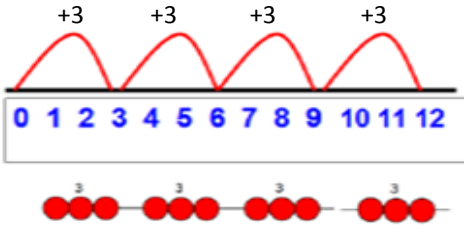
Grouping

There are 6 sweets, how many people can have 2 sweets each?

Children should be taught to recognise whether problems require sharing or grouping.

Grouping using a number line:

Group from zero in equal jumps of the divisor to find out 'how many groups of _ in _ ?'. Pupils could and using a bead string or practical apparatus to work out problems like 'A CD costs £3. How many CDs can I buy with £12?' **This is an important method to develop understanding of division as grouping.**



12 ÷ 3 = 4

Pose **12 ÷ 3** as '**How many groups of 3 are in 12?**'

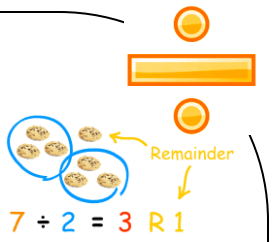
Key Vocabulary: *share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over*

Key number skills needed for division at Y2:

- Count in steps of 2, 3, and 5 from 0
- Recall and use multiplication and division facts for the **2, 5 and 10** multiplication tables, including recognising odd and even numbers.
- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the x, ÷ and = signs.
- Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.
- Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

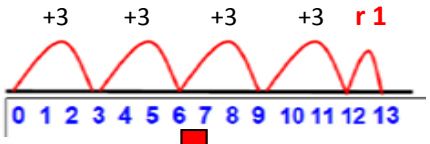
Division

Year 3 Divide 2-digit numbers by a single digit (where there is no remainder in the final answer)



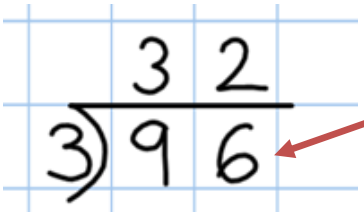
Grouping on a number line:

13 ÷ 3 = 4 r 1

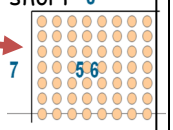


STEP 1: Children continue to work out unknown division facts by grouping on a number line from zero. They are also now taught the concept of **remainders,** as in the example. This should be introduced practically and with arrays, as well as being translated to a number line. Children should work towards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

Short division: Limit numbers to NO remainders in the answer OR carried (each digit must be a multiple of the divisor).



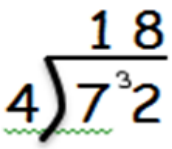
STEP 2: Once children are secure with division as grouping and demonstrate this using number lines, arrays etc., **short division** for larger 2-digit numbers should be introduced, initially with carefully selected examples requiring no calculating of remainders at all. Start by introducing the layout of short division by comparing it to an array.



Remind children of correct place value, that 96 is equal to 90 and 6, but in short division, pose:

- *How many 3's in 9? = 3, and record it above the **9 tens**.*
- *How many 3's in 6? = 2, and record it above the **6 units**.*

Short division: Limit numbers to NO remainders in the final answer, but with remainders occurring within the



STEP 3: Once children demonstrate a full understanding of remainders, and also the short division method taught, they can be taught how to use the method when remainders occur within the calculation (e.g. 96÷4), and be taught to 'carry' the remainder onto the next digit. **If needed, children should use the number line to work out individual division facts that occur which they are not yet able to recall mentally.**

Step 3 Only taught when pupils can calculate '**remainders**'.

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.

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***

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 × 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (30 × 2 = 60, so 60 ÷ 3 = 20 and 20 = 60 ÷ 3).
- 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.

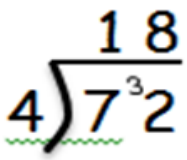
Division

Year 4 Divide up to 3-digit numbers by a single digit

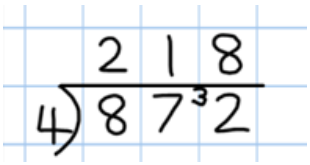
(without remainders initially)

Short division should only be taught once children have secured the skill of calculating 'remainders'.

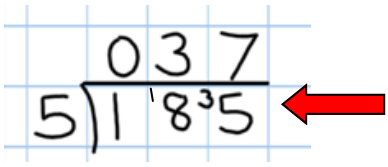
Continue to develop short division:



STEP 1: Pupils must be secure with the process of short division for dividing 2-digit numbers by a single digit (**those that do not result in a final remainder** —see steps in Y3), but must understand how to calculate remainders, using this to 'carry' remainders within the calculation process (see example).



STEP 2: Pupils move onto dividing numbers with up to **3-digits** by a single digit, however problems and calculations provided should **not result in a final answer with remainder** at this stage. Children who exceed this expectation may progress to Y5 level.



When the answer for the **first column** is zero (1 ÷ 5, as in example), children could initially write a zero above to acknowledge its place, and must always 'carry' the number (1) over to the next digit as a remainder.

Include money and measure contexts when confident.

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.

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***

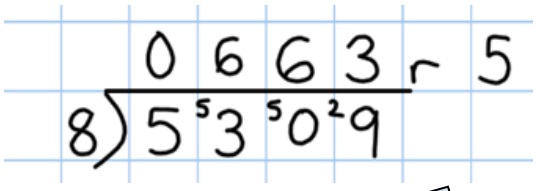
Key number skills needed for division at Y4:

- **Recall multiplication and division facts for all numbers up to 12 x 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 × 3 = 600 so 600 ÷ 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.

Division

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

Short division, including remainder answers:



Short division with remainders: Now that pupils are introduced to examples that give rise to remainder answers, division needs to have a real life problem solving context, where **pupils consider the meaning of the remainder and how to express it,** ie. as a fraction, a decimal, or as a rounded number or value , depending upon the context of the problem.

The answer to 5309 ÷ 8 could be expressed as 663 and five eighths, 663 r 5, as a decimal, or rounded as appropriate to the problem involved.

See Y6 for how to continue the short division to give a decimal answer for children who are confident.

Include money and measure contexts.

Approximate,
Calculate,
Check it mate!

If children are confident and accurate:

- Introduce **long division** for pupils who are ready to divide any number by a 2-digit number (e.g. 2678 ÷ 19). This is a Year 6 expectation—see

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:

- Recall multiplication and division facts for all numbers up to 12 x 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 ÷ 4 = 24 r 2 = $24\frac{1}{2}$ = 24.5 ≈ 25).
- Solve problems involving combinations of all four operations, including understanding of the equals sign, and including division for scaling by different fractions and problems involving simple rates.

Division

Year 5 Long division (Chunking)

```
          27
36 ) 972
   - 720      20x
     252
   - 252       7x
       0

Answer :      27
```

Find out 'How many 36s are in 972?' by subtracting 'chunks' of 36, until zero is reached (or until there is a remainder). Teach pupils to write a '**useful list**' first at the side that will help them decide what chunks to use, e.g.:

'Useful' list: 1x = 36
10x = 360
100x = 3600

Introduce the method in a simple way by limiting the choice of chunks to 'Can we use

10 lots? Can use 100 lots? As children become confident with the process, encourage more efficient chunks to get to the answer more quickly (e.g. 20x, 5x), and expand on their 'useful' lists.

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

Approximate,
Calculate,
Check it mate!

432 ÷ 15 becomes

			2	8	r 12
1	5	4	3	2	
		3	0	0	
		1	3	2	
		1	2	0	
			1	2	

Answer: 28 remainder 12

432 ÷ 15 becomes

			2	8	
1	5	4	3	2	
		3	0	0	15×20
		1	3	2	
		1	2	0	15×8
			1	2	

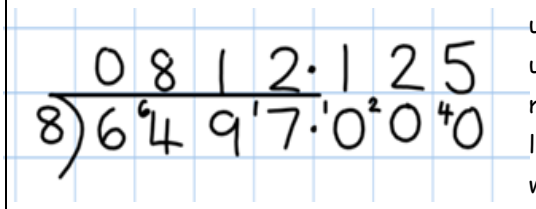
$\frac{12}{15} = \frac{4}{5}$

Answer: $28\frac{4}{5}$

Division

Year 6 Divide at least 4 digits by both single-digit and 2-digit numbers (including decimal numbers and quantities)

Short division, for dividing by a single digit: e.g. 6497 ÷ 8



Short division with remainders: Pupils should continue to use this method, but with numbers to at least 4 digits, and understand how to express remainders as fractions, decimals, whole number remainders, or rounded numbers. Real life problem solving contexts need to be the starting point, where pupils have to consider the most appropriate way to express the remainder.

Calculating a decimal remainder: In this example, rather than expressing the remainder as **r 1**, a decimal point is added after the units because there is still a remainder, and the one remainder is carried onto zeros after the decimal point (to show there was no decimal value in the original number). Keep dividing to an appropriate degree of accuracy for the problem being solved.

Long division for dividing by a 2-digit number:

432 ÷ 15 becomes

```
        2  8 · 8
    ┌──────────
15  │ 4  3  2 · 0
      3  0
    ──────
      1  3  2
      1  2  0
    ──────────
         1  2  0
         1  2  0
    ──────────
               0
```

Answer: 28·8

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.

Division

Year 6 Divide whole numbers by proper fractions.

To divide any number by a fraction:

Multiply the number by the reciprocal of the fraction.
Simplify the resulting fraction if possible.
Check your answer: Multiply the result you got by the divisor and be sure it equals the original dividend.

You can only divide by non-zero fractions.

Dividing by fractions is just like multiplying fractions, except for one additional step.

To divide any number by a fraction:

First step: Find the reciprocal of the fraction.

Second step: Multiply the number by the reciprocal of the fraction.

Third step: Simplify the resulting fraction if possible.

Fourth step: Check your answer: Multiply the result you got by the divisor and be sure it equals the original dividend.

Note that you can only divide by non-zero fractions.

Example 1

$$3 \div \frac{1}{4} = 3 \times 4 = 12$$

Example 2

$$3 \div \frac{3}{4} = 3 \times \frac{4}{3} = \frac{3 \times 4}{3} = \frac{12}{3} = 4$$