St. Philomena's Catholic Primary School

Headteacher: Miss V Maher

Calculation Policy

July 2022

Date of Policy	**Signed**	**Position**
July 2022	Veronica Maher	Headteacher
Monitoring	**By**	**Date**
Reviewed	Resources Committee	
To be ratified	Full Governing Body	
Uploaded to website	**By**	**Date**
This policy will be reviewed every two years by the full Governing Body Date of next review : 2024		

Calculation Policy

Introduction

This policy sets out the path of progression for maths within St. Philomena's School. At St Philomena's School we plan and teach from the National Curriculum (NC) objectives using The White Rose approach. Children spend time learning, consolidating and mastering maths using a unit based approach. Each unit is taught sequentially and progressively across each key stage.

This policy outlines various calculation methods that children are taught as they progress through the school.

When faced with a calculation problem, children will be encouraged to ask:

- What is the same and what is different?
- Which method is most efficient?
- What steps do I need to solve the problem?
- Can I use jottings to help me?
- Do I need to use a mental method or written method?
- Is my answer sensible?
- Can I use an estimate or the inverse to check my calculating?

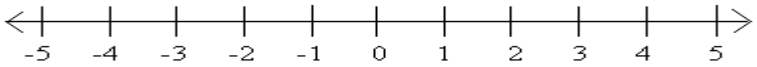
Number Lines

Number lines are a very important tool used in all calculations. Children are introduced to number lines when they begin in the EYFS.

Number lines can take many forms and are used in a variety of ways to develop children's understanding of number. Children become proficient in making 'jumps' up and down a number line to help them solve a mathematical problem.

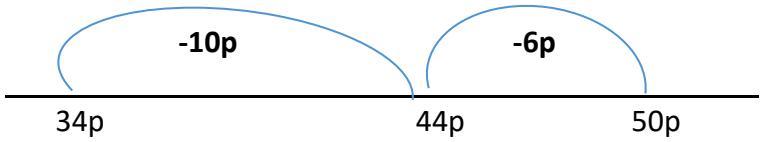
1	2	3	4	5	6	7	8	9	10

All classes have access to number lines of various types appropriate to their age group, including those incorporating negative numbers.



As they progress through the school the children are taught the value of drawing a blank/empty number line that can accommodate relevant numbers to solve calculations.

e.g finding change from 50p after spending 16p.



Part Whole Models

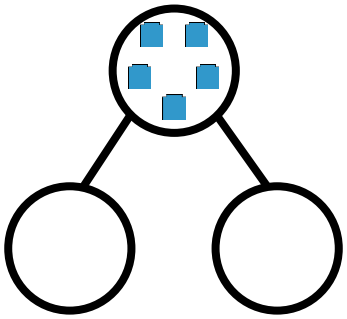
Children are introduced to the concept of partitioning upon starting in the EYFS. Partitioning underpins number sense which underpins many of the subsequent segments, and build towards use of the part–part–whole model.

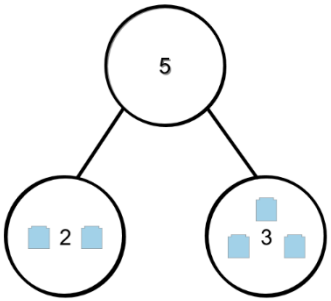
A 'whole' can be represented by one object; if some of the whole object is missing, it is not the 'whole'.

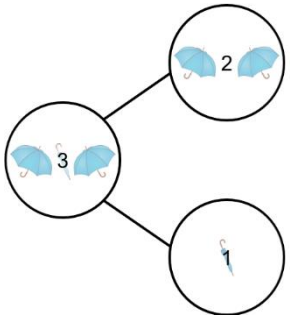
A whole object can be split into two or more parts in many different ways. The parts might look different; each part will be smaller than the whole, and the parts can be combined to make the whole.

A 'whole' can be represented by a group of discrete objects. If some of the objects in the group are missing, it is not the whole group – it is part of the whole group.

A whole group of objects can be composed of two or more parts and this can be represented using a part–part–whole 'cherry' diagram. The group can be split in many different ways. The parts might look different; each part will be smaller than the whole group and the parts can be combined to make the whole group



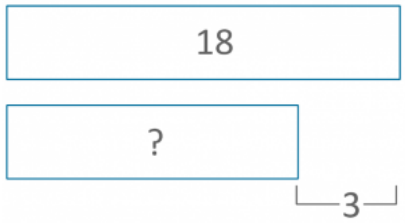




Bar Models

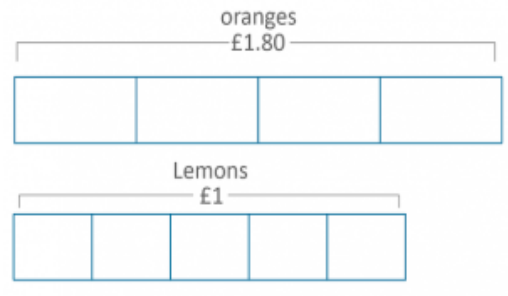
Bar models are bars that are drawn to represent known and unknown quantities. In a similar way to part whole models, it encourages learners to understand how each part or bar combines to make the whole.

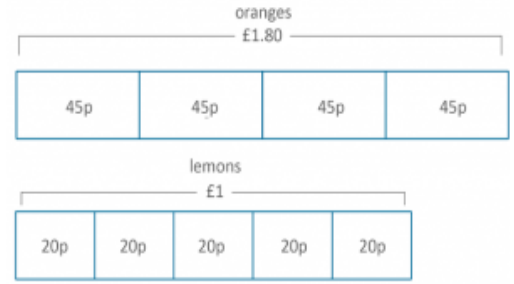
Austin has 18 lego bricks. Lionel has 3 lego bricks. How many more lego bricks does Austin have than Lionel?



Calculation: 18 – 3 =

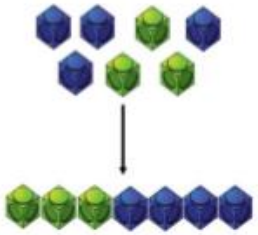
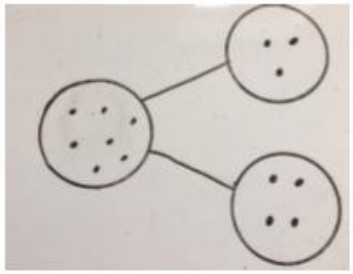
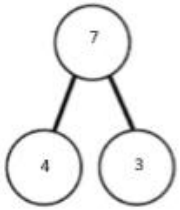
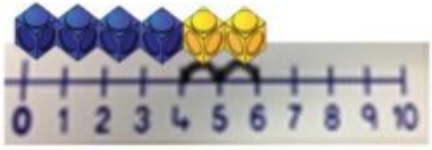
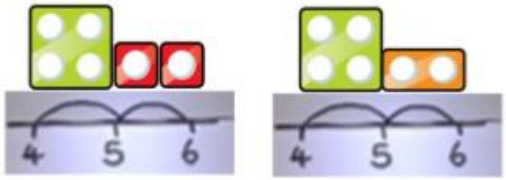
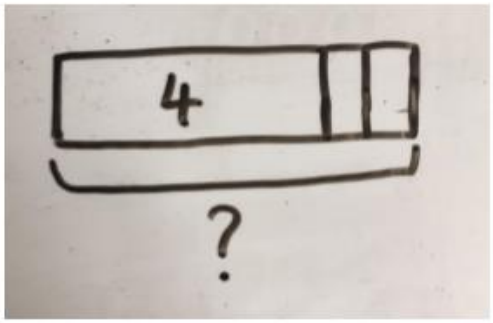
A bag of 5 lemons costs £1. A bag of 4 oranges costs £1.80. How much more does one orange cost than one lemon?

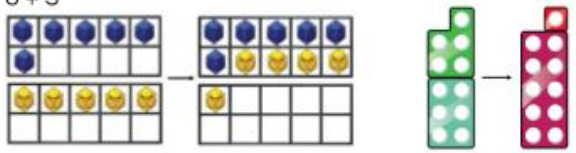
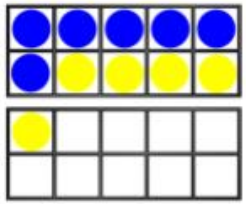
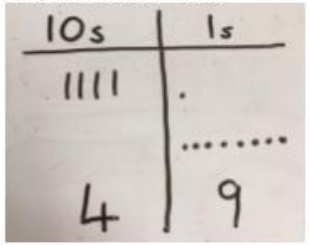
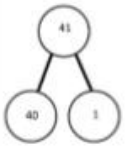
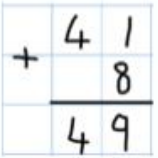
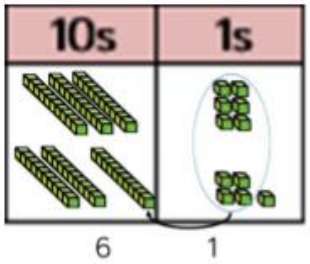
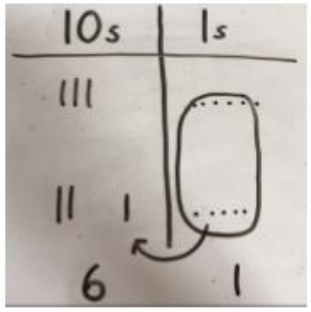




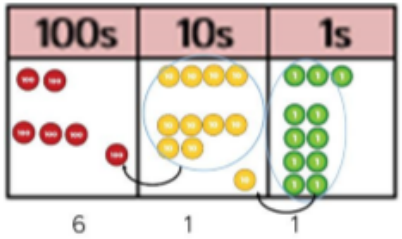
Calculation policy: Addition

Key language: sum, total, parts and wholes, plus, add, altogether, more, 'is equal to' 'is the same as'.

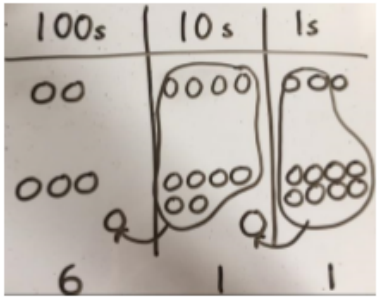
Concrete	Pictorial	Abstract
Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars). 	Children to represent the cubes using dots or crosses. They could put each part on a part whole model too. 	4 + 3 = 7 Four is a part, 3 is a part and the whole is seven. 
Counting on using number lines using cubes or Numicon.  	A bar model which encourages the children to count on, rather than count all. 	The abstract number line: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? 4 + 2 

Regrouping to make 10; using ten frames and counters/cubes or using Numicon. 6 + 5 	Children to draw the ten frame and counters/cubes. 	Children to develop an understanding of equality e.g. 6 + □ = 11 6 + 5 = 5 + □ 6 + 5 = □ + 4
TO + O using base 10. Continue to develop understanding of partitioning and place value. 41 + 8 	Children to represent the base 10 e.g. lines for tens and dot/crosses for ones. 	41 + 8  1 + 8 = 9 40 + 9 = 49 
TO + TO using base 10. Continue to develop understanding of partitioning and place value. 36 + 25 	Chidlren to represent the base 10 in a place value chart. 	Looking for ways to make 10. 36 + 25= 1 5 30 + 20 = 50 5 + 5 = 10 50 + 10 + 1 = 61 Formal method: 36 +25 61 1

Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred.

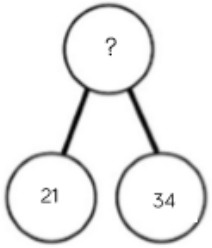


Chidren to represent the counters in a place value chart, circling when they make an exchange.



$$\begin{array}{r} 243 \\ +368 \\ \hline 611 \\ \hline 1\ 1 \end{array}$$

Conceptual variation; different ways to ask children to solve 21 + 34



?	
21	34

Word problems:
In year 3, there are 21 children and in year 4, there are 34 children.
How many children in total?

21 + 34 = 55. Prove it

$$\begin{array}{r} 21 \\ +34 \\ \hline \\ \hline \end{array}$$

21 + 34 =

$\square$ = 21 + 34

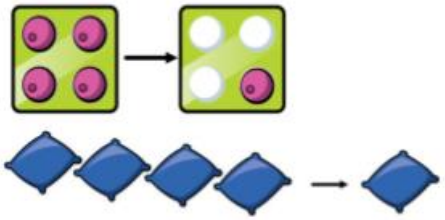
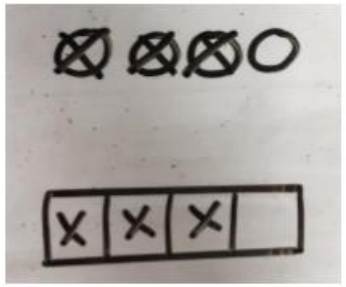
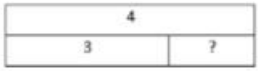
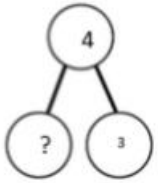
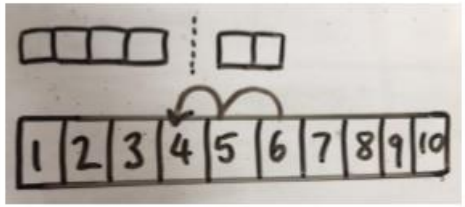
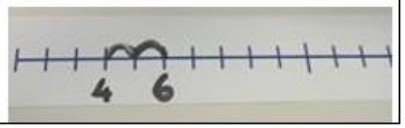
Calculate the sum of twenty-one and thirty-four.

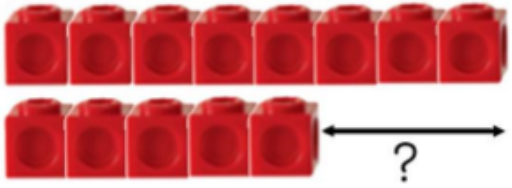
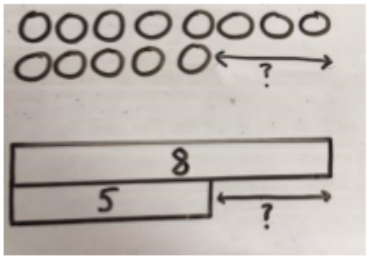
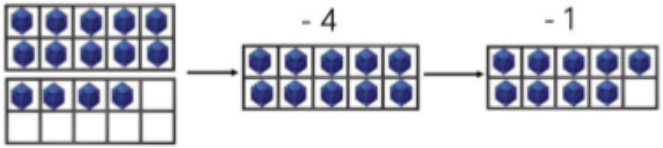
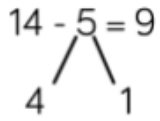
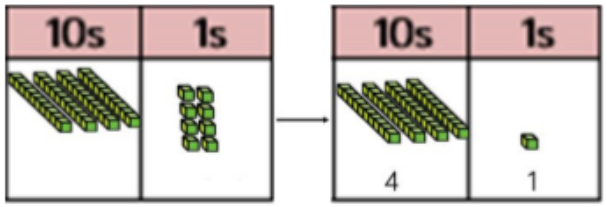
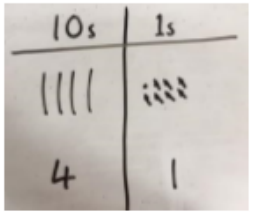
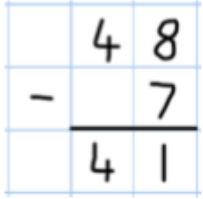
Missing digit problems:

10s	1s
	1
	?
?	5

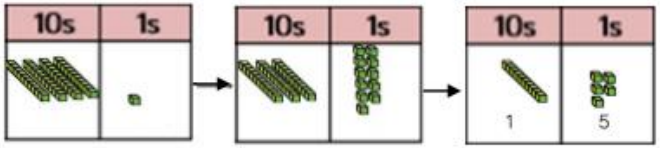
Calculation policy: Subtraction

Key language: take away, less than, the difference, subtract, minus, fewer, decrease.

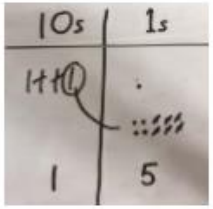
Concrete	Pictorial	Abstract
Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items such as beanbags could be used). 4 – 3 = 1 	Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used. 	4- 3 = □ = 4 – 3  
Counting back (using number lines or number tracks) children start with 6 and count back 2. 6 – 2 = 4 	Children to represent what they see pictorially e.g. 	Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line  

Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used). Calculate the difference between 8 and 5. 	Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate. 	Find the difference between 8 and 5. 8 – 5, the difference is ☐ Children to explore why 9 - 6 = 8 – 5 = 7 – 4 have the same difference.
Making 10 using ten frames. 14 – 5 	Children to present the ten frame pictorially and discuss what they did to make 10. 	Children to show how they can make 10 by partitioning the subtrahend.  14 – 4 = 10 10 – 1 = 9
Column method using base 10. 48-7 	Children to represent the base 10 pictorially. 	Column method or children could count back 7. 

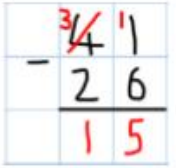
Column method using base 10 and having to exchange.
41 – 26



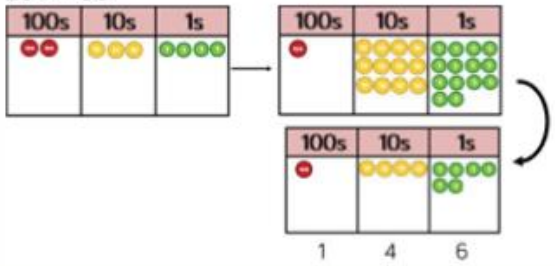
Represent the base 10 pictorially, remembering to show the exchange.



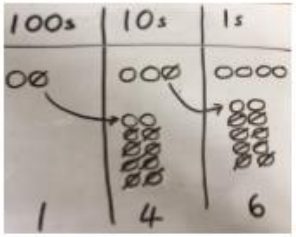
Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because 41 = 30 + 11.



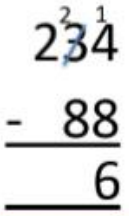
Column method using place value counters.
234 – 88



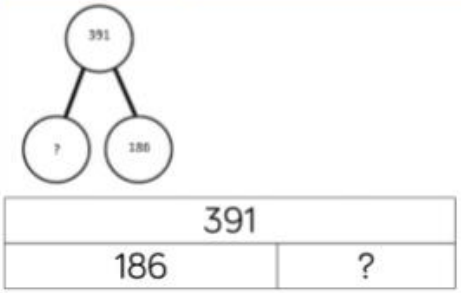
Represent the place value counters pictorially; remembering to show what has been exchanged.



Formal colum method. Children must understand what has happened when they have crossed out digits.



Conceptual variation; different ways to ask children to solve 391 - 186



Raj spent £391, Timmy spent £186.
How much more did Raj spend?

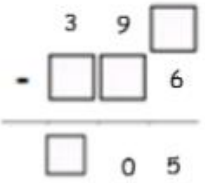
Calculate the difference between 391 and 186.

☐ = 391 – 186

391
-186
———

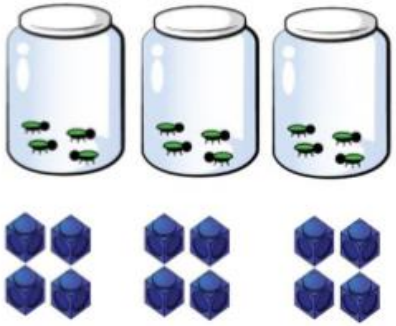
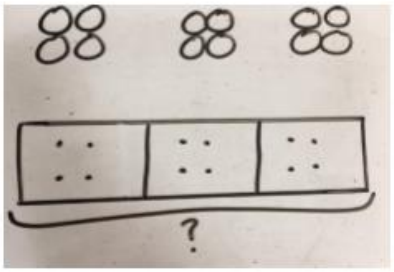
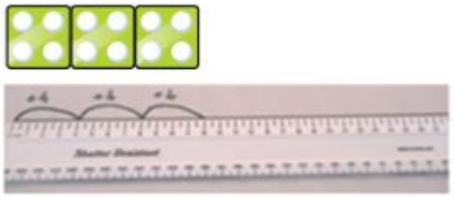
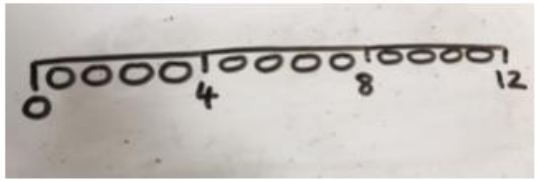
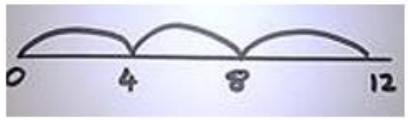
What is 186 less than 391?

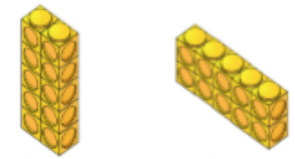
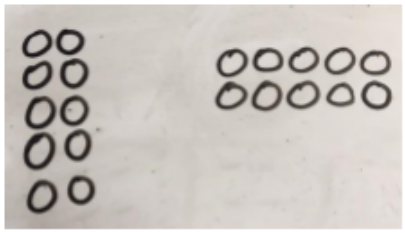
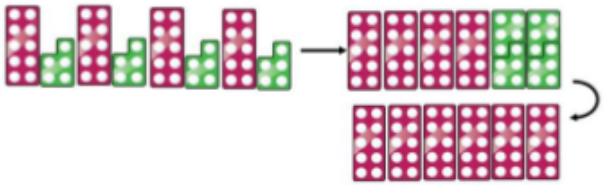
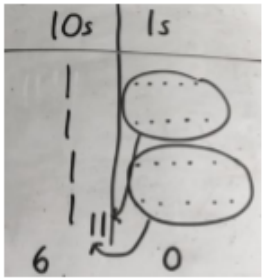
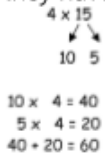
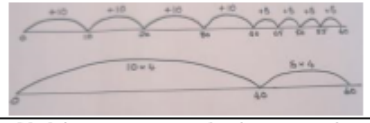
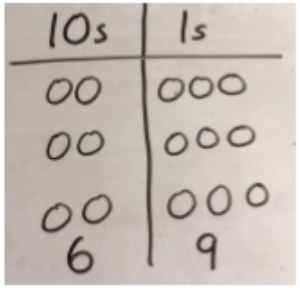
Missing digit calculations



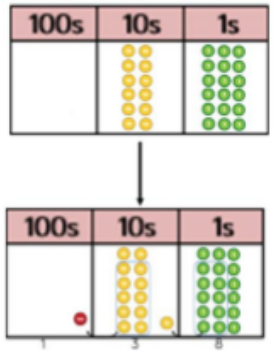
Calculation policy: Multiplication

Key language: double, times, multiplied by, the product of, groups of, lots of, equal groups.

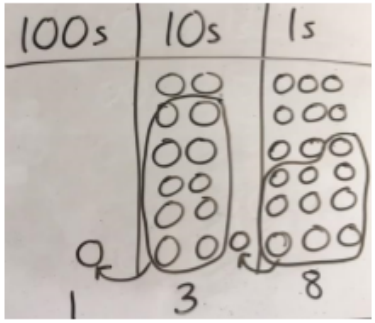
Concrete	Pictorial	Abstract
Repeated grouping/repeated addition 3 × 4 4 + 4 + 4 There are 3 equal groups, with 4 in each group. 	Children to represent the practical resources in a picture and use a bar model. 	3 × 4 = 12 4 + 4 + 4 = 12
Number lines to show repeated groups- 3 × 4  Cuisenaire rods can be used too.	Represent this pictorially alongside a number line e.g.: 	Abstract number line showing three jumps of four. 3 × 4 = 12 

Use arrays to illustrate commutativity counters and other objects can also be used. $2 \times 5 = 5 \times 2$  2 lots of 5 5 lots of 2	Children to represent the arrays pictorially. 	Children to be able to use an array to write a range of calculations e.g. $10 = 2 \times 5$ $5 \times 2 = 10$ $2 + 2 + 2 + 2 + 2 = 10$ $10 = 5 + 5$
Partition to multiply using Numicon, base 10 or Cuisenaire rods. 4×15 	Children to represent the concrete manipulatives pictorially. 	Children to be encouraged to show the steps they have taken.  A number line can also be used 
Formal column method with place value counters (base 10 can also be used.) 3×23 	Children to represent the counters pictorially. 	Children to record what it is they are doing to show understanding. 3×23 $20 \quad 3$ $3 \times 20 = 60$ $3 \times 3 = 9$ $60 + 9 = 69$ $\begin{array}{r} 23 \\ \times\ 3 \\ \hline 69 \end{array}$

Formal column method with place value counters.
6 x 23



Children to represent the counters/base 10, pictorially e.g. the image below.



Formal written method

$$6 \times 23 =$$

$$\begin{array}{r} 23 \\ \times\ 6 \\ \hline 138 \\ \hline 1\ 1 \end{array}$$

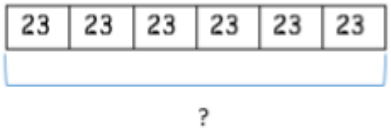
When children start to multiply 3d × 3d and 4d × 2d etc., they should be confident with the abstract:

To get 744 children have solved 6 × 124.
To get 2480 they have solved 20 × 124.

$$\begin{array}{r} 1\ 2\ 4 \\ \times\ \ 2\ 6 \\ \hline 7\ 4\ 4 \\ 2\ 4\ 8\ 0 \\ \hline 3\ 2\ 2\ 4 \\ \hline 1\ 1 \end{array}$$

Answer: 3224

Conceptual variation; different ways to ask children to solve 6 × 23



Mai had to swim 23 lengths, 6 times a week.
How many lengths did she swim in one week?

With the counters, prove that 6 x 23 = 138

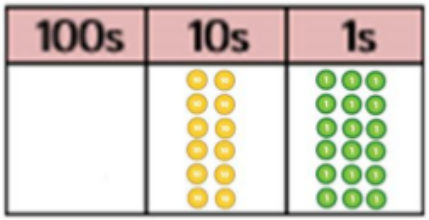
Find the product of 6 and 23

6 × 23 =

□ = 6 × 23

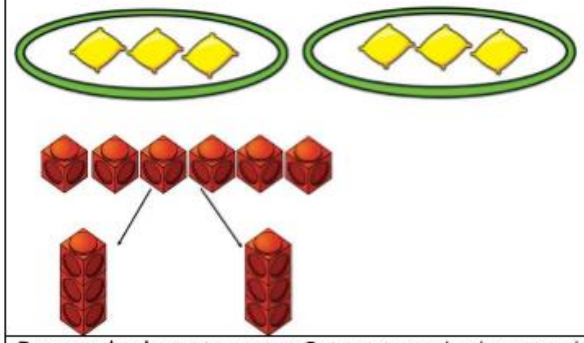
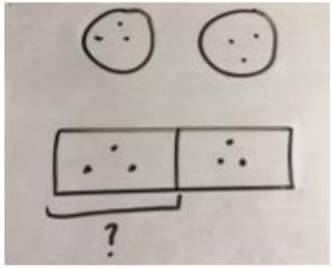
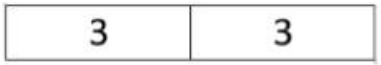
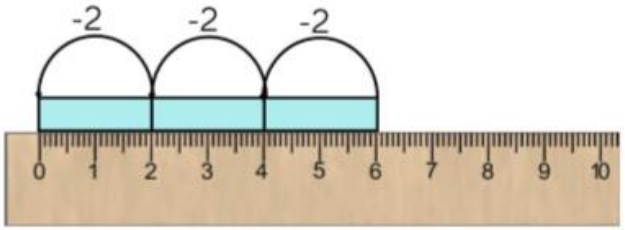
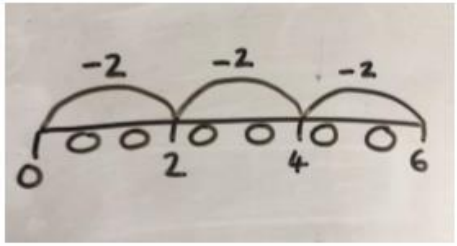
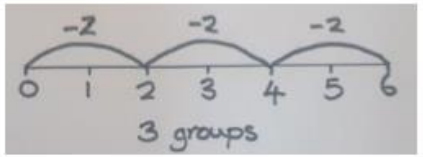
$$\begin{array}{r} 6 \\ \times\ 23 \\ \hline \\ \hline \end{array} \qquad \begin{array}{r} 23 \\ \times\ 6 \\ \hline \\ \hline \end{array}$$

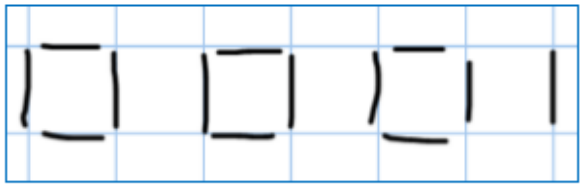
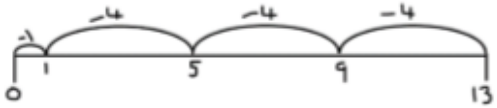
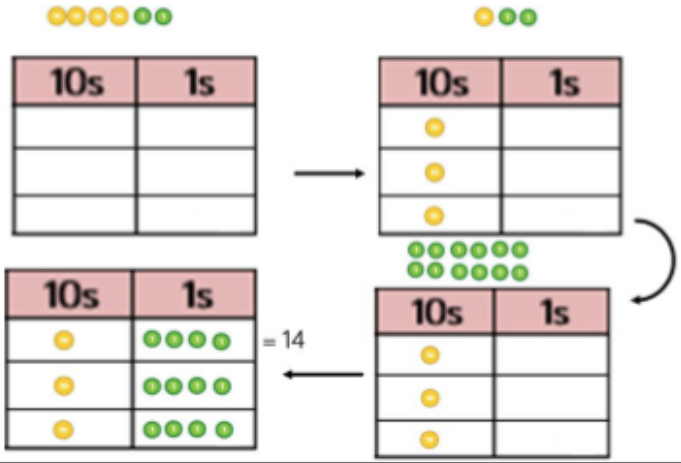
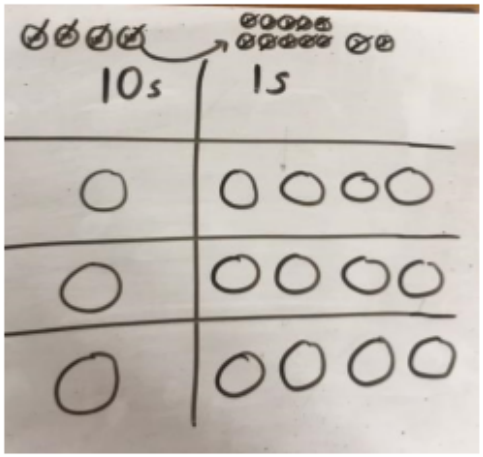
What is the calculation?
What is the product?



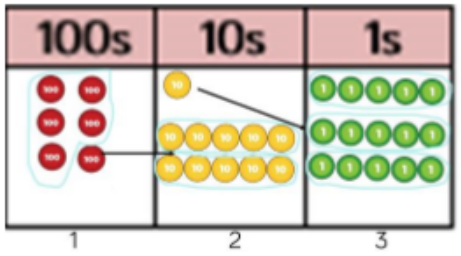
Calculation policy: Division

Key language: share, group, divide, divided by, half.

Concrete	Pictorial	Abstract
Sharing using a range of objects. 6 ÷ 2 	Represent the sharing pictorially. 	6 ÷ 2 = 3  Children should also be encouraged to use their 2 times tables facts.
Repeated subtraction using Cuisenaire rods above a ruler. 6 ÷ 2  3 groups of 2	Children to represent repeated subtraction pictorially. 	Abstract number line to represent the equal groups that have been subtracted. 

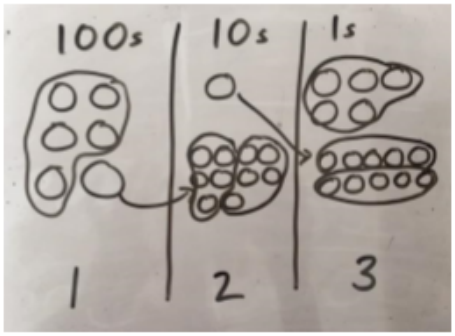
2d ÷ 1d with remainders using lollipop sticks. Cuisenaire rods, above a ruler can also be used. 13 ÷ 4 Use of lollipop sticks to form wholes- squares are made because we are dividing by 4.  There are 3 whole squares, with 1 left over.	Children to represent the lollipop sticks pictorially.  There are 3 whole squares, with 1 left over.	13 ÷ 4 = 3 remainder 1 Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line. '3 groups of 4, with 1 left over' 
Sharing using place value counters. 42 ÷ 3 = 14 	Children to represent the place value counters pictorially. 	Children to be able to make sense of the place value counters and write calculations to show the process. 42 ÷ 3 42 = 30 + 12 30 ÷ 3 = 10 12 ÷ 3 = 4 10 + 4 = 14

Short division using place value counters to group.
615 ÷ 5



1. Make 615 with place value counters.
2. How many groups of 5 hundreds can you make with 6 hundred counters?
3. Exchange 1 hundred for 10 tens.
4. How many groups of 5 tens can you make with 11 ten counters?
5. Exchange 1 ten for 10 ones.
6. How many groups of 5 ones can you make with 15 ones?

Represent the place value counters pictorially.

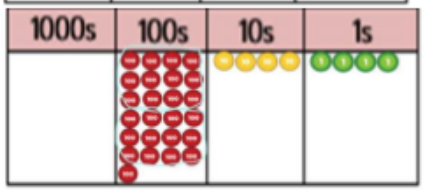


Children to the calculation using the short division scaffold.

$$5\overline{)615}^{\,123}$$

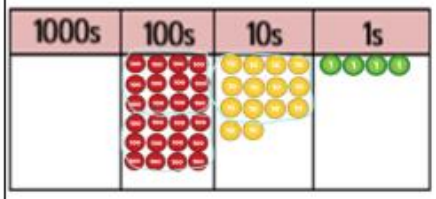
Long division using place value counters
2544 ÷ 12

We can't group 2 thousands into groups of 12 so will exchange them.



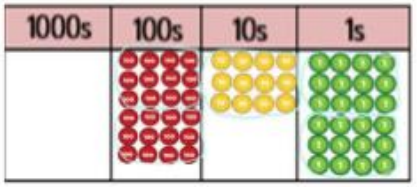
We can group 24 hundreds into groups of 12 which leaves with 1 hundred.

$$12\overline{)2544}^{\,02}$$
$$\underline{24}$$
$$1$$



After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens.

$$\begin{array}{r} 021 \\ 12\overline{)2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 2 \end{array}$$

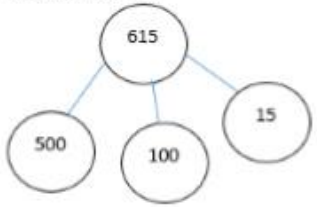


After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder.

$$\begin{array}{r} 0212 \\ 12\overline{)2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 24 \\ 24 \\ \hline 0 \end{array}$$

Conceptual variation; different ways to ask children to solve 615 ÷ 5

Using the part whole model below, how can you divide 615 by 5 without using short division?



I have £615 and share it equally between 5 bank accounts. How much will be in each account?

615 pupils need to be put into 5 groups. How many will be in each group?

$5\overline{)615}$

615 ÷ 5 =

☐ = 615 ÷ 5

What is the calculation?
What is the answer?

	Addition Key Vocabulary
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. **Video clips: Using a range of equipment and strategies to reinforce addition statements / bonds to 10**
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 addition. • Recognise place value of each digit in 3-digit numbers (hundreds, tens, ones). • Continue to practise a wide range of mental addition strategies, ie. number bonds, adding the nearest multiple of 10, 100, 100 and adjusting, using near doubles, partitioning and recombining.
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. • Add numbers with more than 4 digits using formal written method of columnar addition.
Year 6	**Key vocabulary**: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, „carry", expanded, compact, vertical, thousands, hundreds, digits, inverse, decimal places, decimal point, tenths, hundredths, thousandths **Key skills for addition at Y6:** • Perform mental calculations, including with mixed operations and large numbers, using and practising a range of mental strategies. • Solve multi-step problems in context, deciding which operations and methods to use and why. • Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.

	• Read, write, order and compare numbers up to 10 million and determine the value of each digit. • Round any whole number to a required degree of accuracy. • Pupils understand how to add mentally with larger numbers and calculations of increasing complexity.

	Subtraction Key Vocabulary
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 (ie 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 be-tween, 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 Key Vocabulary
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 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240) • Solve simple problems in contexts, deciding which operations and methods to use. • Develop efficient mental methods to solve a range of problems e.g. using commutativity (**4 × 12 × 5** = 4 × 5 × 12 **= 20 × 12** = 240) and for missing number problems x 5 = 20, 3 x = 18, x = 32
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 (thousands, hundreds, tens, and ones) • Use place value, known facts and derived facts to multiply mentally, e.g. multiply by 1, 10, 100, by 0, or to multiply 3 numbers. • Use commutativity and other strategies mentally 3 x 6 = 6 x 3 , 2 x 6 x 5 = 10 x 6 , 39x7 = 30 x 7 + 9 x 7. • Solve problems with increasingly complex multiplication in a range of contexts.
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 (as Y4).** • 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 Key Vocabulary
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 x, ÷ and = signs. • Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.

	• Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.
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 multiplied by a one-digit numbers, using mental and progressing to for-mal written methods. • Solve problems, in contexts, and including missing number problems, involving multiplication and division. • Pupils develop efficient mental methods, for example, using multiplication and division facts (e.g. using 3 × 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (30 × 2 = 60, so 60 ÷ 3 = 20 and 20 = 60 ÷ 3). • Pupils develop reliable written methods for division, starting with calculations of 2-digit numbers by 1-digit numbers and progressing to the formal written method of short division.
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 × 3 = 600 so 600 ÷ 3 = 200 • Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as three cakes shared equally between 10 children.

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 ÷ 4 = 24 r 2 = 241/2 = 24.5 ≈ 25). • Solve problems involving combinations of all four operations, including understanding of the equals sign, and including division for scaling by different fractions and problems involving simple rates.
Year 6	**Key Vocabulary: As previously, & common factor** **Key number skills needed for division at Y6:** • Recall and use multiplication and division facts for all numbers to 12 x 12 for more complex calculations(as in Y4 and Y5) • 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.