



How we teach calculations

Calculation Policy For Mathematics

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. We start every lesson with a problem, making this a priority within our learning, ensuring that all children are exposed to problem solving and reasoning discussions and tasks.

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. Children will be given the opportunity to develop their mental skills with focused daily sessions.

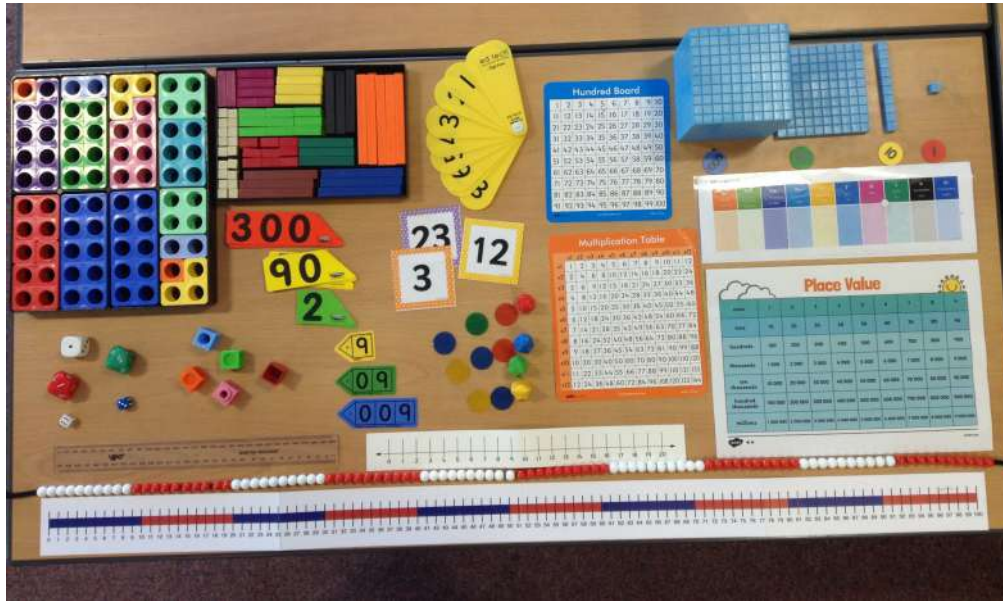


Can I do it in my head
with a mental strategy?

Can I use some jottings
to help me?

Should I use a written
method to work it out?

Representations



When making progress through written calculation methods children also progress through a range of resources to support their learning. This practical process will embed the children's learning and provide them with a clear understanding of calculating.

Number line – used early in Key Stage 1 when children are beginning addition and subtraction. This will develop in KS2 to support children with their understanding of negative numbers.

100 square – used as children begin calculating using 2 digit numbers.

Multiplication square - used to support learning of counting in multiples and times tables including the inverse.

Bead strings – used for embedding number bonds and simple addition.

Multi-link – used as an early practical resources when solving all four calculations.

Numicon - can be used to represent addition and multiplication as repeated addition.

Arrow cards – used for partitioning 2 and 3 digit numbers, supports understanding of place value.

Base 10 – used as an abstract representation of a hundred, ten and a one. Children to use these for more partitioning and beginning column method.

Place Value counters – used to support column addition, subtraction and division. Children can use these on a place value grid to work alongside formal written methods. Using these to 'regroup' supporting the children when 'carrying' 10 using a formal written method.

Cuisenaire - used as abstract representation of any given numbers. Children use these to support calculations and problem solving.

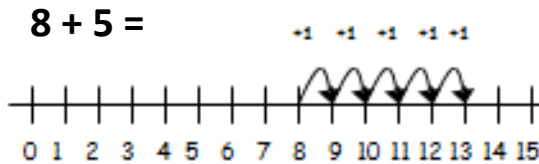
Bar modelling - an approach used to help children represent problems in order to choose the right calculation to solve them. (Please see separate guidance on how to use—[https://www.yesatrichmondschool.net/Portals/0/The Ultimate Guide To Bar Modelling.pdf](https://www.yesatrichmondschool.net/Portals/0/The%20Ultimate%20Guide%20To%20Bar%20Modelling.pdf))

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.



They select the biggest number first i.e. 8 and count on the smaller number in ones.

Children should be familiar with a range of number lines including increasing in 1's, 2's, 5's and 10's.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

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.
- Interpret addition number sentences and solve missing box problems, using concrete objects and number line addition to solve them: $8 + 3 = \square$ $15 + 4 = \square$ $5 + 3 + 1 = \square$ $\square + \square = 6$.

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.

Different orientations of the 100 square help children transfer their skills and understanding between ?

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.

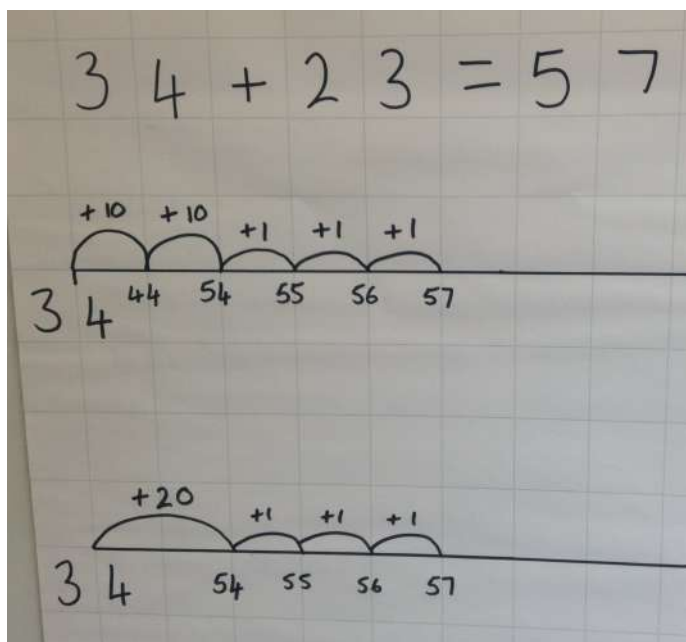
Solve simple 1-step problems involving addition, using objects, number lines and pictorial representations.

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.

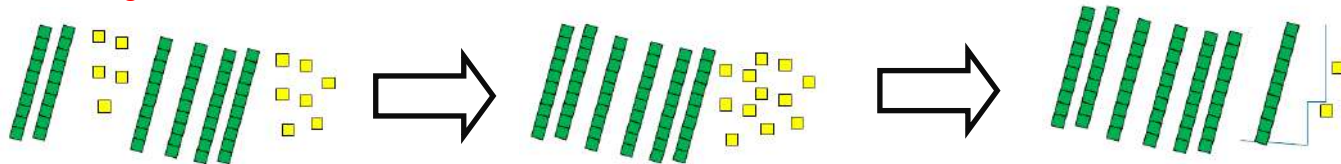


Use **empty number lines**, concrete equipment, hundred squares etc. to build confidence and fluency in mental addition skills.

First counting on in tens and ones.

Counting on in multiples of 10.

Partitioning



$$\begin{array}{r}
 25 + 47 = \\
 20 + 40 = 60 \\
 5 + 7 = 12 \\
 \hline
 72
 \end{array}$$

Children should partition tens and ones and recombine as shown. This will support children when making the transition to formal written

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

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.

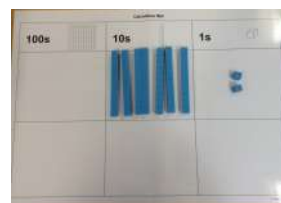
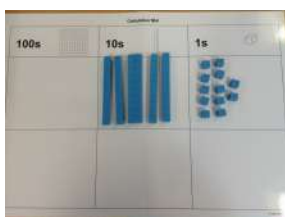
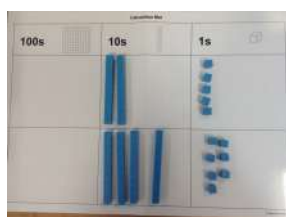
Addition

Year 3

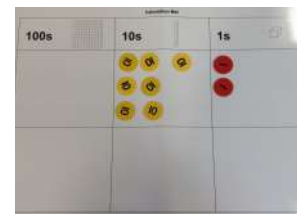
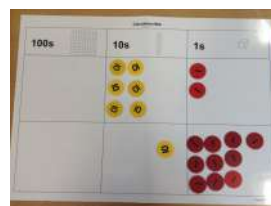
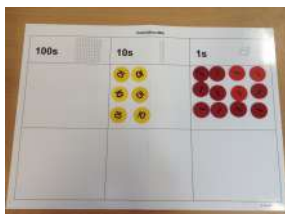
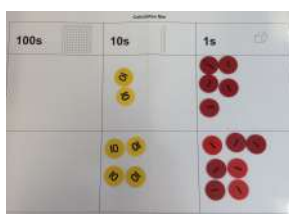
Add numbers with up to 3-digits

To ensure the statutory final written method is grounded in understanding, this stage connects the practical equipment to the formal written method using a similar and transferable layout.

Begin calculating in the right hand 'ones' column.



When the tens barriers is crossed in the 'ones' then **regrouping** takes place.



$$\begin{array}{r} 25 \\ + 47 \\ \hline 72 \end{array}$$

In formal written methods we show that a regroup has taken place by **regrouping 10** to the **doorstep**.

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, exchange

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.

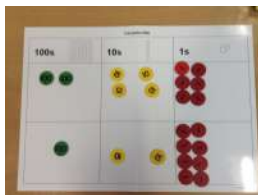
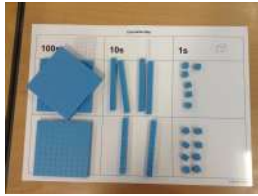
Recognise place value of each digit in 3-digit numbers (hundreds, tens, ones).

Addition

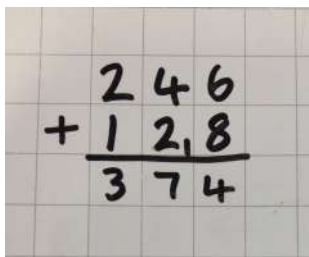
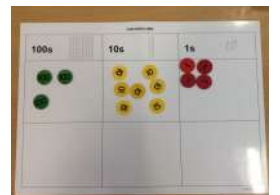
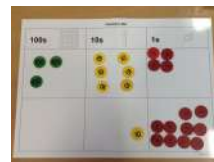
Year 4

Add numbers with up to 4 digits

In this method, recording is reduced further. Regrouped digits are on the doorstep using the words 'carry ten' or 'carry one hundred' etc, according to the value of the digit.



When the tens barrier is crossed in the 'ones' then **regrouping** takes place.



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

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, exchange, regroup, 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 up to 4 digits

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

$$\begin{array}{r} \text{£} \cdot \text{p} \\ 23.59 \\ + 17.55 \\ \hline 41.14 \end{array}$$

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

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

$$\begin{array}{r} 19.01 \\ 3.65 \\ + 10.70 \\ \hline 23.36 \end{array}$$

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

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, ones, partition, plus, addition, column, tens boundary, hundreds boundary, increase, exchange, regroup. expanded, compact, vertical, thousands, hundreds, digits, inverse & decimal places, decimal point, tenths, hundredths, thousandths.

Key skills for addition at Y5:

Add numbers mentally with increasingly large numbers, using and practising a range of mental strategies ie. add the nearest multiple of 10, 100, 1000 and adjust; use near doubles, inverse, partitioning and re-combining using number bonds.

Use rounding to check answers and accuracy.

Solve multi-step problems in contexts, deciding which operations and methods to use and why.

Read, write, order and compare numbers to at least 1 million and determine the value of each digit.

Round any number up to 1, 000, 000 to the nearest 10, 100, 1000, 10,000 and 100,000.

Add numbers with more than 4 digits using formal written method of columnar addition.

Addition

Year 6

Add several numbers of increasing complexity

A handwritten addition problem on a grid background. The numbers are aligned by their decimal points. The first number is 23.361, the second is 9.080, the third is 59.770, and the fourth is 21.300. A horizontal line is drawn under the fourth number, and the sum 93.511 is written below it.

$$\begin{array}{r} 23.361 \\ 9.080 \\ 59.770 \\ 21.300 \\ \hline 93.511 \end{array}$$

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.
- A 'zero' can be used to visually support efficient calculating when working with numbers with different decimal places.

A handwritten addition problem on a grid background. The numbers are aligned by their decimal points. The numbers are 81,059, 3,668, 15,301, 2,055.1, and 120,579. A horizontal line is drawn under the fourth number, and the sum 120,579 is written below it.

$$\begin{array}{r} 81,059 \\ 3,668 \\ 15,301 \\ + 2,055.1 \\ \hline 120,579 \end{array}$$

Adding several numbers with more than 4 digits.

Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, ones, partition, plus, addition, column, tens boundary, hundreds boundary, increase, exchange, regroup, 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.

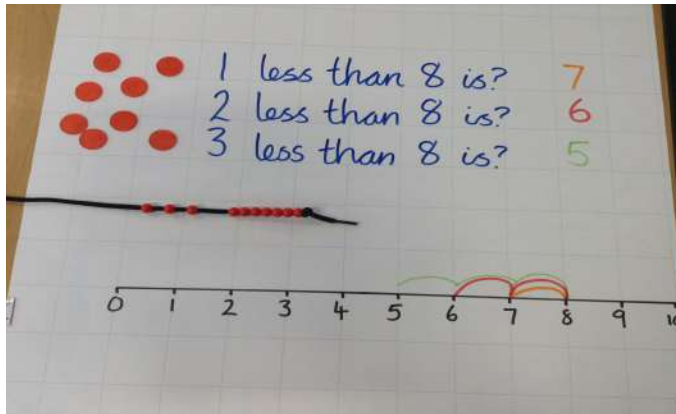
Pupils understand how to add mentally with larger numbers and calculations of increasing complexity.

Subtraction

Year 1

Subtract from numbers up to 20

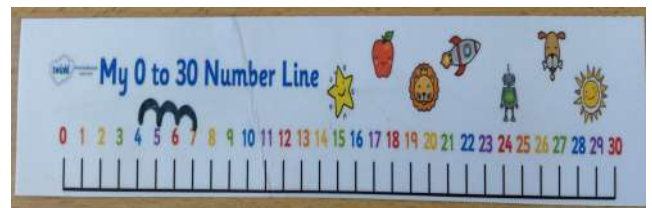
Children consolidate understanding of subtraction practically, showing subtraction on bead strings, using cubes etc. and in familiar contexts, and are introduced to more formal recording using number lines as below:



Finding the difference

The labelled number line

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



The **difference** between 7 and 4 is 3.

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.

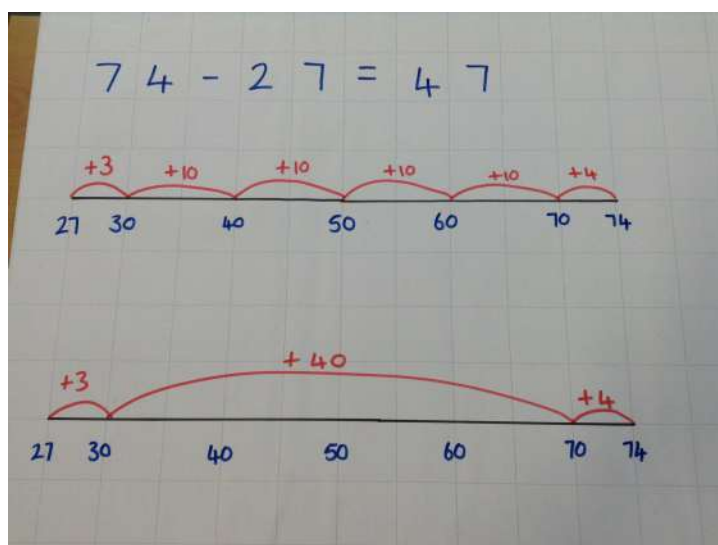
Read and write numbers from 0 to 20 in numerals and words.

Subtraction

Year 2

Subtract with 2-digit numbers

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



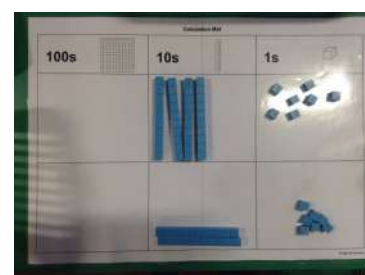
The 'jumps' should be added, either mentally or with jottings according to confidence, beginning with the largest number e.g. $40 + 4 + 3 =$

The steps can also be recorded by **counting on** from the smaller to the larger number to find the difference.



Only create the starting number from which you are subtracting.

If you have insufficient ones, exchange one 'ten' for ten 'ones'



Drag down the number you are subtracting. The remainder in the top is the answer

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.

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.

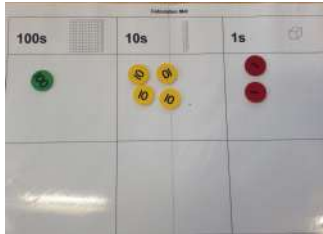
Subtraction

Year 3

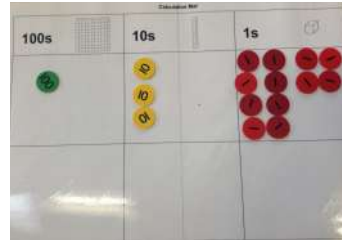
Subtracting with 2 and 3 digit numbers.

Children use practical apparatus to take away the smaller number from the larger. This should be used to model exchanging as in the example.

1 Starting number.

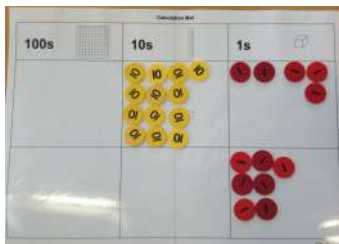


2 Exchanging tens for ones.

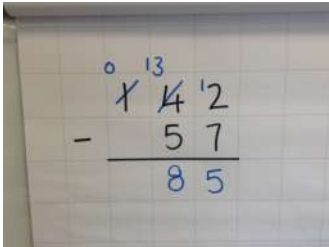
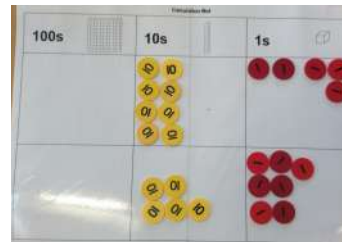


3 Drag down number of ones subtracting.

Exchange one 'hundred' for ten 'tens'



4 Drag down number subtracting.



Because of the cumbersome nature of 'exchanges' in this form, examples that children are expected to do with the practical equipment should be limited to HTO – HTO with one exchange in each calculation.

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, hundreds, tens, ones, exchange, decrease, 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.

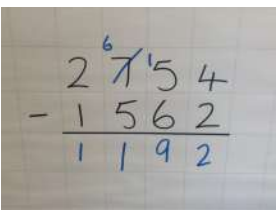
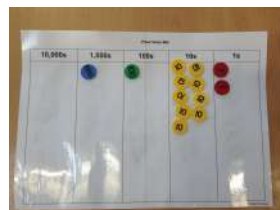
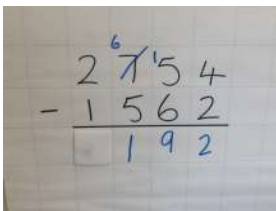
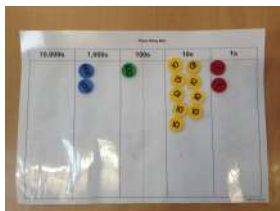
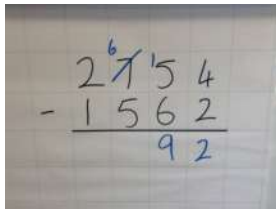
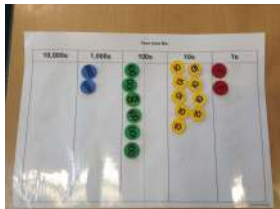
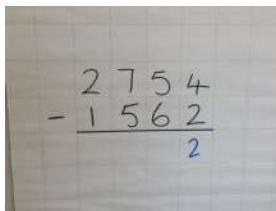
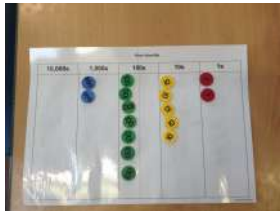
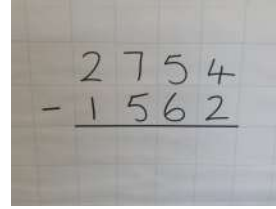
Subtraction

Year 4

Subtracting with up to 4 digits.

Children first experience the practical version of column subtraction and when confident in explaining this, including exchanging when 'not having enough to subtract from, they record the written method alongside.

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



Because of the cumbersome nature of 'exchanges' in this form, examples that children are expected to do with the practical equipment should be limited to HTO – HTO with one exchange in each calculation

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, thousands, hundreds, tens, ones, exchange, decrease, hundreds, value, digit, **inverse**.

Key skills for subtraction at Y4:

Subtract by counting on where numbers are close together or they are near to multiples of 10, 100 etc.

Children select the most appropriate and efficient methods for given subtraction calculations.

Estimate and use inverse operations to check answers.

Solve addition and subtraction 2-step problems, choosing which operations and methods to use and why.

Solve simple measure and money problems involving fractions and decimals to two decimal places.

Find 1000 more or less than a given number.

Count backwards through zero, including negative numbers.

Recognise place value of each digit in a 4-digit number Round any number to the nearest 10, 100 or 1000.

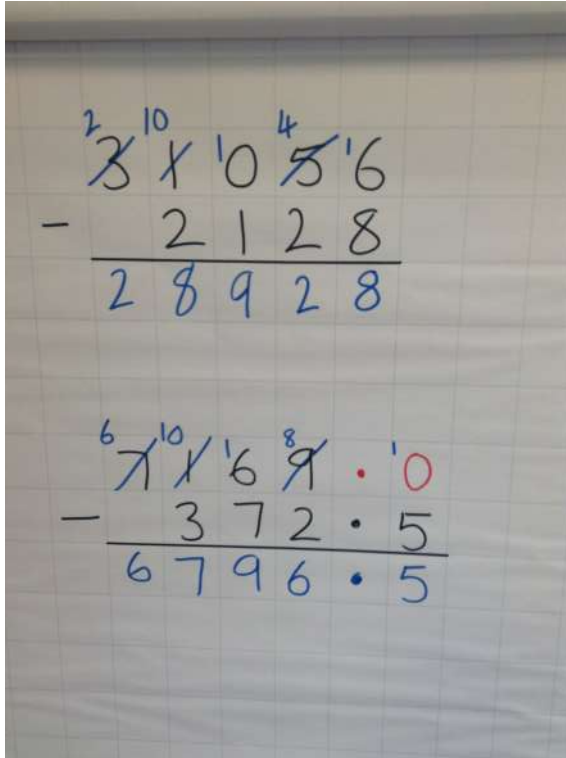
Solve number and practical problems that involve the above, with increasingly large positive numbers.

Subtraction

Year 5

Subtract with at least 4-digit numbers

Including money, measures and decimals.



Finally children complete the compact column subtraction as the most efficient form.

Once children are confident with HTO – HTO, this should be extended to four digit subtract four digit calculations.

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

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

Key skills for subtraction at Y5:

Subtract numbers mentally with increasingly large numbers .

Use rounding and estimation to check answers to calculations and determine, in a range of contexts, levels of accuracy .

Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.

Read, write, order and compare numbers to at least 1 million and determine the value of each digit.

Count forwards or backwards in steps of powers of 10 for any given number up to 1 million.

Interpret negative numbers in context, counting forwards and backwards with positive and negative integers through zero.

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

Subtraction

Year 6

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

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

Using the compact column method to subtract more complex integers.

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

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

Key vocabulary: equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is_? difference, count on, strategy, partition, tens, ones, exchange, regroup, 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.

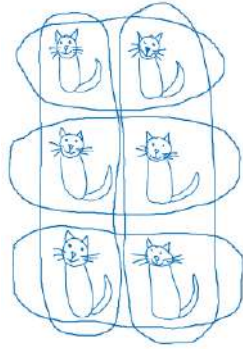
Children need to utilise and consider a range of mental subtraction strategies, jottings and written methods before choosing how to calculate.

Multiplication

Year 1

Multiply with concrete objects, arrays and pictorial representations.

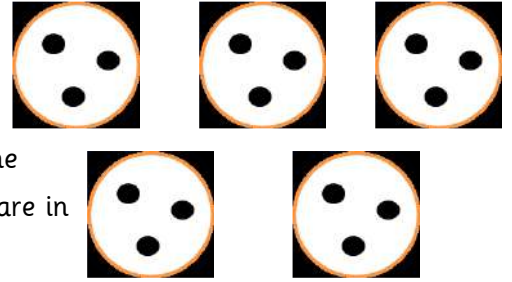
Children will experience equal groups of objects. They will count in 2s and 10s and begin to count in 5s. They will experience practical calculation opportunities involving equal sets or groups using a wide variety of equipment.



Children should use pictorial representations and may use rings to show e.g. 3 groups of 2 and 2 groups of 3 introducing the commutative law of multiplication.

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

$$3+3+3+3+3=15$$



$$5 + 5 + 5 = 15$$

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.

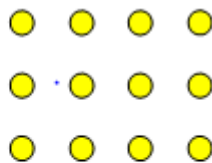
Multiplication

Year 2

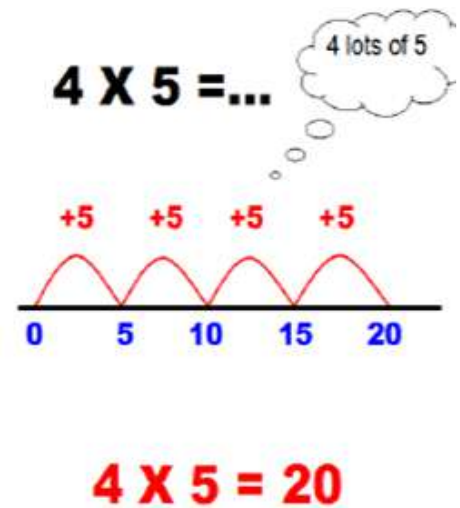
Multiply using arrays and repeated addition (using at least 2s, 5s and 10s)

It is important to be able to visualise multiplication as a rectangular array. This helps children develop their understanding of the **commutative** law i.e. $3 \times 4 = 4 \times 3$.

3 lots of 4
 3×4



4 lots of 3
 4×3



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

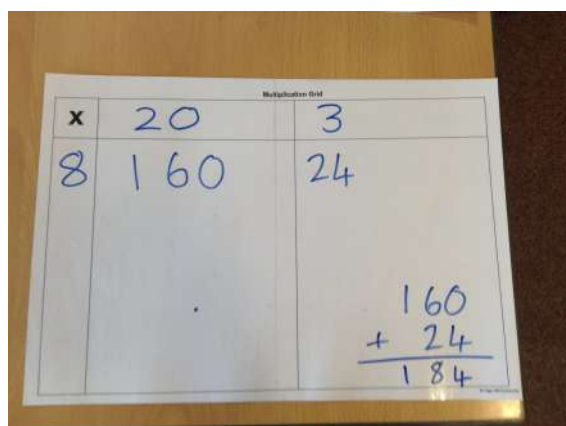
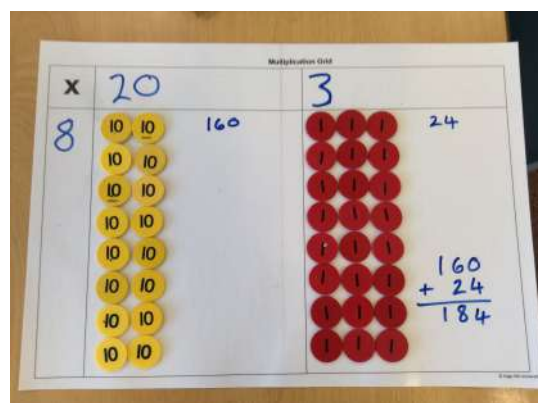
Multiply 2-digits by a single digit number

Introduce the grid method

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.

This is the first exposure to the **distributive** law of multiplication and children should be given plenty of opportunity to explore this.



Recording using column will reinforce addition methods.

To do this, children must be able to:

Partition numbers into tens and units.

Multiply multiples of ten by a single digit (e.g. 20×4) 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.

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

Key skills for multiplication at Y3:

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. $4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$)

Solve simple problems in contexts, deciding which operations and methods to use.

Develop efficient mental methods to solve a range of problems e.g using commutativity ($4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$) and for missing number problems $x \times 5 = 20$, $3 \times x = 18$, $x \times 3 = 24$

Multiplication

Year 4

Multiply 2 and 3-digits by a single digit (Using all multiplication tables up to 12×12)

The image shows two methods for calculating 136×5 . The top method is the grid method, where 136 is split into 100, 30, and 6, each multiplied by 5, and the results (500, 150, 30) are added. The bottom method is column addition, showing the numbers stacked and added from right to left, with carrying.

$$\begin{array}{r}
 136 \times 5 = 680 \\
 \begin{array}{r|l}
 \times & 100 \quad 30 \quad 6 \\
 5 & 500 \quad 150 \quad 30
 \end{array} \\
 \\
 \begin{array}{r}
 500 \\
 150 \\
 + 30 \\
 \hline
 680
 \end{array}
 \end{array}$$

136×5 is **approximately** $140 \times 5 = 700$

Use column addition to add.

Move onto **short multiplication** 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.

The image shows the short multiplication method for 136×5 . The numbers are written in a standard vertical format, and the result 680 is written below the line.

$$\begin{array}{r}
 136 \\
 \times 5 \\
 \hline
 680
 \end{array}$$

Children should be able to:

Approximate before they calculate, and make this a regular part of their calculating, going back to the approximation to check the reasonableness of their answer. e.g:

346×9 is approximately $350 \times 10 = 3500$

Record an approximation to check the final answer against.

Multiply multiples of ten and one hundred by a single-digit, using their multiplication table knowledge.

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

Key skills for multiplication at Y4:

Count in multiples of 6, 7, 9, 25 and 1000.

Recall multiplication facts for **all multiplication tables up to 12×12** .

Recognise place value of digits in up to 4-digit numbers.

Use place value, known facts and derived facts to multiply mentally, e.g. multiply by 1, 10, 100, by 0, or to multiply 3 numbers.

Use commutativity and other strategies mentally $3 \times 6 = 6 \times 3$, $2 \times 6 \times 5 = 10 \times 6$, $39 \times 7 = 30 \times 7 + 9 \times 7$.

Solve problems with increasingly complex multiplication in a range of contexts.

Count in multiples of 6, 7, 9, 25 and 1000.

Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones).

Multiplication

Year 5

Multiply up to 4 digits by 1 or 2 digits.

$$138 \times 17$$

$$\text{Estimate } 140 \times 20 = 800$$

$$\begin{array}{r} 2764 \\ \times 6 \\ \hline 16^4, 5^3, 8^2, 4 \end{array}$$

Short multiplication for multiplying

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.

The recording is reduced further, with the regrouped digits recorded at the top of the next column. Next, move on to **long multiplication** using 2 digits.

2764 x 6 on the 1st row

2764 x 10 on the 2nd row. Put a zero in ones first. Then continue saying $1 \times 4 =$

$$\begin{array}{r} 2764 \\ \times 16 \\ \hline 16^4, 5^3, 8^2, 4 \\ + 2, 7, 6, 4, 0 \\ \hline 44224 \end{array}$$

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.

$$\begin{array}{r} 27.64 \\ \times 6 \\ \hline 165.84 \end{array}$$

Children should be expected to maintain this systematic approach to multiplying numbers, working right to left along the bottom number. This will ensure that mistakes are not made by 'missing' parts, especially when multiplying numbers with more digits.

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

Children will be able to:

Use **rounding** and **place value** to make approximations before calculating and use these to check answers against.

$$\begin{array}{r} 27.64 \\ \times 16 \\ \hline 165.84 \\ + 276.40 \\ \hline 442.24 \end{array}$$

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 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, regroup, **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.

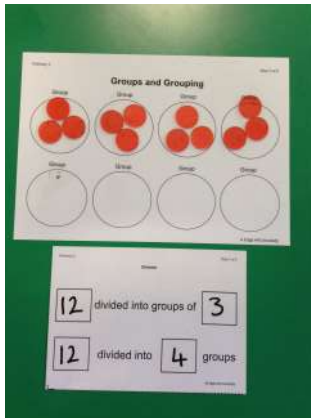
Round any integer to a required degree of accuracy.

Division

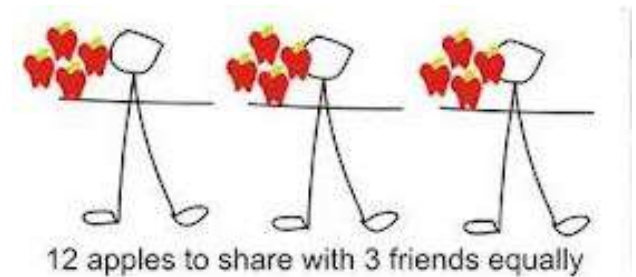
Year 1

Group and share small quantities.

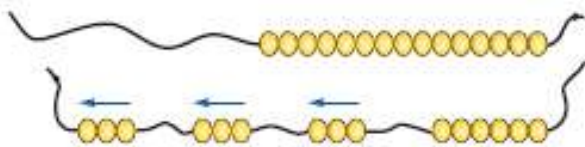
Using objects, diagrams and pictorial representations to solve problems involving **both grouping and sharing**.



grouping



sharing



15 eggs are placed in baskets, with 3 in each basket. How many baskets are needed?

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.

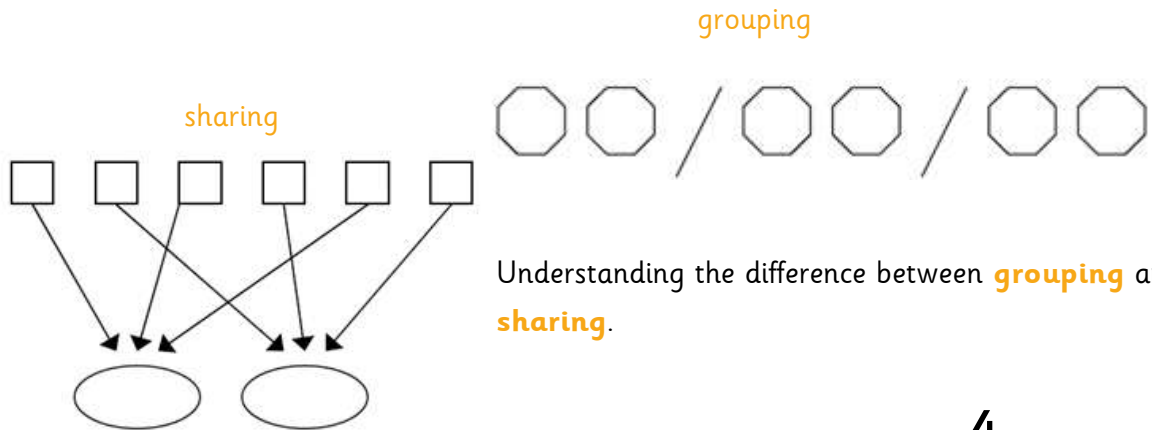
They make connections between arrays, number patterns, and counting in twos, fives and tens.

Division

Year 2

Group and share small quantities

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

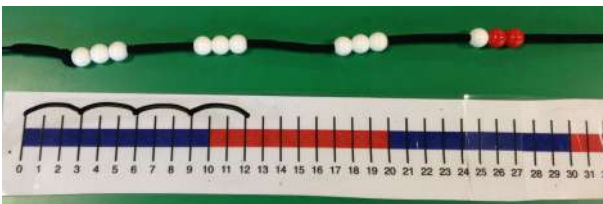
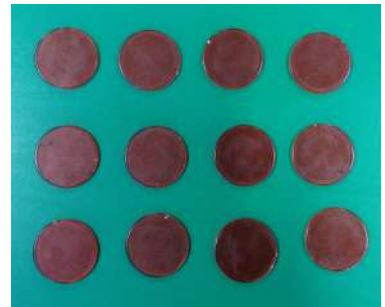


Understanding the difference between **grouping** and **sharing**.

Use **arrays** to make the link clear between division and multiplication.

3

4



$$12 \div 3 = 4$$

This is an important method to develop understanding of **division** as **grouping**.

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 $\times$, $\div$ 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.

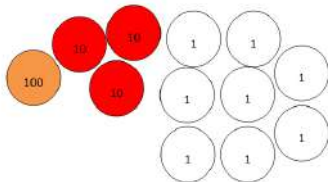
Division

Year 3

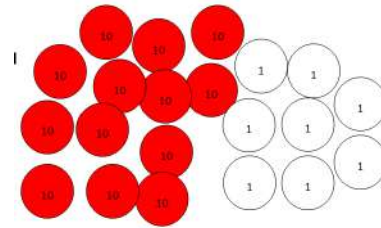
Divide 2-digit numbers by a single digit (where there is no remainder in the final answer)

Place value counters should be used to exemplify taking away the most efficient chunks from the starting number.

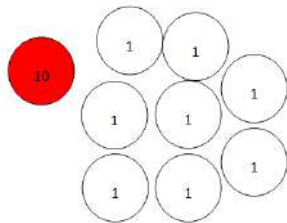
$138 \div 6$ (How many lots of 6?)



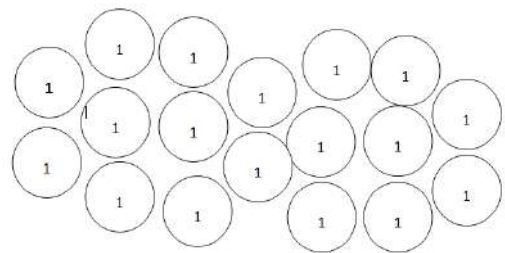
Step 1: I can't make any hundred lots of 6, so I exchange the 100 for 10 tens.



Step 2: I can now group 20 lots of 6 (120) leaving 18 left over.



Step 3: I then exchange the ten for ten 1s.



When ready, children to move onto recording formally.

$$138 \div 6 = 23$$

$$\begin{array}{r} 23 \\ 6 \overline{) 138} \\ \underline{12} \\ 18 \\ \underline{18} \\ 0 \end{array}$$

And I

can now group another 3 lots of 6 with none left over.

In total I have made $20 + 3$ groups of $6 = 23$ so $138 \div 6 = 23$.

This can move onto larger numbers and those which leave remainders.

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

Recall and use multiplication and division facts for the 2, 3, 4, 5, 8 and 10 multiplication tables (through doubling, connect the 2, 4 and 8s).

Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.

Solve problems, in contexts, and including missing number problems, involving multiplication and division.

Pupils develop efficient mental methods, for example, using multiplication and division facts (e.g. using $3 \times 2 = 6$, $6 \div 3 = 2$ and $2 = 6 \div 3$) to derive related facts ($30 \times 2 = 60$, so $60 \div 3 = 20$ and $20 = 60 \div 3$).

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.

Divide up to 3-digit numbers by a single digit

Children continue to develop short division.

Children should continue to use practical resources to support with their understanding of short division, grouping hundreds, tens and units to reach an answer. This way children will develop a secure understanding of what remainders are and how to record them.

$$\begin{array}{r} 18 \\ 4 \overline{) 72} \end{array}$$

Pupils must be secure with the process of short division for dividing 2-digit numbers by a single digit, but must understand how to calculate remainders, using this to 'regroup' remainders within the calculation process.

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.

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

$$\begin{array}{r} 185 \div 5 = 37 \\ 5 \overline{) 185} \end{array}$$

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

As children progress through formal methods they will begin to use the word **chunk** to replace **group**. This will support when moving on to more complex long division.

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, regroup, remainder, multiple, divisible by, factor.

Key number skills needed for division at Y4:

Recall multiplication and division facts for all numbers up to 12×12 .

Use place value, known and derived facts to multiply and divide mentally, including: multiplying and dividing by 10 and 100 and 1.

Pupils practise to become fluent in the formal written method of short division with exact answers when dividing by a one-digit number.

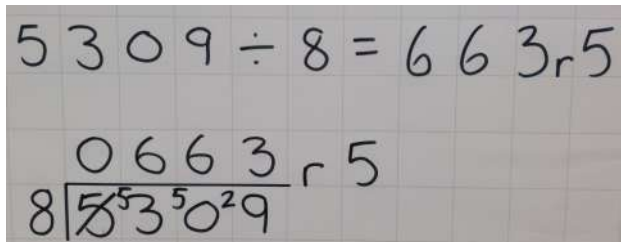
Pupils practise mental methods and extend this to three-digit numbers to derive facts, for example $200 \times 3 = 600$ so $600 \div 3 = 200$.

Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as three cakes shared equally between 10 children.

Division

Year 5

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



$$5309 \div 8 = 663 \text{ r}5$$

$$\begin{array}{r} 663 \text{ r}5 \\ 8 \overline{) 5309} \end{array}$$

Children are expected to 'internalise' the working, looking for the most efficient number of groups to make at each time and recording the answer above the line.

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.

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. $2678 \div 19$).

This is a Year 6 expectation.

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 12×12 (as in Y4).

Multiply and divide numbers mentally, drawing upon known facts.

Identify multiples and factors, including finding all factor pairs of a number, and common factors of two number.

Solve problems involving multiplication and division where larger numbers are decomposed into their factors.

Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.

Use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers.

Work out whether a number up to 100 is prime, and recall prime numbers to 19.

Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context.

Use multiplication and division as inverses.

Interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (e.g. $98 \div 4 = 24 \text{ r}2 = 24\frac{1}{2} = 24.5 = 25$).

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.

5 O S I V D

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. $6497 \div 8$.

$$\begin{array}{r} 0812.125 \\ 8 \overline{) 6497.000} \end{array}$$

Using this method with numbers up to 4 digits. Children should become confident representing a remainder as a decimal or fraction.

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 re-grouped onto zeros after the decimal point.

Introduce **long division** by chunks for dividing by 2 digits.

Find out 'How many 15's are in 432?' by making chunks of 15, 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:

$$1 \times 15 = 15$$

$$2 \times 15 = 30$$

$$432 \div 15 =$$

$$\begin{array}{r} 028 \frac{12}{15} \text{ or } \frac{4}{5} \\ 15 \overline{) 432} \\ \underline{- 30} \\ 132 \\ \underline{- 120} \\ 012 \end{array}$$

$$\begin{array}{r} 15 \\ 30 \\ 45 \\ 60 \\ 75 \\ 90 \\ 105 \\ 120 \\ 135 \\ 150 \end{array}$$

Children will begin to become confident representing **remainders** in long division as fractions or decimals.

Key Vocabulary: As previously, & common factor

Key number skills needed for division at Y6:

Recall and use multiplication and division facts for all numbers to 12×12 for more complex calculations.

Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context. Use short division where appropriate.

Perform mental calculations, including with mixed operations and large numbers.

Identify common factors, common multiples and prime numbers.

Solve problems involving all 4 operations.

Use estimation to check answers to calculations and determine accuracy, in the context of a problem.

Use written division methods in cases where the answer has up to two decimal places.

Solve problems which require answers to be rounded to specified degrees of accuracy.