Our Lady of the Rosary RC Primary School

Calculation Policy

Our Journey

Love God

Others First

Respect All

Date of Policy: Autumn 2018

Date of Review: Autumn 2020

Introduction and Rationale

This calculation policy sets out expectations for the mastery of addition, subtraction, multiplication and division as written in the National Curriculum 2014 as well as the progression of written methods as used at Our Lady of the Rosary RC Primary School.

It is very important that pupils are taught according to the stage at which they are currently working, being moved onto the next stage as soon as they are ready, or working at a lower stage until they are secure enough to move on.

Children should not be discouraged from using previously taught methods in which they are secure while new concepts are becoming embedded.

Although this policy focuses largely on written calculation methods, it is important to recognise that the ability to calculate mentally lies at the heart of numeracy; in every written method there is an element of mental processing and children need to develop the mental skills and methods to allow them to do this efficiently. However, written recording can help children to clarify their thinking and supports and extends the development of more fluent and sophisticated strategies.

The long-term aim is for children to be able to select an efficient method that is appropriate for a given task. They should do this by always asking themselves:

- 'Can I do this in my head?'
- 'Can I do this in my head using equipment or drawings?'
- 'Do I need to use a written method and, if so, which one would be most efficient?'

It is important that calculations are given a real life context or problem solving approach where possible 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.

Please note: early learning in number and calculation in Reception follows the Development Matters EYFS curriculum, and this calculation policy is designed to build on progressively from the content and methods established in the Early Years Foundation Stage.

Our Aims

- To ensure consistency and progression in our approach to calculation.
- To ensure that children develop efficient and reliable mental and written methods of calculation for all operations.
- To ensure that children have a mastery of these methods, using them accurately and appropriately with confidence and understanding.
- To ensure that all adults, including parents/carers, are able to support children in an effective and coherent manner

How to use this policy (Teachers)

- Use the policy as the basis of your planning but ensure that you use previous or following year's guidance to allow for personalised learning.
- Always use assessment for learning to identify suitable next steps in calculation for groups of children.
- Always use suitable resources, models and images to support children's understanding of calculation as appropriate.
- If, at any time, children are making significant errors, return to the previous stage in calculation and/or previous resources.
- Encourage children to make efficient choices about the methods they use when solving problems.

How to use this policy (parents/carers)

When supporting your child with a particular calculation, use the policy to identify with your child the method that they are most familiar with. Children should:

- Choose the method that they feel is most suited to the task.
- Use suitable resources, models and images to support children's understanding of calculation, as appropriate (e.g. counters, number lines).
- If, at any time, you child is making significant errors, try returning to the previous stage in calculation and/or previous resources.

Vocabulary

The following key vocabulary below should be used age appropriately. Please note:

- 'Sum' should only be used to refer to addition calculations, and not in a more general sense (e.g. 'Let's do these sums') when referring to calculations which are not addition.
- When transferring units, tens, hundreds, etc, from one place value column to another when using the column method for addition and subtraction, this should be referred to as 'moving' rather than 'carrying' ,'borrowing' or 'exchanging'. E.g. 'We can't take away 6 from 3 so we move 10 across from the tens to make 3 into 13'.
- '=' should not always be expressed verbally as 'equals'. It is useful to sometimes use the terminology 'is the same as' to clarify the meaning of the symbol. E.g when reading aloud 3+3=6 you should say, 'Three plus three is the same as six'

Addition	Subtraction
Add, addition, more, plus, increase, jump forward, count on, sum, total, altogether, get some more, tens, units/ones, hundreds, thousands, place value, digit, value, combine, total, score, double, near double, how many more to make, inverse,	Subtract, take away, minus, leave, jump back, count back, how many are left/leftover? Difference between, half, halve, how many more/fewer is…than…? How much more/less is…? equals, inverse
Multiplication	Division
Lots of, groups of, times, product, multiply, multiplied by, multiple of, once, twice, three times…ten times, repeated addition, array, double, inverse	Divide, share, share equally, halve, one each, two each, three each…, group in pairs, threes, tens, equal groups of, divided by, divided into, divisible by, remainder, factor, quotient, inverse

Written methods for all operations.

It is important that children's mental methods of calculation are practised on a regular basis and secured alongside their learning and use of written methods.

The aim is that children use their mental methods when appropriate, but for calculations that they cannot do in their heads they use a written method appropriately and with confidence.

Children are taught and acquire secure mental methods of calculation and one written method of calculation for addition, subtraction, multiplication and division, which they know they can rely on when mental methods are not appropriate.

This policy shows that the possible stages of each written method for addition, subtraction, multiplication and division, is building towards a more refined method.

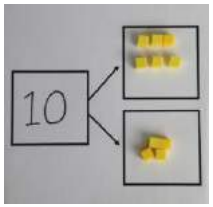
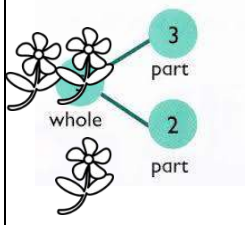
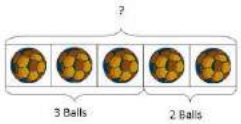
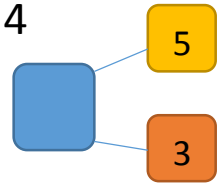
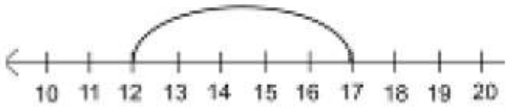
Addition

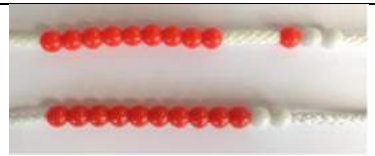
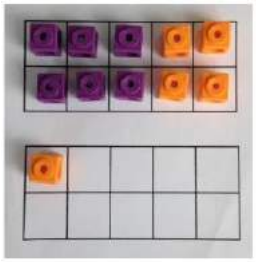
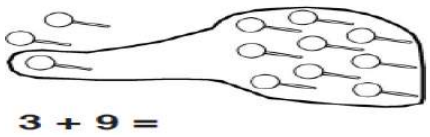
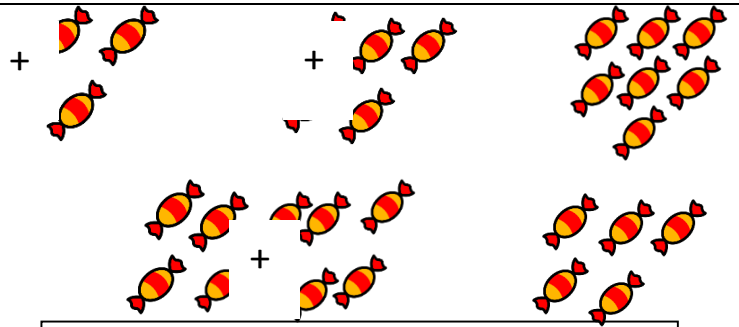
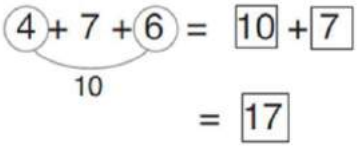
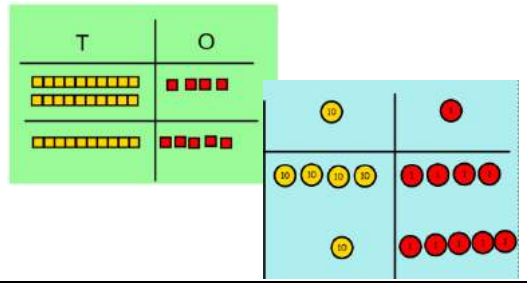
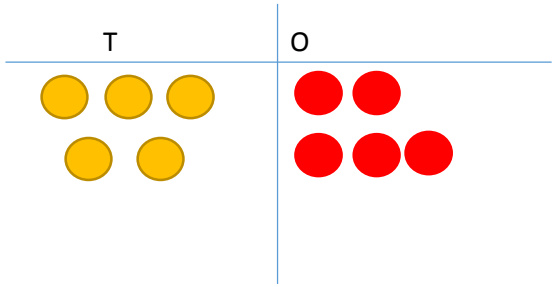
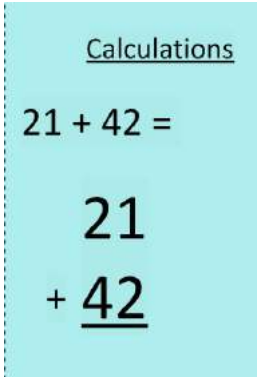
There are some key basic skills that children need to help with addition, which includes:

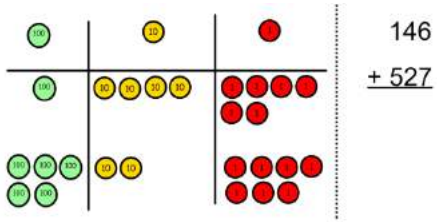
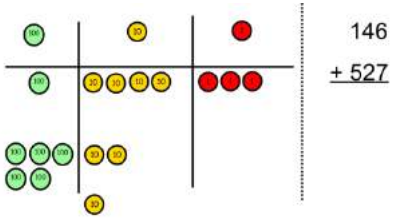
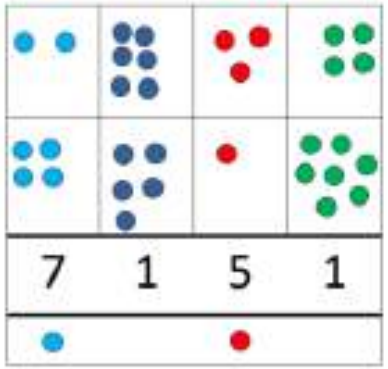
- counting (including in groups of 1, 2, 5, 10 and 100 across boundaries)
- estimating
- recalling all addition pairs to 10, 20 and 100 (7+3=10, 17+3=20, 70+30=100)
- knowing number facts to 10 (6+2=8)
- adding mentally a serious of one-digit numbers (5+8+4)
- adding multiples of 10 (60+70) or of 100 (600+700) using the related addition fact, 6+7, and their knowledge of place value
- partitioning two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways (432 into 400+30+2 and also into 300+120+12)
- understanding and using addition and subtraction as inverse operations

Using and applying is the key theme and one of the aims of National Curriculum and before children move onto the next stage in written calculation it is important that their skills are broadened through their use and application in a range of contexts, these include:

- using inverse 123 + 456 = 579 so 579 – 123 = 456 and 579 – 456 = 123
- missing box questions 476 + ☐ = 567
- using units of measure including money and time £3.45 + £10.81
- word problems If the stadium has 34 567 home fans inside and 4983 away fans. How many fans are there?
- open ended investigations How many ways can you partition the number 456?

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

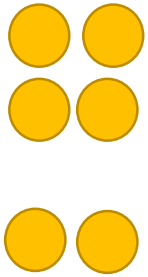
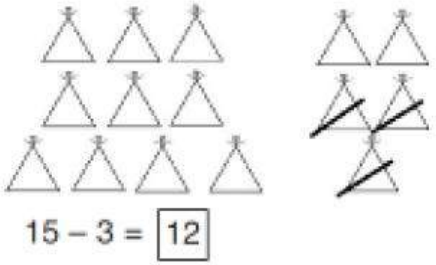
Regrouping to make 10.	 6 + 5 = 11  Start with the bigger number and use the smaller number to make 10.	 3 + 9 = Use pictures or a number line. Regroup or partition the smaller number to make 10. 9 + 5 = 14 1 4 +1 +4 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	7 + 4= 11 If I am at seven, how many more do I need to make 10. How many more do I add on now?
Adding three single digits	4 + 7 + 6= 17 Put 4 and 6 together to make 10. Add on 7.  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.	 Combine the two numbers that make 10 and then add on the remainder.
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 = 21 + 42

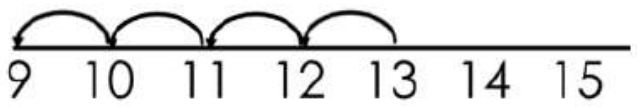
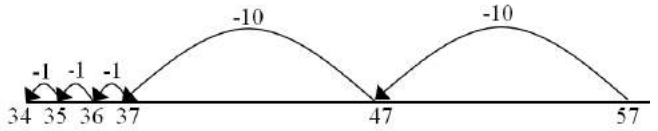
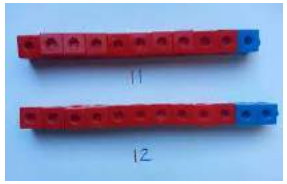
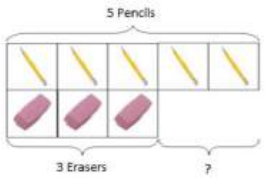
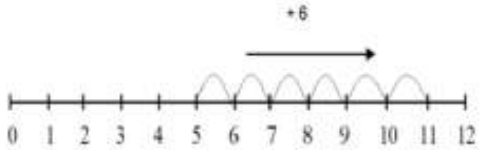
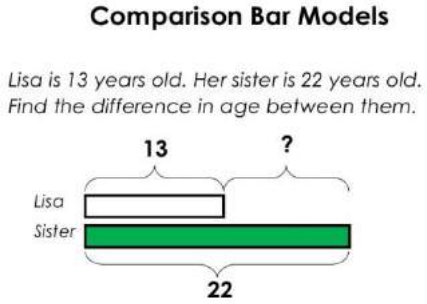
Column method- regrouping	Make both numbers on a place value grid.  146 + 527 Add up the units and exchange 10 ones for one 10.  146 + 527 Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added. This can also be done with Base 10 to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100. As children move on to decimals, money and decimal place value counters can be used to support learning.	Children can draw a pictoral representation of the columns and place value counters to further support their learning and understanding.  7 1 5 1	Start by partitioning the numbers before moving on to clearly show the exchange below the addition. 20 + 5 40 + 8 60 + 13 = 73 As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here. 536 + 85 621 1 1 72.8 + 54.6 127.4 1 1 £23.59 + £7.55 £31.14 1 1 1 23.361 9.080 59.770 + 1.300 93.511 2 1 2

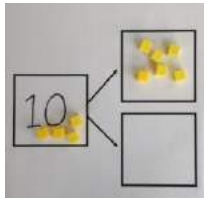
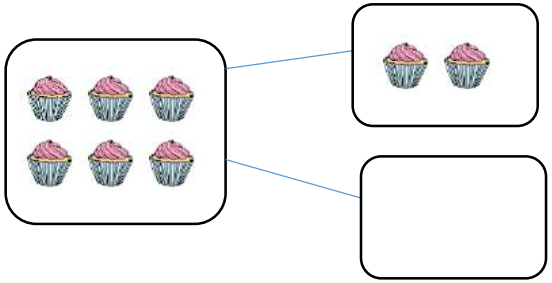
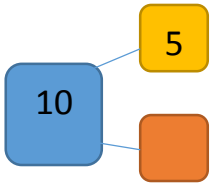
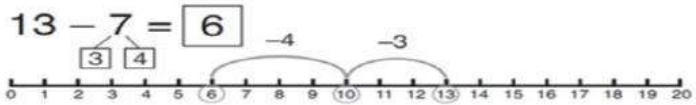
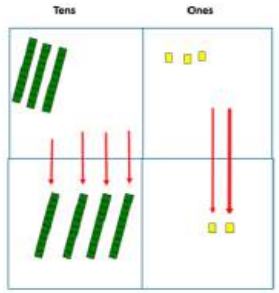
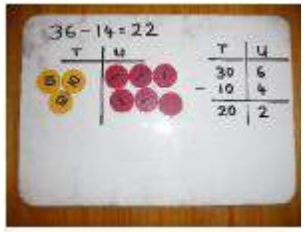
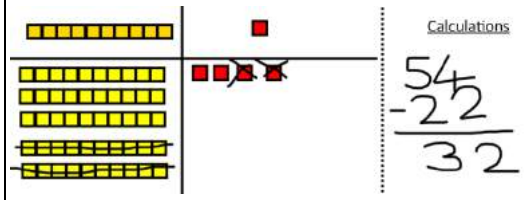
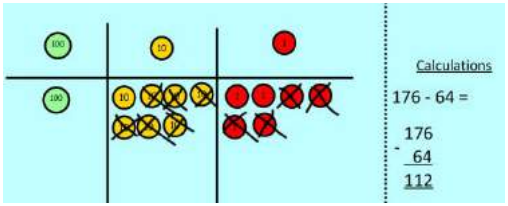
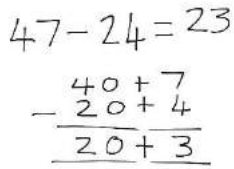
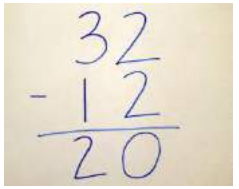
Subtraction

This policy shows the possible stages of each written method for subtraction, each stage building towards a more refined method. There are some key basic skills that children need to help with subtraction, which include:

- counting
- estimating
- recalling all addition pairs to 10, 20 and 100 along with their inverses (7+3=10, 10-3=7, 17+3=20, 20-3=17, 70+30=100, 100-30=70)
- knowing number facts to 10 and their inverses (6+2=8, 8-2=6)
- subtracting multiples of 10 (160-70) using the related subtraction fact, 16-7, and their knowledge of place value
- partitioning two-digit and three- digit and applying it numbers into multiples of 100, 10 and 1 in different ways (432 into 400+30+2 and also 300+120+12)
- understanding and using subtraction and addition as inverse operations

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

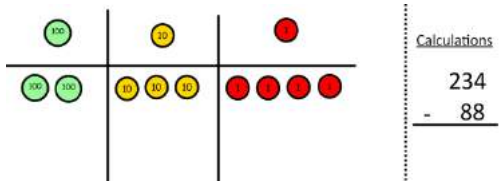
Counting back	Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.  13 – 4 Use counters and move them away from the group as you take them away counting backwards as you go. 	Count back on a number line or number track  Start at the bigger 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 13 in your head, count back 4. What number are you at? Use your fingers to help.
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. Draw bars to find the difference between 2 numbers.  	Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.

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 =	Use a pictorial representation of objects to show the part part whole model. 	 Move to using numbers within the part whole model.
Make 10	14 – 9 =  Make 14 on the ten frame. Take away the four first to make 10 and then takeaway one more so you have taken away 5. You are left with the answer of 9.	 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.	16 – 8= How many do we take off to reach the next 10? How many do we have left to take off?
Column method without regrouping	 Use Base 10 to make the bigger number then take the smaller number away. Show how you partition numbers to subtract. Again make the larger number first. 	 Draw the Base 10 or place value counters alongside the written calculation to help to show working. 	 This will lead to a clear written column subtraction. 

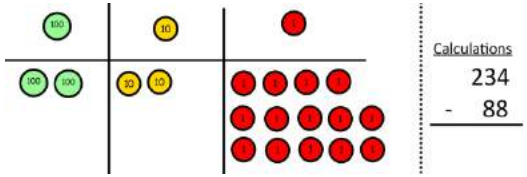
Column method with regrouping

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

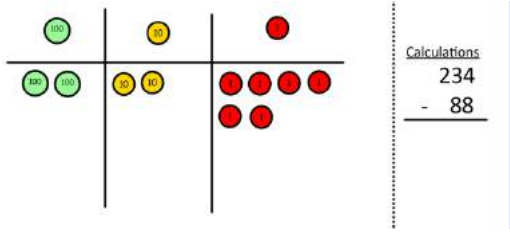
Make the larger number with the place value counters



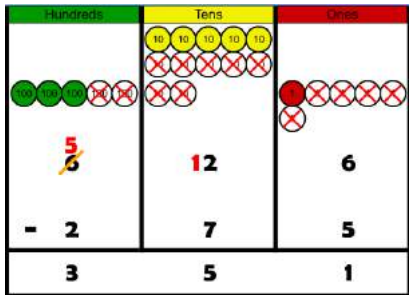
Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.



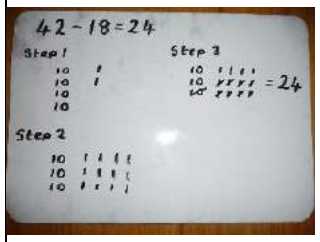
Now I can subtract my ones.



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

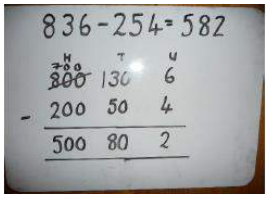


Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.

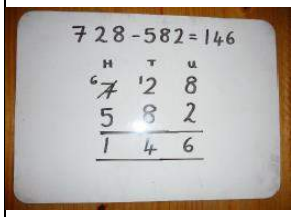


When confident, children can find their own way to record the exchange/regrouping.

Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup.

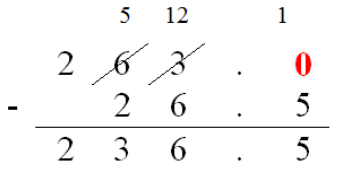


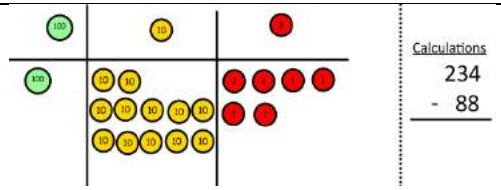
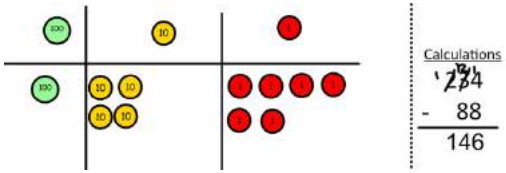
Children can start their formal written method by partitioning the number into clear place value columns.



Moving forward the children use a more compact method.

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

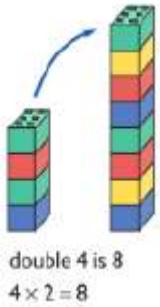
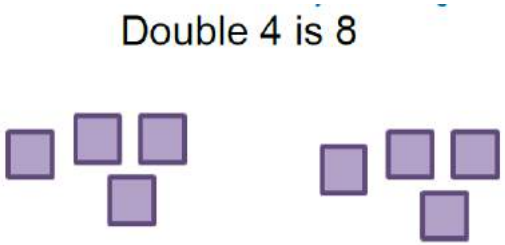
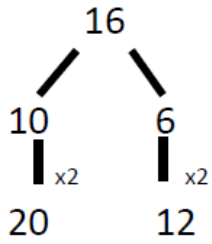


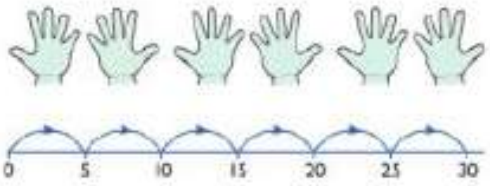
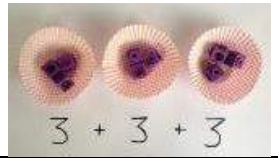
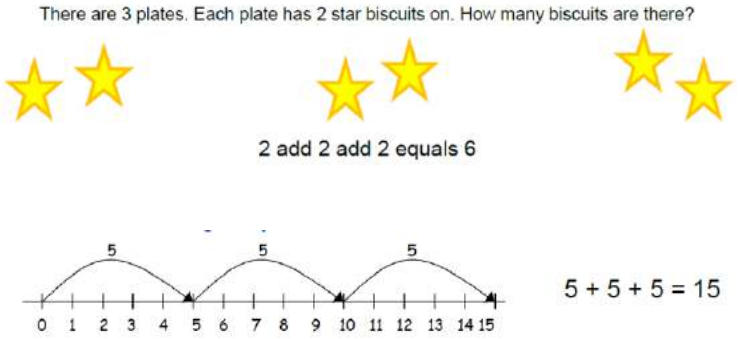
	 Calculations 234 - 88 Now I can take away eight tens and complete my subtraction  Calculations ~~2~~ 234 - 88 146 Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.		

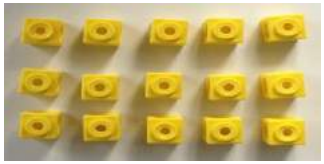
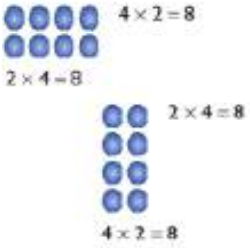
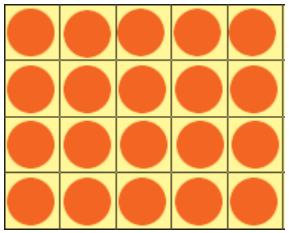
Multiplication

This policy shows the stages of each written method for multiplication, each stage building towards a more refined method. These are some key basic skills that children need to help with multiplication, which include:

- counting
- estimating
- understanding multiplication as repeated addition
- recalling all multiplication facts to 12x12
- partitioning numbers into multiples of one hundred, ten and one-digit working out products (70x5, 70x50, 700x50) using the related fact 7x5 and their knowledge of place value
- adding two or more single-digit numbers mentally
- adding multiples of 10 (60 + 70) or of 100 (600+700) using the related addition fact, 6+7, and their knowledge of place value
- adding combinations of whole numbers
- understanding and using division and multiplication as inverse operations

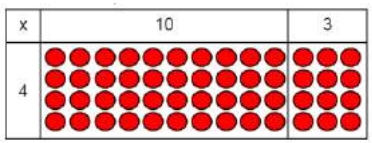
Objective and Strategies	Concrete	Pictorial	Abstract
Doubling	Use practical activities to show how to double a number.  	Draw pictures to show how to double a number.  	 Partition a number and then double each part before recombining it back together.

Counting in multiples	  Count in multiples supported by concrete objects in equal groups.	 Use a number line or pictures to continue support in counting in multiples.	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25 , 30
Repeated addition	   Use different objects to add equal groups.	 	Write addition sentences to describe objects and pictures. 

Arrays- showing commutative multiplication	Create arrays using counters/ cubes to show multiplication sentences.  	Draw arrays in different rotations to find **commutative** multiplication sentences.   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 x 3 = 15 3 x 5 = 15

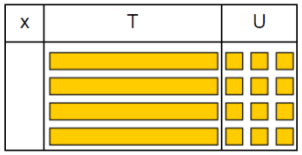
Grid Method

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



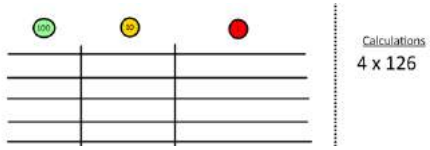
4 rows of 10
4 rows of 3

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

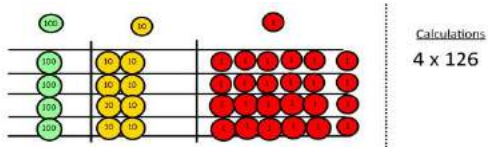


4 rows of 13

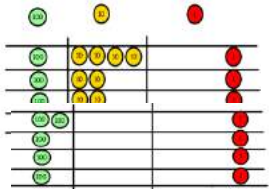
Move on to place value counters to show how we are finding groups of a number.We are multiplying by 4 so we need 4 rows.



Fill each row with 126.



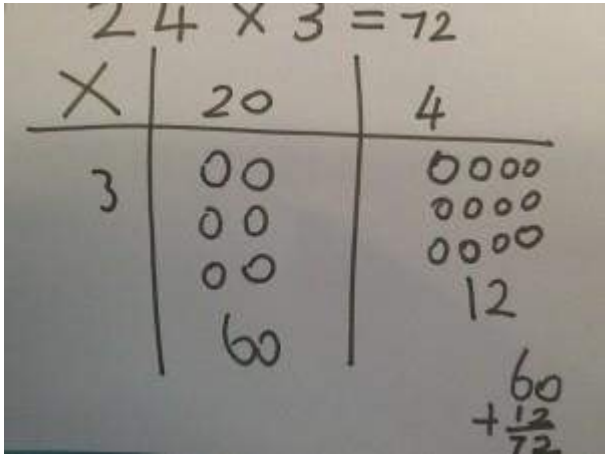
Add up each column, starting with the ones making any exchanges needed.



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.

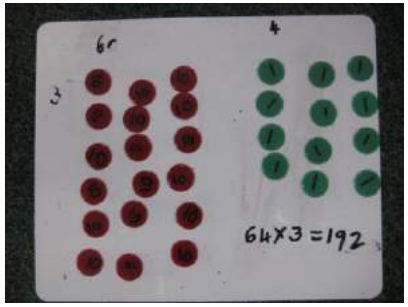
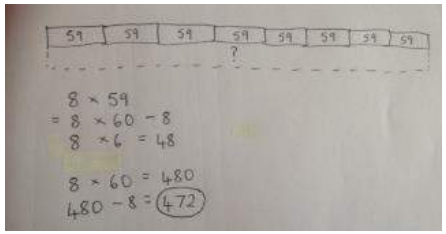
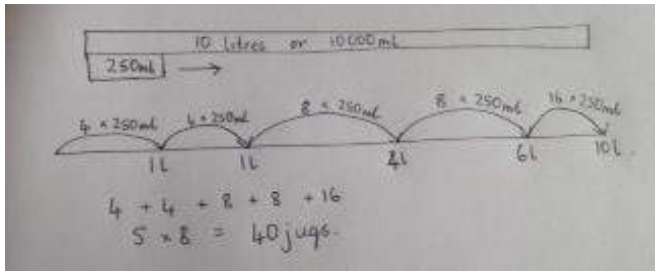
×	30	5
7	210	35

210 + 35 = 245

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

	10	8
10	100	80
3	30	24

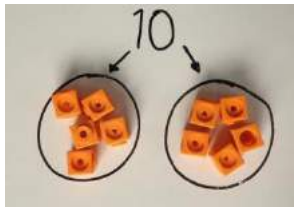
X	1000	300	40	2
10	10000	3000	400	20
8	8000	2400	320	16

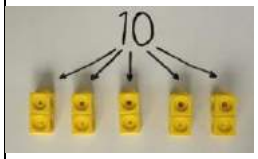
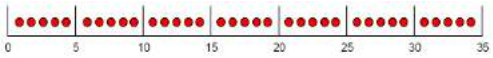
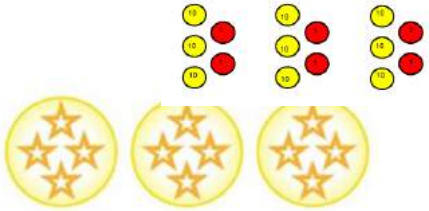
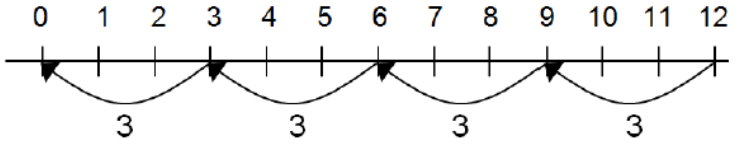
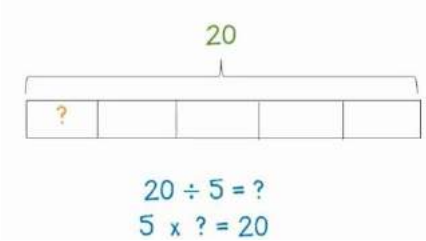
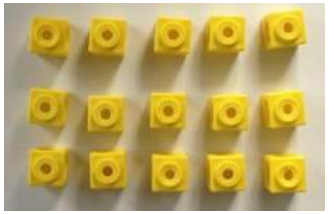
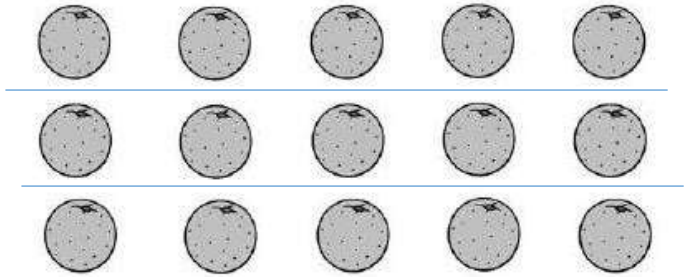
Column multiplication	Children can continue to be supported by place value counters at the stage of multiplication.  It is important at this stage that they always multiply the ones first and note down their answer followed by the tens which they note below.	Bar modelling and number lines can support 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. 32 x 24 8 (4 x 2) 120 (4 x 30) 40 (20 x 2) 600 (20 x 30) 768 This moves to the more compact method. 74 × 63 12 210 240 + 4200 4662

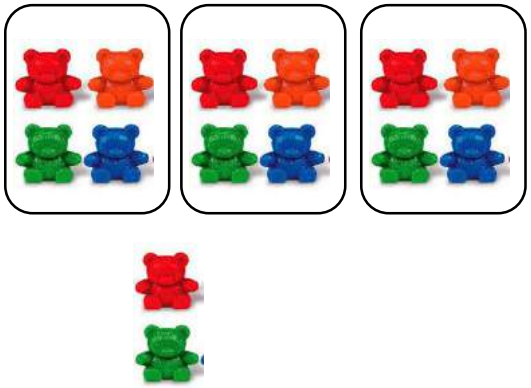
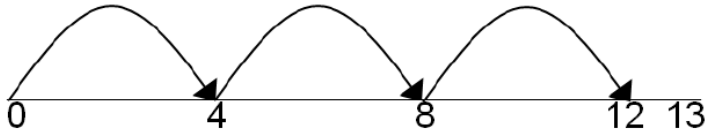
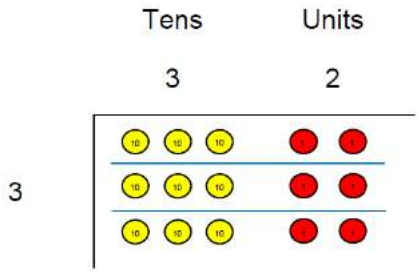
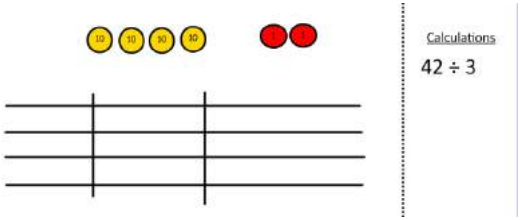
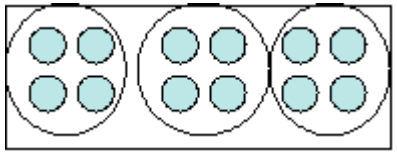
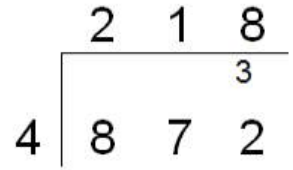
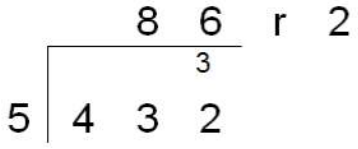
Division

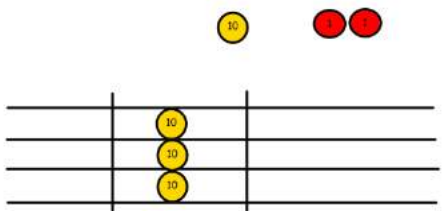
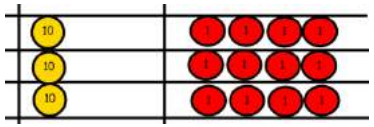
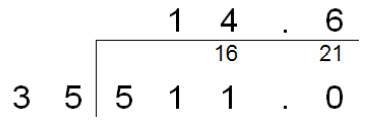
There are some key basic skills that children need to help with division, which include:

- counting
- estimating
- understanding division as repeated subtraction
- partitioning two-digit and three-digit numbers into multiples of 100, 10 and 1 in different ways (432 into 400+30+2 and also into 300+120+12)
- recalling multiplication facts and division facts to 12x12
- recognising multiples of one-digit numbers and dividing multiples of 10 or 100 by a single-digit number using their knowledge of division facts and place value
- knowing how to find a remainder working mentally, for example, find the remainder when 48 is divided by 5
- understanding and using division and multiplication as inverse operations

Objective and Strategies	Concrete	Pictorial	Abstract
Sharing objects into groups	 I have 10 cubes, can you share them equally in 2 groups? 	Children use pictures or shapes to share quantities.  $8 \div 2 = 4$	Share 9 buns between three people. $9 \div 3 = 3$

Division as grouping	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.   96 ÷ 3 = 32 	Use a number line to show jumps in groups. The number of jumps equals the number of groups.  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.  	28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group?
Division within arrays	 Link division to multiplication by creating an array and thinking about the number sentences that can be created. Eg 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 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 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7

Division with a remainder	14 ÷ 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. 
Short division	 Use place value counters to divide using the bus stop method alongside  42 ÷ 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.	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. 

	 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.		Finally move into decimal places to divide the total accurately. 

Appendix

Addition and Subtraction National Curriculum Requirements

Year 1

Pupils should be taught to:

- I can read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs.
- I can represent and use number bonds and related subtraction facts within 20 (e.g. rapid recall of 7 + 5 = 12 and 12 – 7 = 5).
- I can add and subtract one-digit and two-digit numbers to 20, including zero (e.g. 15 – 0 = 15).
- I can solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems (e.g. 7= ◯– 9).

Year 2

Pupils should be taught to:

- I can solve problems with addition and subtraction:
  - using concrete objects and pictorial representations, including those involving numbers, quantities and measures;
  - applying their increasing knowledge of mental and written methods.
- I can recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 (e.g. 4 + 5 = 9, so 40 + 50 = 90).
- I can add and subtract numbers using concrete objects, pictorial representations, and mentally, including:
  - a two-digit number and ones (e.g. 24 + 2 = 26);
  - a two-digit number and tens (e.g. 24 + 20 = 44);
  - two two-digit numbers (e.g. 24 + 13 = 37);
  - adding three one-digit numbers (e.g. 4 + 6 + 2 = 12).
- I can show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot (e.g. 5 + 4 is the same as 4 + 5 but 5 – 4 is not the same as 4 – 5).
- I can recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems; e.g. If I know 9 + 7 = 16 then I can work out 7= ◯– 9)

Year 3

Pupils should be taught to:

- I can add and subtract numbers mentally, including:
  - a three-digit number and ones (e.g. 453 + 3 = 456);
  - a three-digit number and tens (e.g. 453 + 30 = 483);
  - a three-digit number and hundreds (e.g. 453 + 300 = 753).
- I can add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction.
- I can estimate the answer to a calculation and use inverse operations to check answers (e.g. If I know that 453 + 30 = 483 then I also know that 483 – 30 = 453).
- I can solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

Year 4

Pupils should be taught to:

- I can add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate (e.g. adding 4536 and 2653 using the column method).
- I can estimate and use inverse operations to check answers to a calculation (e.g. If I know that 453 + 30 = 483 then I also know that 483 – 30 = 453).
- I can solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.

Year 5

Pupils should be taught to:

- I can add and subtract whole numbers with more than 4 digits, including using formal columnar addition and subtraction written methods (e.g. adding 23 453 and 7653 using the column method).
- I can add and subtract numbers mentally with increasingly large numbers.
- I can use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy (e.g. rounding 23 453 + 7653 to 23 000 + 8000 to get an approximate answer).
- I can solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Year 6
Pupils should be taught to:

- I can perform mental calculations, including with mixed operations and large numbers
- I can use their knowledge of the order of operations to carry out calculations involving the four operations
- I can solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
- I can solve problems involving addition and subtraction, multiplication and division
- I can use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy

Multiplication and Division National Curriculum Requirements

Year 1
Pupils should be taught to:

- I can solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher (e.g. physically putting together 3 groups of 2 objects to find out that the total is 6).

Year 2
Pupils should be taught to:

- I can recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.
- I can calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs.
- I can show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot (e.g. 6 x 2 is the same as 2 x 6 but 6 ÷ 2 is not the same as 2 ÷ 6).
- I can solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

Year 3

Pupils should be taught to:

- I can recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.
- I can 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.
- I can solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems (e.g. eight times as long) and correspondence problems in which n objects are connected to m objects (e.g. 3 hats and 4 coats, how many different outfits?).

Year 4

Pupils should be taught to:

- I can recall multiplication and division facts for multiplication tables up to 12 ×12.
- I can use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers.
- I can recognise and use factor pairs (e.g. 3 and 4 are a factor pair for 12 because when you multiply them together you get 12) and commutativity (3 x4 is the same as 4 x 3) in mental calculations.
- I can multiply two-digit and three-digit numbers by a one-digit number using formal written layout.
- I can solve problems involving multiplying and adding, including using the distributive law (i.e. multiplying a number by a group of numbers added together is the same as doing each multiplication separately, e.g. 13 × (2 + 4) = 13×2 + 13×4) to multiply two digit numbers by one digit, integer scaling problems (e.g. eight times as long) and harder correspondence problems such as n objects are connected to m objects (e.g. 13 hats and 4 coats, how many different outfits?).

Year 5

Pupils should be taught to:

- I can identify multiples and factors, including finding all factor pairs of a number (e.g. 12 has the factor pairs 1-12, 2-6, 3-4), and common factors of two numbers (e.g. 3 is a factor of both 6 and 12).
- I know and can use the vocabulary of prime numbers (a prime number can be divided evenly only by 1 or itself and it must be a whole number greater than 1, e.g. 7), prime factors (a factor that is a prime number, e.g. the prime factors of 15 are 3 and 5) and composite (non-prime) numbers.
- I can establish whether a number up to 100 is prime and recall prime numbers up to 19.
- I can multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers.
- I can multiply and divide numbers mentally drawing upon known facts.

- I can 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 (e.g. If I need enough buses to transport 65 children and each bus holds 20 children, then I will need 4 buses because 65 ÷ 20 = 3 r 5).
- I can multiply and divide whole numbers and those involving decimals by 10,100 and 1000.
- I can recognise and use square numbers (the number we get after multiplying an integer (not a fraction) by itself, e.g. 4 × 4 = 16, so 16 is a square number) and cube numbers (the number we get after multiplying an integer by itself twice, e.g. 4 x 4 x 4 = 64), and the notation for squared (2) and cubed (3).
- I can solve problems involving multiplication and division including using my knowledge of factors and multiples, squares and cubes.
- I can solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign
- I can solve problems involving multiplication and division, including scaling by simple fractions (e.g. half as long) and problems involving simple rates (e.g. 3 oranges for £1).

Year 6

Pupils should be taught to:

- I can multiply multi-digit numbers up to 4 digits by a two-digit whole number (e.g. 1886 x 23) using the formal written method of long multiplication.
- I can divide numbers up to 4 digits by a two-digit whole number (e.g. 1986 ÷22) using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context (e.g. 2009 ÷ 82 = 24 r 41 = 24½ = 24.5 ≈ 25).
- I can divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context.
- I can perform mental calculations, including with mixed operations and large numbers.
- I can identify common factors, common multiples and prime numbers (see above for definitions).
- I can use my knowledge of the order of operations to carry out calculations involving the four operations (division and multiplication, left to right, before addition and subtraction, left to right)
- I can solve problems involving multiplication and division.
- I can use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.

Fractions National Curriculum Requirements

Year 1
Pupils should be taught to:

- I can recognise, find and name a half as one of two equal parts of an object, shape or quantity
- I can recognise, find and name a quarter as one of four equal parts of an object, shape or quantity.

Year 2
Pupils should be taught to:

- I can recognise, find, name and write fractions 1/3, ¼, 2/4 and ¾ of a length, shape, set of objects or quantity
- I can write simple fractions for example, ½ of 6 = 3, 1 of 6 = 3 and recognise the equivalence of 2/4 and ½

Year 3
Pupils should be taught to:

- I can count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10
- I can recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators
- I can recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators
- I can recognise and show, using diagrams, equivalent fractions with small denominators
- I can add and subtract fractions with the same denominator within one whole [for example, 5/7 +1/7 = 6/7
- I can compare and order unit fractions, and fractions with the same denominators
- I can solve problems that involve all of the above.

Year 4
Pupils should be taught to:

- I can recognise and show, using diagrams, families of common equivalent fractions
- I can count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten.
- I can solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number
- I can add and subtract fractions with the same denominator
- I can recognise and write decimal equivalents of any number of tenths or hundredths
- I can recognise and write decimal equivalents to ¼, ½, 3/4

- I can find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths
- I can round decimals with one decimal place to the nearest whole number
- I can compare numbers with the same number of decimal places up to two decimal

Plus

- I can solve simple measure and money problems involving fractions and decimals to two decimal places.

Year 5

Pupils should be taught to:

- I can compare and order fractions whose denominators are all multiples of the same number
- I can identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths
- I can recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number [for example, 2/5 +4/5 =6/5 = 1 1/5)
- I can add and subtract fractions with the same denominator and denominators that are multiples of the same number
- I can multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams
- I can read and write decimal numbers as fractions [for example, 0.71 = 71/100]
- I can recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents
- I can round decimals with two decimal places to the nearest whole number and to one decimal place
- I can read, write, order and compare numbers with up to three decimal places
- I can solve problems involving number up to three decimal places
- I can recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal
- I can solve problems which require knowing percentage and decimal equivalents of ½, ¼, 1/5, 2/5, 4/5 and those fractions with a denominator of a multiple of 10 or 25.

Year 6

Pupils should be taught to:

- I can use common factors to simplify fractions; use common multiples to express fractions in the same denomination
- I can compare and order fractions, including fractions > 1
- I can add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions
- I can multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, ¼ x ½ = 1/8)
- I can divide proper fractions by whole numbers [for example, 1/3 ./. 2 = 1/6
- I can associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, 3/8)

- I can identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places.