

Highfields Academy

Together we inspire, always aiming higher

Maths Calculation Policy 2022

Adopted by the Local Advisory Board of
Highfields Academy on

Approved by:

Date: 11th January 2022

**Last reviewed
on:**

11th January 2022

**Next review due
by:**

January 2024

Progression in Calculations

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.

As children begin to understand the underlying ideas they develop ways of recording to support their thinking and calculation methods, use particular methods that apply to special cases, and learn to interpret and use the signs and symbols involved. Over time children learn how to use models and images, such as empty number lines, to support their mental and informal written methods of calculation. As children's mental methods are strengthened and refined, so too are their informal written methods. These methods become more efficient and succinct and lead to efficient written methods that can be used more generally.

By the end of Year 6 children are equipped with mental, written and calculator methods that they understand and can use correctly. When faced with a calculation, children are able to decide which method is most appropriate and have strategies to check its accuracy. At whatever stage in their learning, and whatever method is being used, it must still be underpinned by a secure and appropriate knowledge of number facts, along with those mental skills that are needed to carry out the process and judge if it was successful.

The overall aim for when children leave primary school is that they:

- have a secure knowledge of number facts and a good understanding of the four operations
- are able to use this knowledge and understanding to carry out calculations mentally and to apply general strategies when using one-digit and two-digit numbers and particular strategies to special cases involving bigger numbers
- make use of diagrams and informal notes to help record steps and part answers when using mental methods that generate more information than can be kept in their heads
- have an efficient, reliable, compact written method of calculation for each operation that children can apply with confidence when undertaking calculations that they cannot carry out mentally

Providing a context for calculation:

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

Choosing a calculation method:

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

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

Could I use some jottings to help me?

Should I use a written method to work it out?

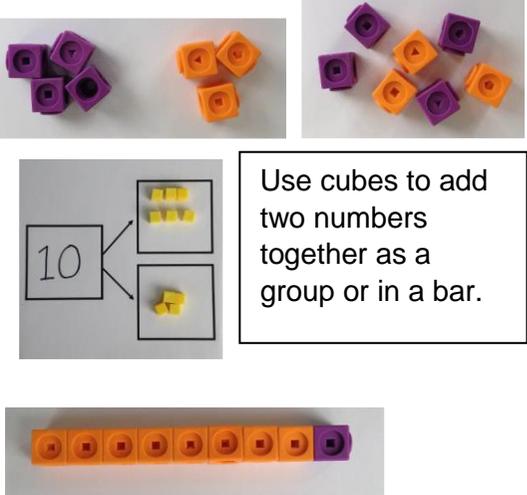
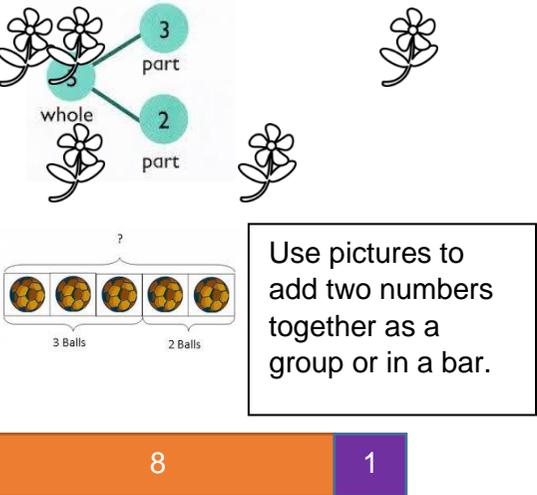
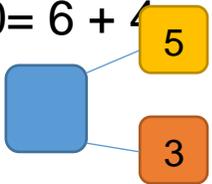
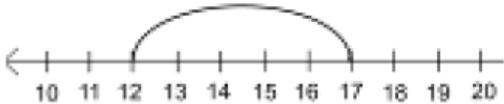
Access to resources:

Children in all year groups need to have access to a range of mathematical resources during the math's lesson. Children should be encouraged to use number lines, 100 squares, counters and beads to support their calculations and carry out methods in a visual context.

When problem solving children should be allowed to choose any resources they feel are needed to solve the problem and make jottings as they feel necessary.

The following strategies are progressive. As the children begin school in Foundation they will begin with Step 1 in addition and subtraction. As the children progress through the school they will begin to use more strategies and will gradually move through the steps.

Addition

Objective and Strategies	Concrete	Pictorial	Abstract
<p>1. Combining two parts to make a whole: part-whole model</p>	 <p>Use cubes to add two numbers together as a group or in a bar.</p>	 <p>Use pictures to add two numbers together as a group or in a bar.</p>	$4 + 3 = 7$ $10 = 6 + 4$  <p>Use the part-part whole diagram as shown above to move into the abstract.</p>
<p>2. Starting at the bigger number and counting on</p>	 <p>Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.</p>	$12 + 5 = 17$  <p>Start at the larger number on the number line and count on in ones or in one jump to find the answer.</p>	$5 + 12 = 17$ <p>Place the larger number in your head and count on the smaller number to find your answer.</p>

3.Counting on with tens

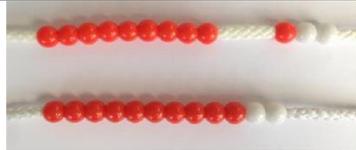
Make the larger number in your addition with Base 10 blocks. Add the tens on to the first number.

Start at the bigger number and count on the smaller number, showing the jumps of 10 on the number line.

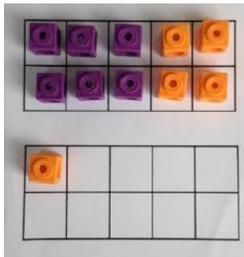
$$43 + 30 = 73$$

Place the larger number in your head and count on in 10s mentally.

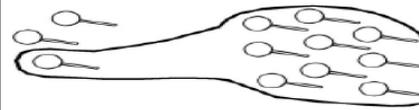
4.Regrouping to make 10.



$$6 + 5 = 11$$



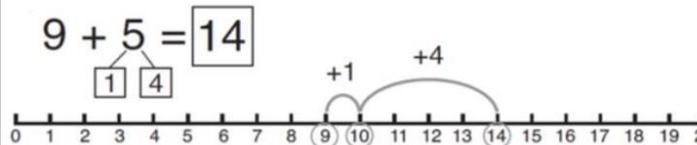
Start with the bigger number and use the smaller number to make 10.



$$3 + 9 =$$

to make 10.

Use pictures or a number line. Regroup or partition the smaller number

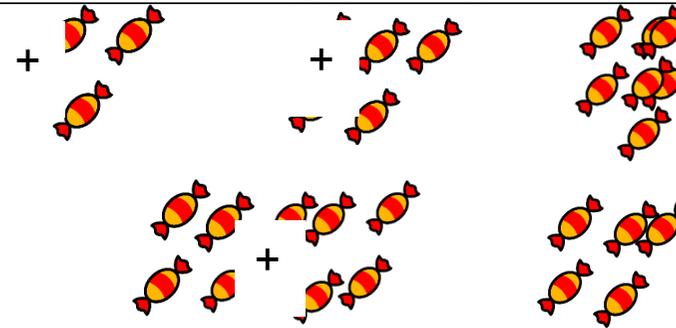


$$7 + 4 = 11$$

If I am at seven, how many more do I need to make 10. How many more do I add on now?

5.Adding three single digits

$4 + 7 + 6 = 17$
Put 4 and 6 together to make 10. Add on 7.



$$\begin{aligned} (4 + 7) + 6 &= 10 + 7 \\ &= 17 \end{aligned}$$

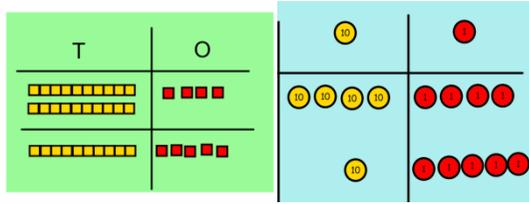
Combine the two numbers that make 10 and then add on the remainder.

Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.

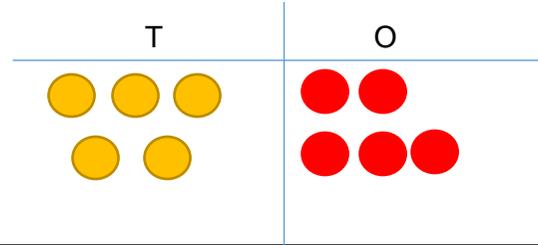
Add together three groups of objects. Draw a picture to recombine the groups to make 10.

6. Column method- no regrouping

$24 + 15 =$
Add together the ones first then add the tens. Use the Base 10 blocks first before moving onto place value counters.



After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions.



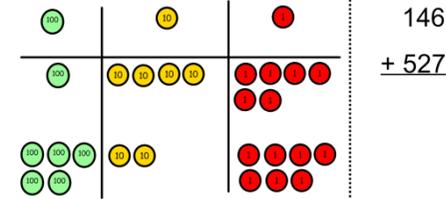
Calculations

$$21 + 42 =$$

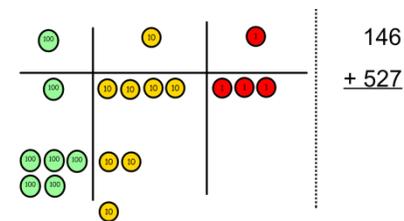
$$\begin{array}{r} 21 \\ + 42 \\ \hline \end{array}$$

7. Column method- regrouping

Make both numbers on a place value grid. Add up the units and

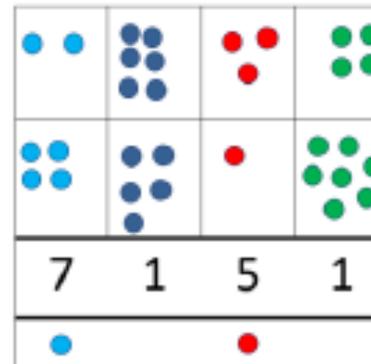


exchange 10 ones for one 10.



Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added.

Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding.



Start by partitioning the numbers before moving on to clearly show the exchange below the addition.

$$\begin{array}{r} 20 + 5 \\ 40 + 8 \\ 60 + 13 = 73 \end{array}$$

$$\begin{array}{r} 536 \\ + 85 \\ \hline 621 \\ 11 \end{array}$$

This can also be done with Base 10 to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100.

As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here.

$$\begin{array}{r}
 72.8 \\
 + 54.6 \\
 \hline
 127.4 \\
 11
 \end{array}$$

$$\begin{array}{r}
 \text{£ } 23.59 \\
 + \text{£ } 7.55 \\
 \hline
 \text{£ } 31.14 \\
 \small 1 \quad 1 \quad 1 \\
 23.361 \\
 9.080 \\
 59.770 \\
 + 1.300 \\
 \hline
 93.511 \\
 \small 2 \quad 1 \quad 2
 \end{array}$$

As children move on to decimals, money and decimal place value counters can be used to support learning.

Foundation Stage Early Learning Goal

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

Children count reliably with numbers from 1 to 20, place them in order and say which number is one more or less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

Year 1

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.

Year 2

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

Key skills for addition at Y2:

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

Year 3

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

Key skills for addition at Y3:

- Read and write numbers to 1000 in numerals and words.
- Add 2-digit numbers mentally, incl. those exceeding 100.
- Add a three-digit number and ones mentally ($175 + 8$)
- Add a three-digit number and tens mentally ($249 + 50$)
- Add a three-digit number and hundreds mentally ($381 + 400$)
- Estimate answers to calculations, using inverse to check answers
- Solve problems, including missing number problems, using
- Number facts, place value, and more complex additio.

- Recognise place value of each digit in 3-digit numbers (hundreds, tens, ones)
- Continue to practise a wide range of mental addition strategies. i.e. Number Bonds, adding the nearest multiple of 10, 100, 100 and adjusting, using near doubles, partitioning and recombining.

Year 4

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

Key skills for addition at Y4:

Select most appropriate method: mental, jottings or written and explain why Recognise the place value of each digit in a four-digit number

Round any number to the nearest 10, 100 or 1000

Estimate and use inverse operations to check answers

Solve 2-step problems in context, deciding which operations and methods to use and why

Find 1000 more or less than a given number

Continue to practise a wide range of mental addition strategies. ie. Number Bonds, add the

nearest multiple of 10, 100, 1000 and adjust, use near doubles, partitioning and recombining Add numbers with up to 4 digits using the formal written method of column addition

Solve 2-step problems in contexts, deciding which operations and methods to use and why Estimate and use inverse operations to check answers to a calculation.

Year 5

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

Key skills for addition at Y5:

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

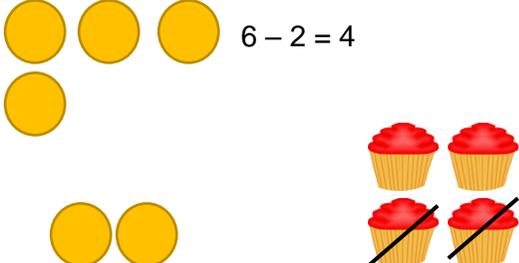
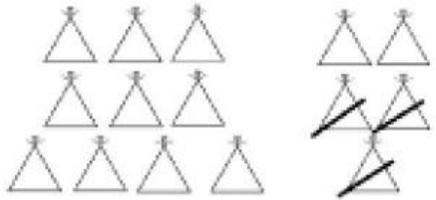
Year 6

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

Key skills for addition at Y6:

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

Subtraction

Objective and Strategies	Concrete	Pictorial	Abstract
<p>1. Taking away ones</p>	<p>Use physical objects, counters, cubes etc to show how objects can be taken away.</p>  <p>$6 - 2 = 4$</p>	<p>Cross out drawn objects to show what has been taken away.</p>  <p>$15 - 3 = 12$</p>	<p>$18 - 3 = 15$</p> <p>$8 - 2 = 6$</p>

2. Counting back

Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.

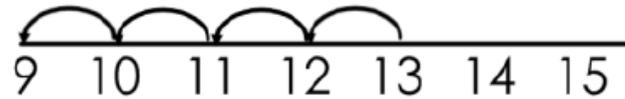


$$13 - 4$$

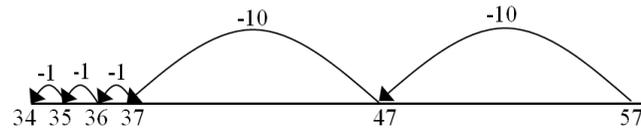
Use counters and move them away from the group as you take them away counting backwards as you go.



Count back on a number line or number track



Start at the bigger number and count back the smaller number showing the jumps on the number line.



This can progress all the way to counting back using two 2 digit numbers.

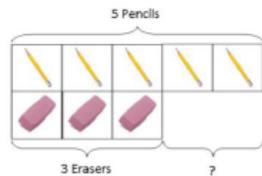
Put 10 in your head, count back 4. What number are you at? Use your fingers to help.

3. Find the difference

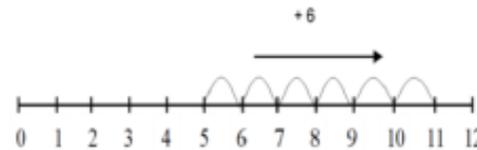
Compare amounts and objects to find the difference.



Use cubes to build towers or make bars to find the difference



Use basic bar models with items to find the difference



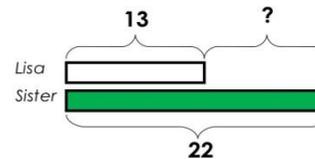
Count on to find the difference.

Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.

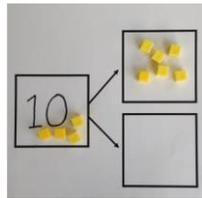
Draw bars to find the difference between 2 numbers.

Comparison Bar Models

Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.



4. Part Part Whole Model



Link to addition - use the part whole model to help explain the inverse between addition and subtraction.

If 10 is the whole and 6 is one of the parts. What is the other part?

$$10 - 6 =$$

$$14 - 9 =$$

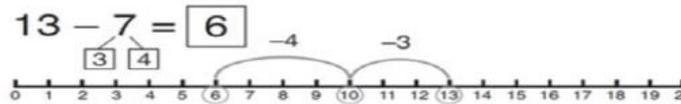
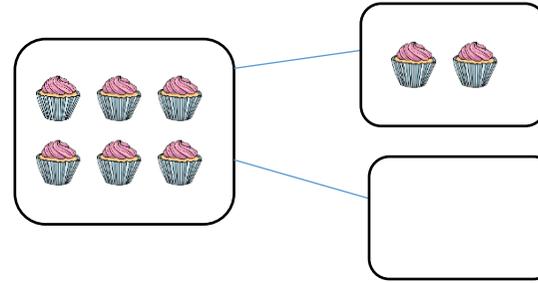


Make 14 on the ten frame. Take away the four first to make 10 and then take away one more so you have taken

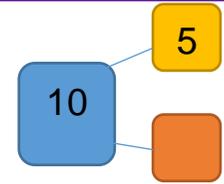
away 5. You are left with the answer of 9.

5. Make 10

Use a pictorial representation of objects to show the part whole model.



Start at 13. Take away 3 to reach 10. Then take away the remaining 4 so you have taken away 7 altogether. You have reached your answer.



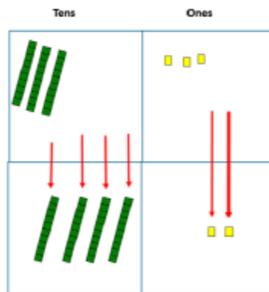
Move to using numbers within the part whole model.

$$16 - 8 =$$

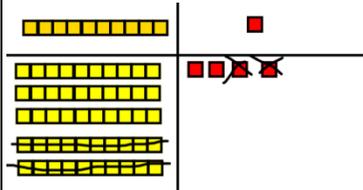
How many do we take off to reach the next 10?

How many do we have left to take off?

6. Column method without regrouping



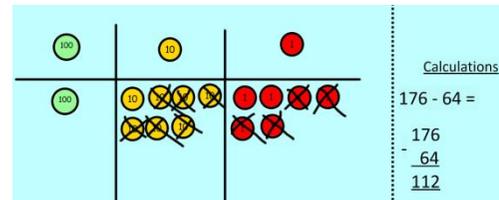
Use Base 10 to make the bigger number then take the smaller number away.



Calculations

$$\begin{array}{r} 54 \\ - 22 \\ \hline 32 \end{array}$$

Draw the Base 10 or place value counters alongside the written calculation to help to show working.

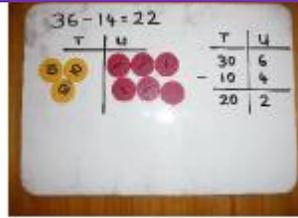


Calculations

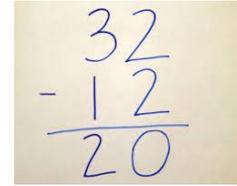
$$\begin{array}{r} 176 - 64 = \\ 176 \\ - 64 \\ \hline 112 \end{array}$$

$$\begin{array}{r} 47 - 24 = 23 \\ \underline{40 + 7} \\ - \underline{20 + 4} \\ 20 + 3 \end{array}$$

Show how you partition numbers to subtract. Again, make the larger number first.



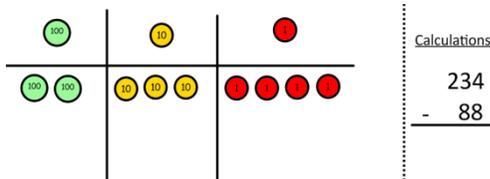
This will lead to a clear written column subtraction.



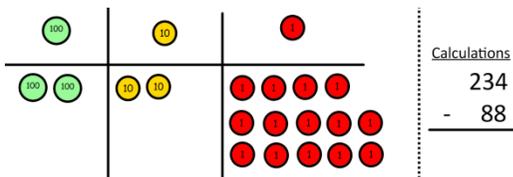
7. Column method with regrouping

Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges.

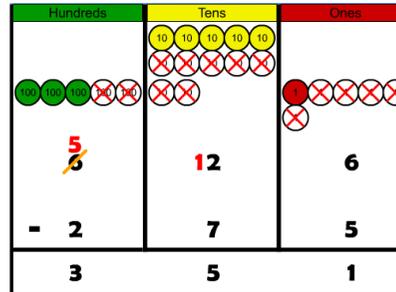
Make the larger number with the place value counters



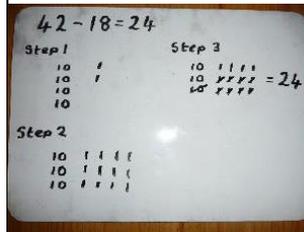
Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.



Now I can subtract my ones.



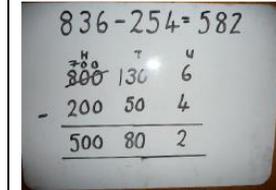
Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.



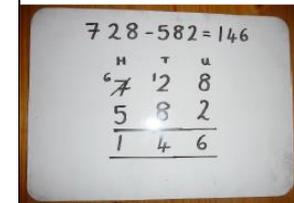
When confident, children can find their own way to record the exchange/regrouping.

Just writing the numbers as shown here shows that the child understands the method and

knows when to exchange/regroup.



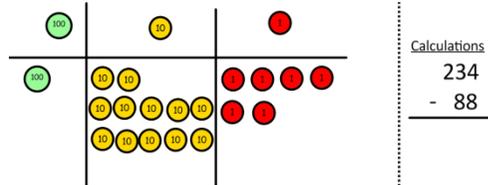
Children can start their formal written method by partitioning the number into clear place value columns.



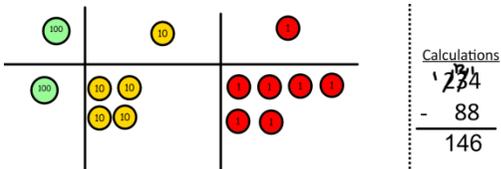
Moving forward the children use a more compact method.

This will lead to an understanding of subtracting any number including decimals.

Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens.



Now I can take away eight tens and complete my subtraction



Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.

$$\begin{array}{r} 5 \quad 12 \quad 1 \\ 2 \quad \cancel{6} \quad \cancel{3} \quad . \quad 0 \\ - \quad 2 \quad 6 \quad . \quad 5 \\ \hline 2 \quad 3 \quad 6 \quad . \quad 5 \end{array}$$

Foundation Stage Early Learning Goal

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

Children count reliably with numbers from 1 to 20, place them in order and say which number is one more or less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

Year 1

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

Year 2

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

Key skills for subtraction at Y2:

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

Year 3

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

Key skills for subtraction at Y3:

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

Year 4

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

Key skills for subtraction at Y4:

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

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

Estimate and use inverse operations to check answers

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

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

Find 1000 more or less than a given number

Count backwards through zero, including negative numbers

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

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

Year 5

Key Vocabulary

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

Key skills for subtraction at Y5:

Subtract numbers mentally with increasingly large numbers

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

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

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

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

Interpret negative numbers in context, counting forwards and backwards with positive and negative integers through 0

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

Year 6

Key Vocabulary

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

Key skills for subtraction at Y6:

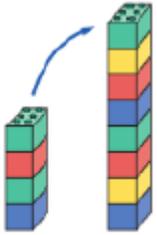
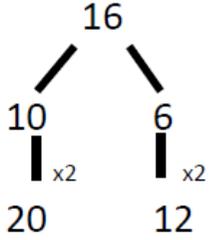
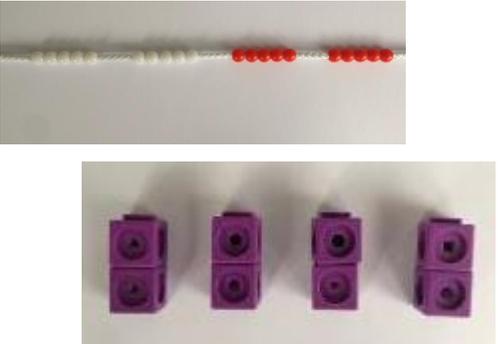
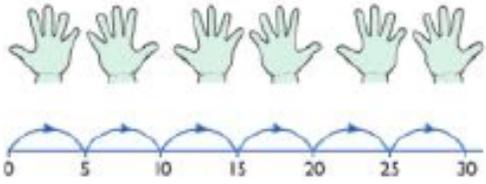
Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.

Read, write, order and compare numbers up to 10 million and determine the value of each digit Round any whole number to a required degree of accuracy

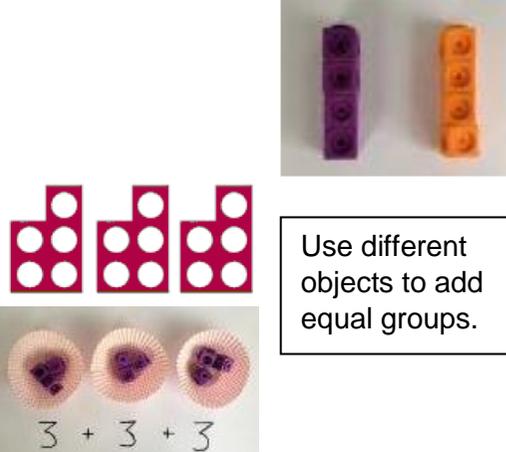
Use negative numbers in context, and calculate intervals across zero.

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

Multiplication

Objective and Strategies	Concrete	Pictorial	Abstract
<p>1. Doubling</p>	<p>Use practical activities to show how to double a number.</p>  <p>double 4 is 8 $4 \times 2 = 8$</p>	<p>Draw pictures to show how to double a number.</p> <p>Double 4 is 8</p> 	 <p>Partition a number and then double each part before recombining it back together.</p>
<p>2. Counting in multiples</p>	 <p>Count in multiples supported by concrete objects in equal groups.</p>	 <p>Use a number line or pictures to continue support in counting in multiples.</p>	<p>Count in multiples of a number aloud.</p> <p>Write sequences with multiples of numbers.</p> <p>2, 4, 6, 8, 10</p> <p>5, 10, 15, 20, 25, 30</p>

3.Repeated addition



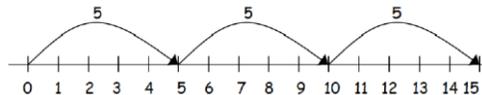
Use different objects to add equal groups.

$$3 + 3 + 3$$

There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?



2 add 2 add 2 equals 6



$$5 + 5 + 5 = 15$$

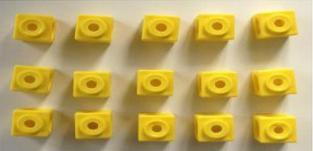
Write addition sentences to describe objects and pictures.



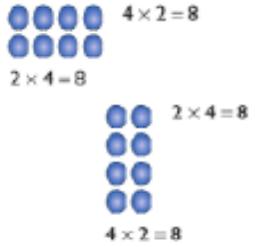
$$2 + 2 + 2 + 2 + 2 = 10$$

4.Arrays- showing commutative multiplication

Create arrays using counters/ cubes to show multiplication sentences.

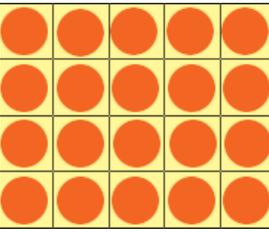
Draw arrays in different rotations to find **commutative** multiplication sentences.



$$4 \times 2 = 8$$

$$2 \times 4 = 8$$

$$2 \times 4 = 8$$

$$4 \times 2 = 8$$


Link arrays to area of rectangles.

Use an array to write multiplication sentences and reinforce repeated addition.



$$5 + 5 + 5 = 15$$

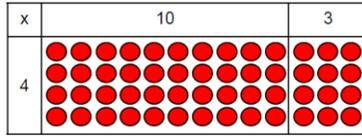
$$3 + 3 + 3 + 3 + 3 = 15$$

$$5 \times 3 = 15$$

$$3 \times 5 = 15$$

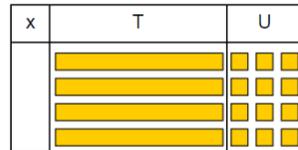
5. Grid Method

Show the link with arrays to first introduce the grid method.



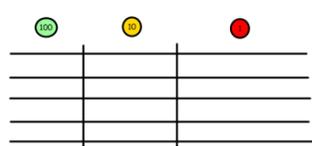
4 rows of 10
4 rows of 3

Move on to using Base 10 to move towards a more compact method.



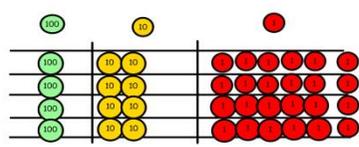
4 rows of 13

Move on to place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows.



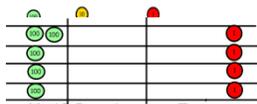
Calculations
4 x 126

Fill each row with 126.



Calculations
4 x 126

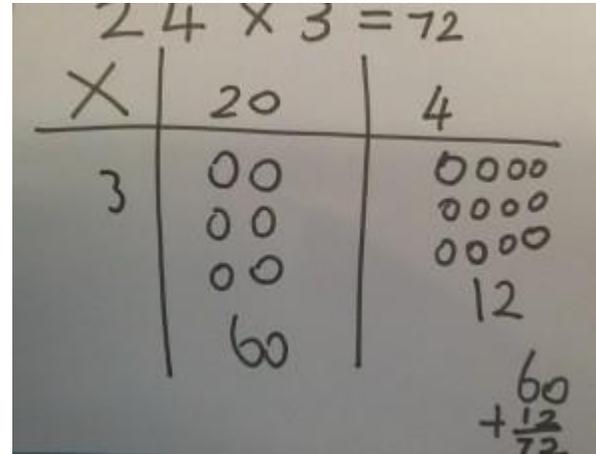
Add up each column, starting with the ones making any exchanges needed.



Then you have your answer.

Children can represent the work they have done with place value counters in a way that they understand.

They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below.



Start with multiplying by one digit numbers and showing the clear addition alongside the grid.

x	30	5
7	210	35

$$210 + 35 = 245$$

Move onto short multiplication using the column method.

$$\begin{array}{r} 35 \\ \times 7 \\ \hline 245 \\ 3 \end{array}$$

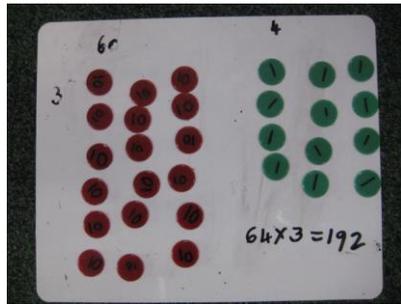
Moving forward, multiply by a 2 digit number showing the different rows within the grid method.

	10	8
10	100	80
3	30	24

x	1000	300	40	2
10	10000	3000	400	20
8	8000	2400	320	16

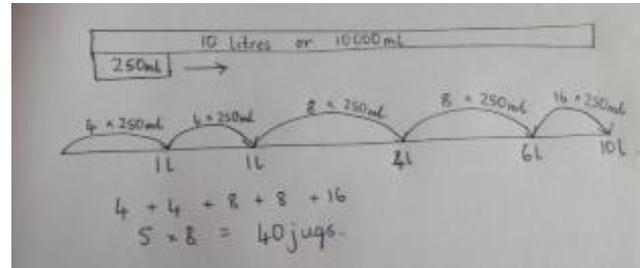
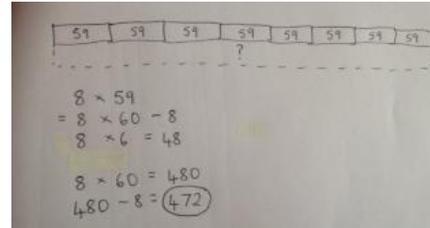
6. Column multiplication

Children can continue to be supported by place value counters at the stage of multiplication.



It is important at this stage that they always multiply the ones first and note down their answer followed by the tens which they note below.

Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.



Start with long multiplication, reminding the children about lining up their numbers clearly in columns.

If it helps, children can write out what they are solving next to their answer.

$$\begin{array}{r} 32 \\ \times 24 \\ \hline 8 \quad (4 \times 2) \\ 120 \quad (4 \times 30) \\ 40 \quad (20 \times 2) \\ 600 \quad (20 \times 30) \\ \hline 768 \end{array}$$

This moves to the more compact method.

$$\begin{array}{r} 7 4 \\ \times 6 3 \\ \hline 1 2 \\ 2 1 0 \\ 2 4 0 \\ + 4 2 0 0 \\ \hline 4 6 6 2 \end{array}$$

	1	3	4	2
x			1	8
1	0	7	3	6
1	3	4	2	0
2	4	1	5	6

Foundation Stage Early Learning Goal

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

Children count reliably with numbers from 1 to 20, place them in order and say which number is one more or less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

Year 1

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.

Year 2

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.

Year 3

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

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

Year 4

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

Key skills for multiplication at Y4:

- Count in multiples of 6, 7, 9, 25 and 1000
- Recall multiplication facts for **all multiplication tables up to 12 x 12** Recognise place value of digits in up to 4-digit numbers
- Use place value, known facts and derived facts to multiply mentally, e.g. multiply by 1, 10, 100, by 0, or to multiply 3 numbers
- Use **commutativity** and other strategies mentally $3 \times 6 = 6 \times 3$, $2 \times 6 \times 5 = 10 \times 6$, $39 \times 7 = 30 \times 7 + 9 \times 7$ 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)

Year 5

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.

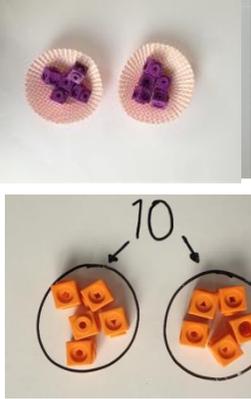
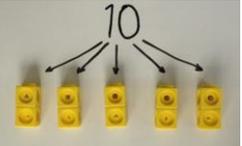
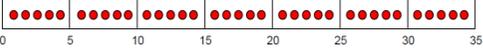
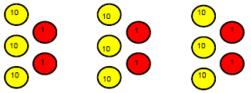
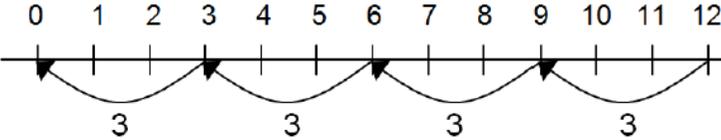
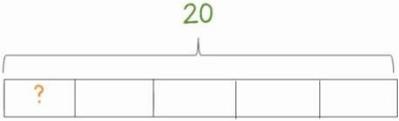
Year 6

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

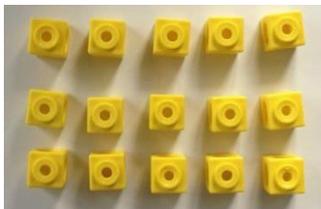
Key skills for multiplication at Y6:

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

Division

Objective and Strategies	Concrete	Pictorial	Abstract
<p>1. Sharing objects into groups</p>	 <p>I have 10 cubes, can you share them equally in 2 groups?</p>	<p>Children use pictures or shapes to share quantities.</p>  <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> $8 \div 2 = 4$ </div>	<p>Share 9 buns between three people.</p> $9 \div 3 = 3$
<p>2. Division as grouping</p>	<p>Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.</p>   $96 \div 3 = 32$  	<p>Use a number line to show jumps in groups. The number of jumps equals the number of groups.</p>  <p>Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.</p>  $20 \div 5 = ?$ $5 \times ? = 20$	$28 \div 7 = 4$ <p>Divide 28 into 7 groups. How many are in each group?</p>

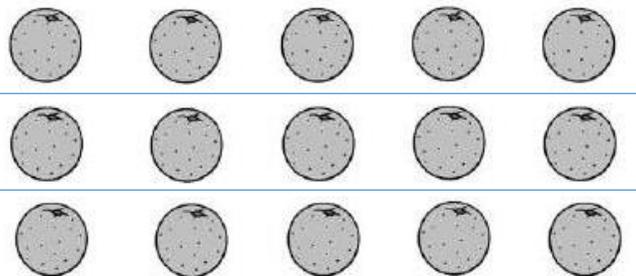
3.Division within arrays



Link division to multiplication by creating an array and thinking about the

number sentences that can be created.

Eg $15 \div 3 = 5$ $5 \times 3 = 15$
 $15 \div 5 = 3$ $3 \times 5 = 15$



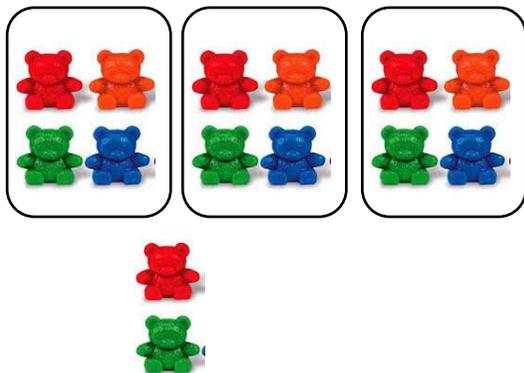
Draw an array and use lines to split the array into groups to make multiplication and division sentences.

Find the inverse of multiplication and division sentences by creating four linking number sentences.

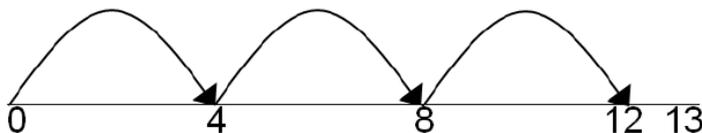
$7 \times 4 = 28$
 $4 \times 7 = 28$
 $28 \div 7 = 4$
 $28 \div 4 = 7$

4.Division with a remainder

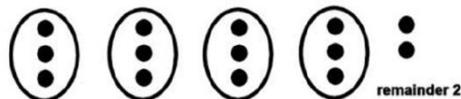
$14 \div 3 =$
 Divide objects between groups and see how much is left over



Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.



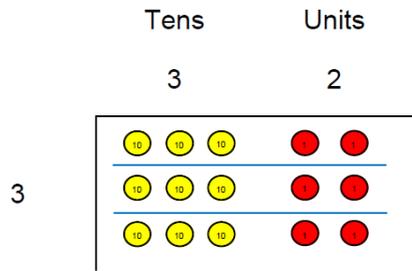
Draw dots and group them to divide an amount and clearly show a remainder.



Complete written divisions and show the remainder using r.

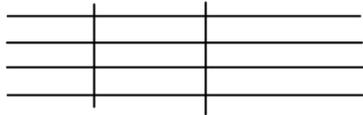
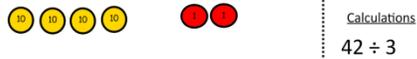
$29 \div 8 = 3$ REMAINDER 5
 ↑ ↑ ↑ ↑
 dividend divisor quotient remainder

5.Short division



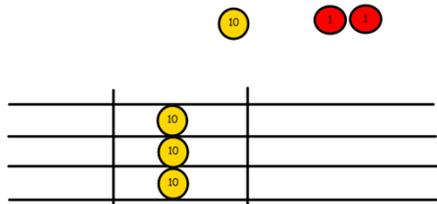
3

Use place value counters to divide using the bus stop method alongside

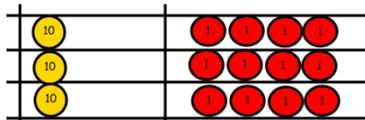


$$42 \div 3 =$$

Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.

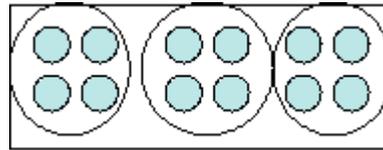


We exchange this ten for ten ones and then share the ones equally among the groups.



We look how much in 1 group so the answer is 14.

Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.



Encourage them to move towards counting in multiples to divide more efficiently.

Begin with divisions that divide equally with no remainder.

Move onto divisions with a remainder.

$$\begin{array}{r} 8 \ 6 \ r \ 2 \\ 3 \overline{) 4 \ 3 \ 2} \\ \underline{4 \ 3 \ 2} \\ 0 \end{array}$$

Finally move into decimal places to divide the total accurately.

$$\begin{array}{r} 1 \ 4 \ . \ 6 \\ 3 \ 5 \overline{) 5 \ 1 \ 1 \ . \ 0} \\ \underline{5 \ 1 \ 1 \ . \ 0} \\ 0 \end{array}$$

Foundation Stage Early Learning Goal

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

Children count reliably with numbers from 1 to 20, place them in order and say which number is one more or less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

Year 1

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.

Year 2

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.

Year 3

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

Key number skills needed for division at Y3:

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

Year 4

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

Key number skills needed for division at Y4:

- **Recall multiplication and division facts for all numbers up to 12 x 12**
- Use place value, known and derived facts to multiply and divide mentally, including: multiplying and dividing by 10 and 100 and 1
- Pupils practise to become fluent in the formal written method of short division with exact answers when dividing by a one-digit number
- Pupils practise mental methods and extend this to three-digit numbers to derive facts, for example $200 \times 3 = 600$ 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

Year 5

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

Key number skills needed for division at Y5:

- Recall multiplication and division facts for all numbers up to 12 x 12 (as in Y4) Multiply and divide numbers mentally, drawing upon known facts
- Identify multiples and factors, including finding all factor pairs of a number, and common factors of two number
- Solve problems involving multiplication and division where larger numbers are decomposed into their factors
- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
- Use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
- Work out whether a number up to 100 is prime, and recall prime numbers to 19
- Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context
- Use multiplication and division as inverses
- Interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (e.g. $98 \div 4 = 24 \text{ r } 2 = 24 \frac{1}{2} = 24.5 \approx 25$)
- 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.

Year 6

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

Key number skills needed for division at Y6:

- Recall and use multiplication and division facts for all numbers to 12 x 12 for more complex calculations
- Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context. Use short division where appropriate.
- Perform mental calculations, including with mixed operations and large numbers.
- Identify common factors, common multiples and prime numbers.
- Solve problems involving all 4 operations.
- Use estimation to check answers to calculations and determine accuracy, in the context of a problem.
- Use written division methods in cases where the answer has up to two decimal places.
- Solve problems which require answers to be rounded to specified degrees of accuracy.
- *Foundation Stage Early Learning Goal*

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

Children count reliably with numbers from 1 to 20, place them in order and say which number is one more or less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Addition	Combining two parts to make a whole: part whole model. Starting at the bigger number and counting on. Regrouping to make 10.	Adding three single digits. Column method – no regrouping.	Column method- regrouping. (up to 3 digits)	Column method- regrouping. (up to 4 digits)	Column method- regrouping. (with more than 4 digits) (Decimals- with the same amount of decimal places)	Column method- regrouping. (Decimals- with different amounts of decimal places)
Subtraction	Taking away ones Counting back Find the difference Part whole model Make 10	Counting back Find the difference Part whole model Make 10 Column method- no regrouping	Column method with regrouping. (up to 3 digits)	Column method with regrouping. (up to 4 digits)	Column method with regrouping. (with more than 4 digits) (Decimals- with the same amount of decimal places)	Column method with regrouping. (Decimals- with different amounts of decimal places)
Multiplication	Doubling Counting in multiples Arrays (with support)	Doubling Counting in multiples Repeated addition Arrays- showing commutative multiplication	Counting in multiples Repeated addition Arrays- showing commutative multiplication Grid method	Column multiplication (2 and 3 digit multiplied by 1 digit)	Column multiplication (up to 4 digit numbers multiplied by 1 or 2 digits)	Column multiplication (multi digit up to 4 digits by a 2 digit number)
Division	Sharing objects into groups Division as grouping	Division as grouping Division within arrays	Division within arrays Division with a remainder Short division (2 digits by 1 digit- concrete and pictorial)	Division within arrays Division with a remainder Short division (up to 3 digits by 1 digit- concrete and pictorial)	Short division (up to 4 digits by a 1 digit number interpret remainders appropriately for the context)	Short division Long division (up to 4 digits by a 2 digit number- interpret remainders as whole numbers, fractions or round)

