Aldersbrook Primary School
Calculation Policy for Mathematics
Guidance and Notes
September 2024

Dear Parents and Carers,

This document is intended to aid your understanding of the way your child will be taught to calculate, in order to help you support your child more effectively with calculations at home.

This policy is in line with the **National Curriculum 2014**, and gives an outline of the methods your child will be learning to add, subtract, multiply and divide with.

It is important to keep in mind that if your child is working below age stage expectations, they may be working at the level of year groups below their own. If your child is working above age stage expectations, then they will be given the opportunity to show mastery of their understanding within their year group.

We welcome and encourage you to ask your child's class teacher if any questions arise about this, or there are any methods you are unsure about, so that we can work together to help your child succeed.

Mrs Kamali
Mathematics Leader

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. Pupils will be taught written methods of calculations according to the expectations of the curriculum for their year group. The emphasis is on understanding the fluency of Maths as well as the method of calculation. Therefore, some children may work below age stage expectation of their year group to suit their needs, demonstrating secure understanding before moving on. Pupils who grasp concepts rapidly and are working above age stage expectations will be challenged through offered rich and sophisticated problems to demonstrate their mastery of their understanding within their year group.

Providing a context for calculations

It is vital 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:

- Can I do it **mentally**?
- Can I do it with a **jotting**?
- Do I need a **written method**?

To work out a tricky calculation:

Estimate, Calculate and Check it!

ADDITION

Year 1 Add with numbers up to 20

Use number tracks, practical methods and numbered number lines to add by counting on in ones, and using the addition (+) and equals (=) signs.

Encourage children to start with the larger number and count on.

Examples: 8 + 3 = □ 4 + 15 = □ 3 + 5 + 1 = □ □ + □ =6

8 + 5 =

Use concrete material such as, bead strings or bead bars, to illustrate addition including bridging through ten by counting on 2 then counting on 3.

Key number skills needed at Y1:

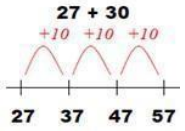
- Read and write numbers to 100 in numerals, incl. 1—20 in words.
- Count in multiples of 1, 2, 5 and 10.
- Recall bonds to 10 and 20, and addition facts within 20.
- Count to and across 100.
- Solve simple 1-step problems involving addition, using objects, number lines and pictorial representations.

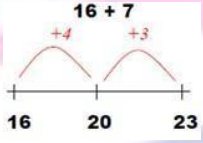
Key Vocabulary:

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

Year 2 Add with 2-digit numbers

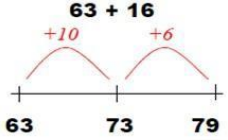
Add 2-digit numbers and **tens**. Add 2-digit numbers and **ones.**

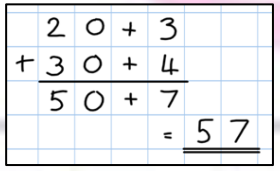




Add pairs of 2-digit numbers, moving to the **partitioned** column method when secure adding tens and ones:

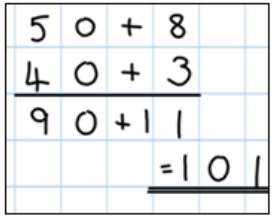
23 + 34 =





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

58 + 43 =



STEP 2: 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).

Key number skills needed 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.

Key Vocabulary:

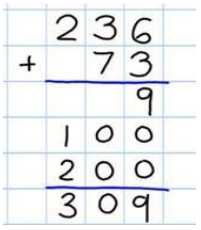
add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, ones, partition, addition, column, tens boundary

ADDITION

Year 3 Add numbers with up to 3 digits

Introduce the **expanded column method**, only introducing examples that cross tens boundary when ready.

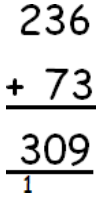
Always add the **ones first**.



In order to carry out this method of addition:

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

Move to the **compact column addition** method, with regrouping when very secured with expanded column addition method.



- Add ones column first.
- Remind pupils the actual value is '**three tens** add **seven tens'**, not 'three add seven', which equals **ten** tens.
- 'Regroup 1 **hundred'** (Not carry the 1) digit underneath the bottom line.

Key number skills needed 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, and ones.)
- Continue to practise a wide range of mental addition strategies, i.e. number bonds, adding the nearest multiple of 10, 100, 1000 and adjusting, using near doubles, partitioning and regrouping.

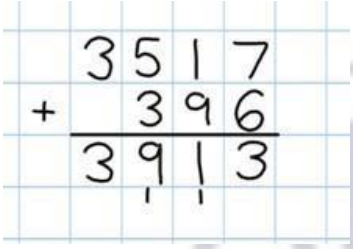
Key Vocabulary:

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, regroup, expanded, compact***

Year 4 Add numbers with up to 4 digits

Using the expanded column method, adding ones first, and 'regrouping' numbers underneath the calculation. Also include money, measures and decimal with different numbers of decimal places.

3517 + 369 =



- Reinforce correct place value by reminding them the actual value is 5 hundreds add 3 hundreds, not 5 add 3, for example.
- Carry digits underneath the bottom line.
- Add **ones** column first.

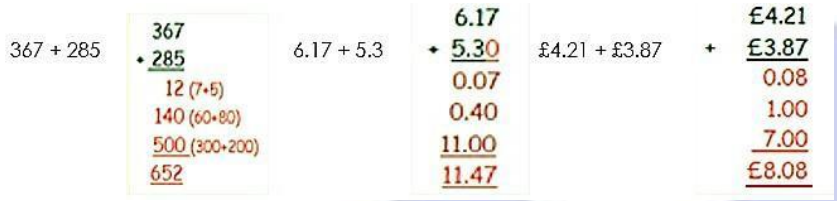
Key number skills needed at Y4:

- 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, i.e. number bonds, add the nearest multiple of 10, 100, 1000 and adjust, use near doubles, partitioning and

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, regroup, expanded, compact, ***thousands, hundreds, digits, inverse, decimal point***

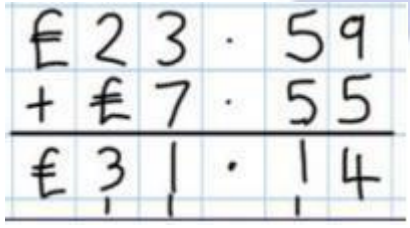
ADDITION



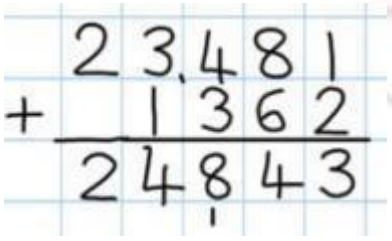
regrouping. • Add numbers with up to 4 digits using the formal written method of column addition
- Solve 2-step problems in contexts, deciding which operations and methods to use and why.
- Estimate and use inverse operations to check answers to a calculation.

Year 5 Add numbers with more than 4 digits

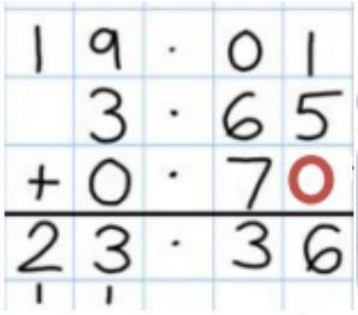
Include money, measures and decimals with different numbers of decimal places.



- 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.
- Use compact column method



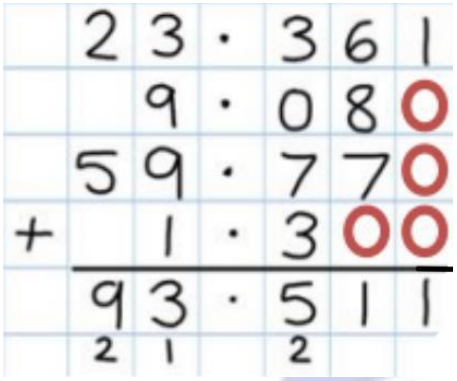
- Pupils should understand the place value of **tenths** and **hundredths.**
- Empty decimal places can be filled with zero to show the place value holder in each column.
- Reinforce place value, say `6 tenths add 7 tenths.

Key number skills needed at Y5:
- Add numbers mentally with increasingly large numbers, using and practising a range of mental strategies i.e. 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

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, regroup, expanded, compact, vertical, thousands, hundreds, digits, inverse & **decimal places, decimal point, tenths, hundredths, thousandths**

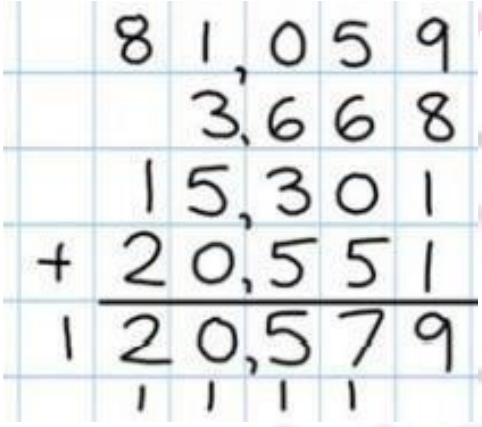
ADDITION

Year 6 Add several numbers of increasing complexity



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



- Adding several numbers with more than 4 digits.

Key number skills needed 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.

Key Vocabulary:

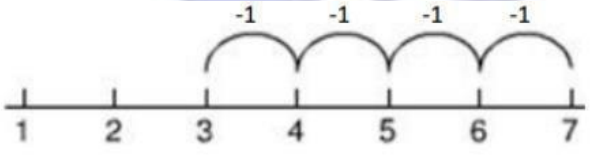
add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, ones, partition, plus, addition, column, tens boundary, hundreds boundary, increase, regroup, expanded, compact, vertical, thousands, hundreds, digits, inverse & **decimal places, decimal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

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:

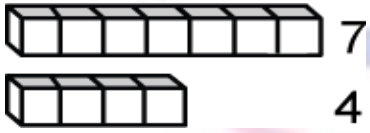
- Subtract by taking away - **Count back** on a numbered number line to take away, starting from the larger number:



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

7 – 4 = 3

- Find the '**difference between', including 'how many more' and 'how many less' is** introduced practically by comparing numbers of objects or familiar contexts.



'Seven is 3 more than 4' or 'I am 2 years older than my sibling'

Begin to read, write and interpret number sentences with - and = symbols

Mental subtraction

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

Key number skills needed 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 (i.e. bead string, objects, cubes) and pictures, and missing number problems.
- Read and write numbers from 0 to 20 in numerals and words.

Key vocabulary: equal to, take, take away, less, minus, subtract, leaves, difference between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is_?

SUBTRACTION

Year 2 Subtract with 2-digit numbers

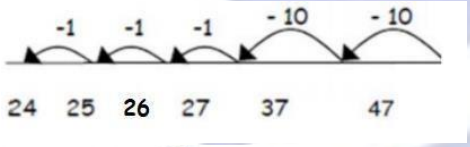
Subtract on a number line by counting back, aiming to develop mental subtraction skills.

This strategy will be used for:

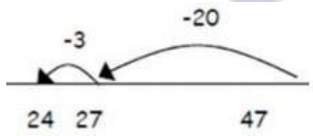
- 2-digit numbers subtract ones (by taking away / counting back) e.g. 36—7
- 2-digit numbers subtract tens (by taking away / counting back) e. g. 48— 30
- Subtracting pairs of 2-digit numbers (see below :)

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

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

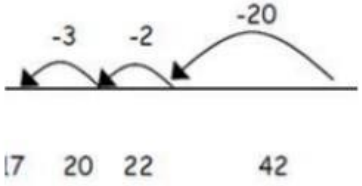


Move towards more efficient jumps back, as below:



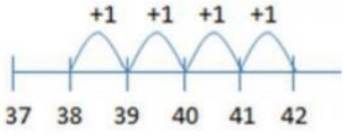
Combine methods with use of a **hundred square** to reinforce understanding of number value and order.

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.** They need to be clear about the relationship between addition and subtraction.



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

Key number skills needed 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.

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**

SUBTRACTION

Year 3 Subtract with 2 and 3-digit numbers

Introduce partitioned column subtraction method.

89 - 35 = 54

80 + 9
- 30 + 5
50 + 4

STEP 1: Introduce this method with examples where no regrouping is required.

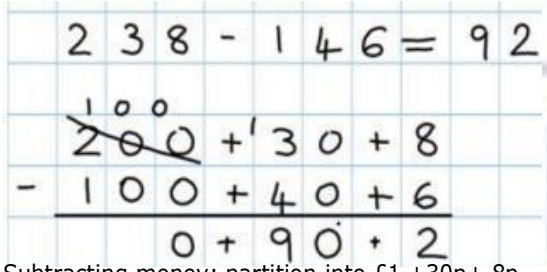
72 - 47

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

60 70 + 12
- 40 + 7
20 + 5 = 25

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

STEP 2: Introduce 'regrouping' through practical subtractions. Make the larger number with Base 10, then subtract 27 from it.



Subtracting money: partition into £1 +30p+ 8p

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

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.

Key number skills needed 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.

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, **regroup**, **redistribution**, **decrease, hundreds, value, digit**

SUBTRACTION

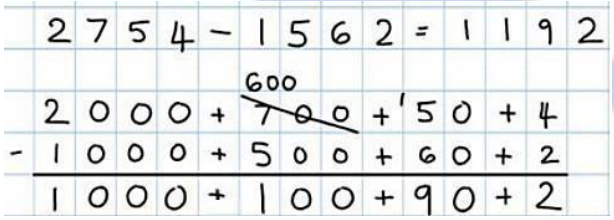
102-89, 131—79, or calculating change from £1 etc.).

• Start at the smaller number and count on in tens first, then count on in ones to find the rest of the difference:

Year 4 Subtract with up to 4-digit numbers

Partitioned column subtraction with 'regrouping' (decomposition):

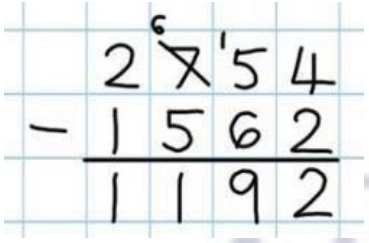
As introduced in Y3, but moving towards more complex numbers and values. Use **place value counters** to reinforce 'regrouping'.



Subtract money: partition into £20 +£7 +50p + 4p For example.

Compact column subtraction

To introduce the compact method, ask children to perform a subtraction calculation with the familiar partitioned column method then display the compact version beside it. Ask pupils to consider how it relates to the method they know, look at the relationship – similar and difference, to develop an understanding of it.



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

Mental Strategy

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.

Key number skills needed 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.

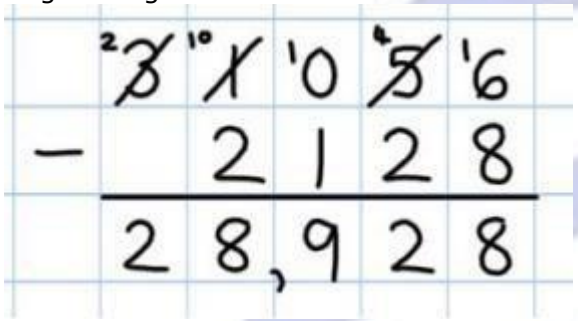
Key vocabulary: equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is_? difference, count on, strategy, partition, tens, ones, regroup, redistribution, decrease, hundreds, value, digit, **inverse**

SUBTRACTION

Year 5 Subtract with at least 4-digit numbers

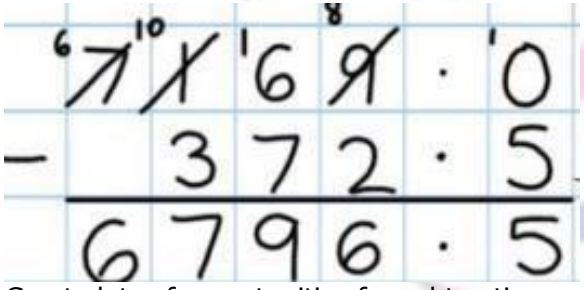
Including money, measures and decimals.

Compact column subtraction with regrouping. Subtracting with larger integers.



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.

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.

Pupils to check answer with the **inverse.**

Continue to use the language of **place value** to ensure understanding.

Key number skills needed at Y5:

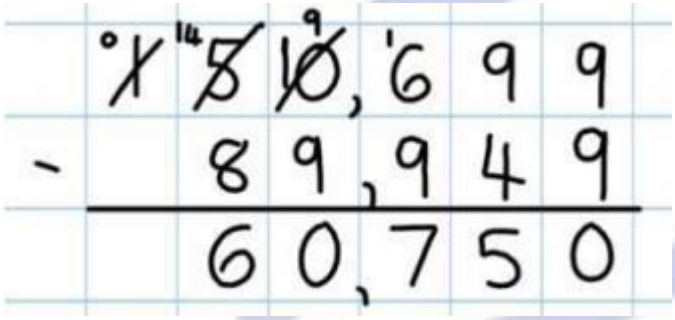
- Subtract numbers mentally with increasingly large numbers.
- Use rounding and estimation to check answers to calculations and determine, in a range of contexts, levels of accuracy.
- Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.
- 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.

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, regroup, redistribution, decrease, hundreds, value, digit, inverse, **tenths, hundredths, decimal point, decimal**

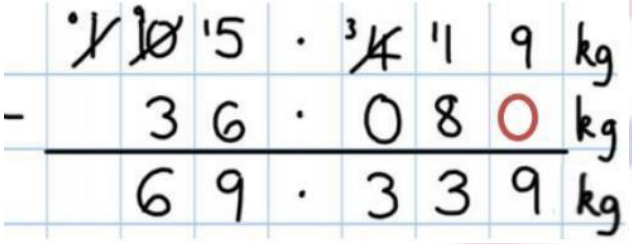
SUBTRACTION

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.

Mental Strategies
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.

Key number skills needed 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.

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, regroup, redistribution, decrease, hundreds, value, digit, inverse, **tenths, hundredths, decimal point, decimal**

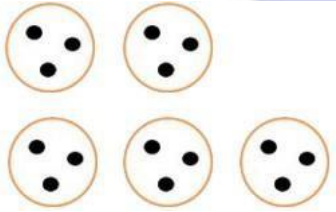
MULTIPLICATION

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

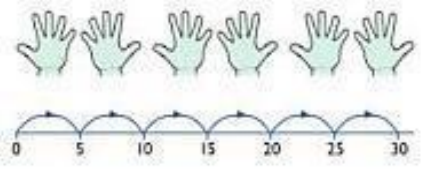
How many socks are there?

2 + 2 + 2 = 6

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



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



5 + 5 + 5 + 5 + 5 + 5 = 30
5 × 6 = 30
5 multiplied by 6
6 groups of 5
6 hops of 5

4 groups of 2p
2p multiplied by 4
2p x 4 = 8p

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.

Key number skills needed 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

Key vocabulary:

groups of, lots of, times, array, altogether, multiply, count

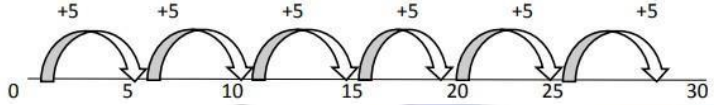
MULTIPLICATION

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

Repeated addition:

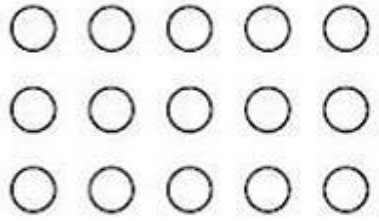
There are 3 groups of 10 crayons, how many crayons altogether?
10 + 10 + 10 = 30 so 3 groups of 10 is the same as 3 times 10 = 3 x 10 = 30 and 10 x 3 = 30

Use a marked or an empty number line as appropriate 6 x 5 = 30



Make the link to repeated addition.

Use arrays:



5 x 3 = 15

3 x 5 = 15

Use arrays to help teach children to understand the commutative law of multiplication. Give example such as solving missing number problems such as:

Key number skills needed 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.

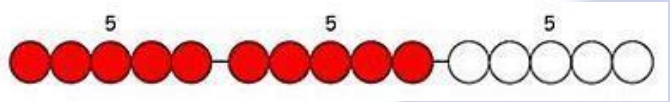
Key vocabulary:

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…**

MULTIPLICATION

Use practical apparatus:

5 x 3 = 5 + 5 + 5



Use mental recall:

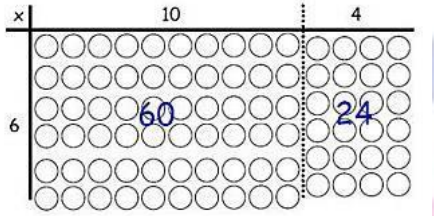
Children should begin to recall multiplication facts for 2, 5 and 10 times tables through practice in counting and understanding of the operation.

Year 3 Multiply 2-digits by a single digit number

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

Link the layout of the grid to an array initially:

14 x 6 = 84



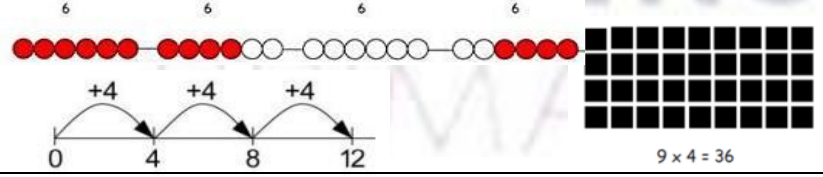
23 x 8 = 184

X	20	3
8	160	24

To do this, children must be able to:

- Partition numbers into tens and ones
- Multiply multiples of ten by a single digit (e.g. 20 x 8) 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:



Key number skills needed at Y3:

- **R**ecall 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 = 4 × 5 × 12 = 20 × 12 = 240) and for missing number problems x 5 = 20, 3 x = 18, x = 32

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, multiple, product, tens, ones, value**

MULTIPLICATION

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

Developing the grid method:
136 x 5 = 680

X	100	30	6
5	500	150	30

500
150
+ 30
680

Encourage column addition to add accurately.

Move onto expanded short multiplication, if and when children are confident and accurate multiplying 2 and 3-digit numbers by a single digit this way.

167 x 8 = 602
100 60 7

```
      X 8
    5 6  (7 x 8)
+ 4 8 0  (60 x 8)
  8 0 0  (100 x 8)
  1 3 3 6
  1
```

Compare a grid method calculation to the expanded short multiplication, to show how steps are related.

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 1 0 = 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 **(Multiplication Tables Check)**

Key number skills needed 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)

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, multiple, product, tens, ones, value, **set of, inverse**

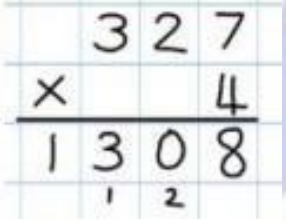
MULTIPLICATION

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

Introducing column multiplication:

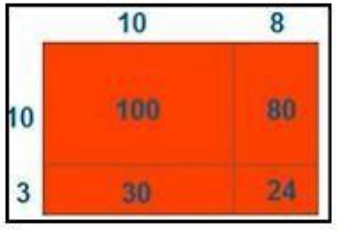
- Introduce expanded short multiplication to short multiplication.
- Children need to be taught to estimate first, e.g. for 72 x 38, they will use rounding: 72 x 38 is estimate to 70 x 40 = 2800, and use the estimation to check the reasonableness of their answer against.

Short multiplication for multiplying by a single digit:



Compare an expanded short method to a short multiplication method, to see how the steps are related, but notice how there are less steps involved in the column method.

Introduce expanded long multiplication for multiplying 2 digits:



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

Move onto **expanded long multiplication method:**

Key number skills needed at Y5:

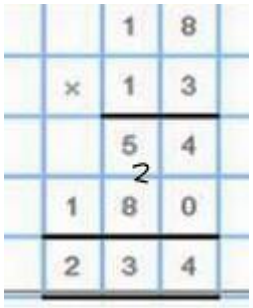
- Identify multiples and factors, using knowledge of multiplication tables to 12x12.
- Solve problems where larger numbers are decomposed into their factors.
- Multiply and divide integers and decimals by 10, 100 and 1000.
- Recognise and use square and cube numbers and their notation.
- Solve problems involving combinations of operations, choosing and using calculations and methods appropriately.

Key vocabulary:

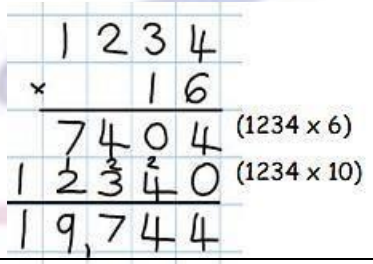
groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, _times as big as, once, twice, three times..., partition, grid method, total, multiple, product, set of, inverse, **square, factor, integer, decimal, short/long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

MULTIPLICATION

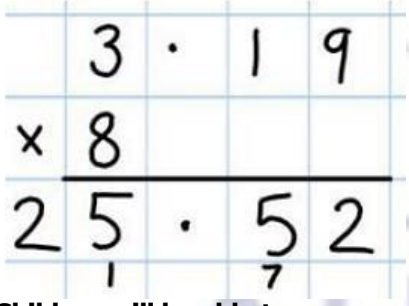
If children are confident and have a secure understanding of place value when multiplying 2-digits by 2. Then move onto **formal long multiplication.**



Move onto more complex numbers:



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



Line up the decimal points In the question and answer.

Remind children that the single digit belongs in the ones column (3 x8)

This works well for multiplying money 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.

Key number skills needed 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.

Key vocabulary:

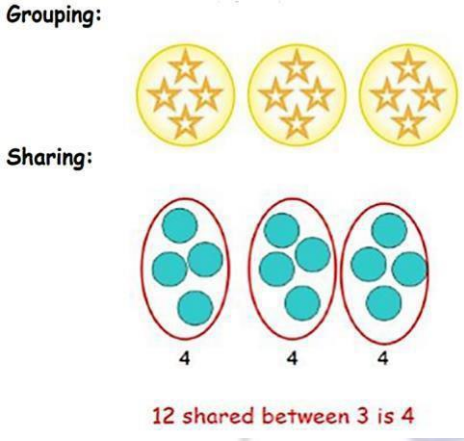
groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, array, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times... partition, grid method, total, multiple, product, inverse, square, factor, integer, decimal, short / long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

DIVISION

Year 1 Group and share small quantities

Using objects, diagrams and pictorial representation to solve problems involving both grouping and sharing.

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



Example division problem in a meaningful 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 number skills needed 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.

Key vocabulary:

share, share equally, one each, two each…, group, groups of, lots of, array

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

Children will use a range of vocabulary to describe division and use practical resources, pictures, diagrams and the ÷ sign to record, using multiples that they know.

Sharing and grouping:

We have 30 crayons and share them equally between three pots. How many crayons in each pot?
(Sharing) 30 ÷ 3 = 10
30 shared between 3 is 10.

We have 30 crayons and put ten crayons in each pot.
How many pots do we need?
(Grouping) 30 ÷ 10 = 3
30 grouped in 10s is 3.

Key number skills needed 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

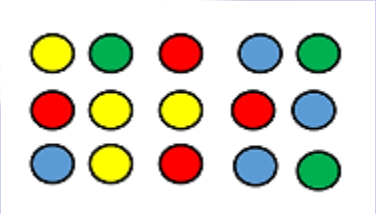
Key vocabulary:

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

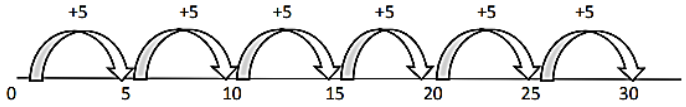
DIVISION

Encourage children to draw <u>arrays</u> to support division:

How many groups of 3 in 15?
How many groups of 5 in 15?
15 shared between 3 people is…?
15 shared between 5 people is…?
15 divided by 5 = 3
15 divided by 3 = 5
15 ÷ 5 = 3 15 ÷ 3= 5



When children are ready, record using an **empty number line** to count forwards: 30 ÷ 5 = 6 , 'How many jumps of five make thirty?'



Also jump back to make the link with *repeated subtraction*.

multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

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

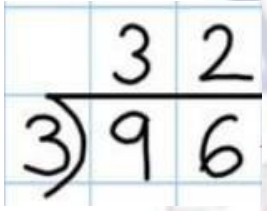
Introduce the formal layout using multiplication/division facts that the children know: e.g. **Step 1 - 24 ÷ 3 = 8**

```
    8
3 ) 24
    24
     0
```

8 x 3

Write out known multiplication facts to make link to division.

Step 2- Short division: Limit numbers to NO remainders in the answer **OR** carried – each digit must be a multiple of the divisor.



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 ones.**

They could first be asked to use a number line to work this out, highlighting the need for a quicker, more efficient method.

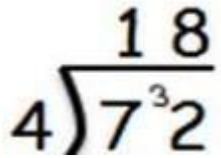
Key number skills needed at Y3:

- **R**ecall 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

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

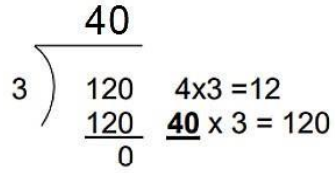
DIVISION

Step 3 – Short division: Limit numbers to NO remainders in the final answer, but with remainders occurring within the calculation to be carried to the next digit.



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.

Step 4 - Children should solve calculations involving divisions they can derive from known facts: **120 ÷ 3 = 40**



"I know 12÷3=4, so 20÷3=40."

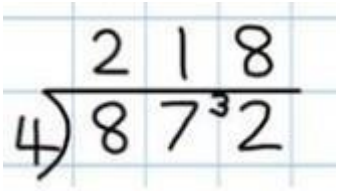
example, using multiplication and division facts (e.g. using 3 × 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (30 × 2 = 60, so 60 ÷ 3 = 20 and 20 = 60 ÷ 3).

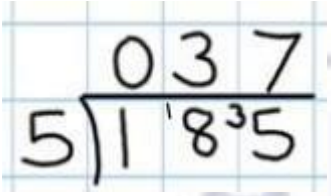
- Pupils develop reliable written methods for division, starting with calculations of 2-digit numbers by 1-digit numbers and progressing to the formal written method of short division.

<u>Year 4</u> Divide up to 3-digit numbers by a single digit (without remainders initially)

Continue to develop short division step 3 in Y3.

Move onto dividing with up to 3 digits by a single digit, without remainder in the final answer.





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.

Key number skills needed 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

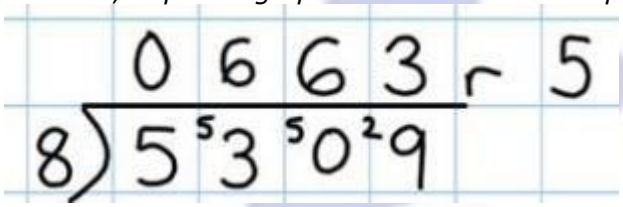
Key vocabulary:

share, share equally, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple**, divisible by, factor**

DIVISION

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

Short division, including remainder answers: 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, i.*e. as a fraction, a decimal, or as a rounded number or value, depending upon the context of the problem.*



Include money and measure contexts.

The above answer can be expressed as the following:

- A fraction $663\frac{5}{8}$
- A decimal **663.625**
- A rounded number 664

If children are confident and accurate:

• Introduce the **long division method** 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 Y6.

Key number skills needed 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 = 241/2 = 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.

Key vocabulary:

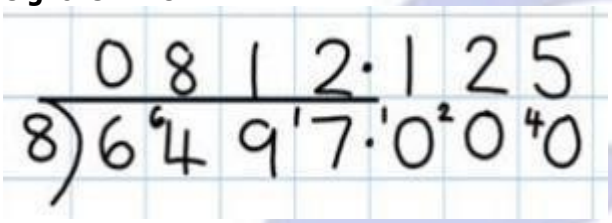
share, share equally, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple, divisible by, factor, **quotient, prime number, prime factors, composite number (non-prime)**

DIVISION

<u>Year 6</u> 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

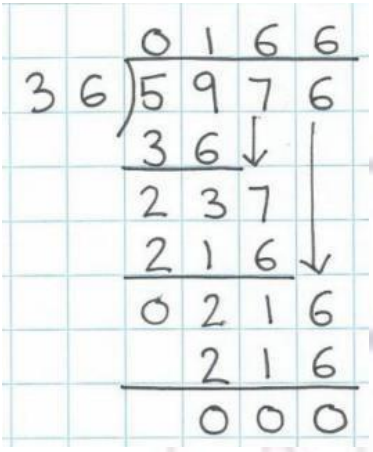


Short division with remainders: Pupils should continue to use this method, but with numbers to **at least 4 digits**, and understand how to express <u>remainders as fractions, decimals</u>, <u>whole number remainders, or rounded numbers</u>. Real life problem solving contexts need to be the starting 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 ones 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.

Introducing long division, for dividing by a 2-digit:

e.g. 4972 ÷ 36



- Must be aligned in place value for subtracting
- Pupils may need to use 'regrouping' skills when subtracting.
- Where **remainders** occur, pupils should express them as fractions, decimals or use rounding, depending upon the problem.

Key number skills needed 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.

Key vocabulary:

share, share equally, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple, divisible by, factor, quotient, prime number, prime factors, composite number (non-prime), **common factor**

	432 ÷ 15 = 28 r12 0 2 8 r12 15) 4 3 2 - 3 0 0 (20 x 15) 1 3 2 1 2 0 (8 x 15) 1 2 432 ÷ 15 = 28 12/15 or 4/5 0 2 8 r12 15) 4 3 2 3 0 ↓ 1 3 2 - 1 2 0 1 2 432 ÷ 15 = 28.8 2 8. 8 15) 4 3 2. 0 3 0 ↓ 1 3 2 - 1 2 0 ↓ 1 2 0	**NB Only teach this method when children are completely secure with the previous method.** The remainder can be expressed as a fraction (the remainder over the divisor). Encourage chn to express as a decimal if they know the equivalents.	