

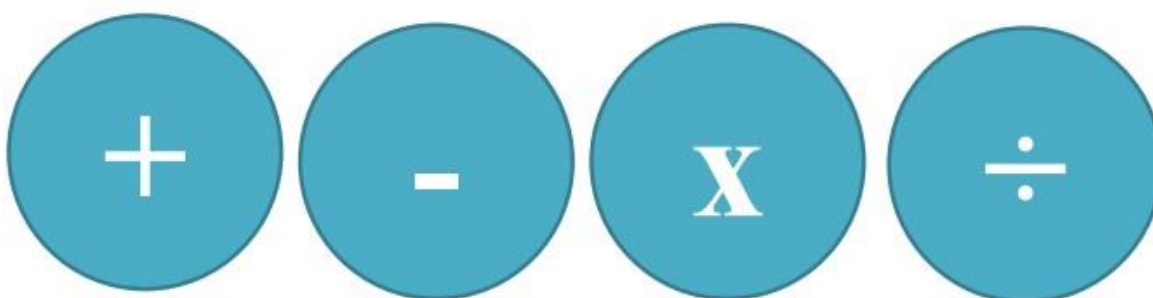
# Otterham CP School

## Calculations Policy



This policy focuses on children's use and understanding of Mathematics, including:

Number Fluency, Reasoning and Problem Solving



Reviewed: January 2019

## Introduction

The purpose of this document is to create a personalised, up-to-date policy, reflecting the requirements of the new curriculum and more importantly, the needs of our pupils.

This policy aims to develop, model and explain core understandings and mathematical principles and show progression, to ensure consistency in the teaching and learning of mathematics in our school.

The focus of this policy is the calculation of the four mathematical operations, with an emphasis on written strategies to clarify processes and understanding, and to make direct links to mental calculating. It is crucial that these mental strategies are discretely taught and linked to written strategies and not confined to starter activities in lessons.

The overall aims of this policy are that when children leave primary school they:

- have a secure knowledge of number facts and a good understanding of the four operations, supported by a fluency and understanding of the fundamentals of mathematics;
- know the best strategy to use, estimate before calculating, systematically break problems down into a series of simpler steps with perseverance, as well as use estimation and rounding to check that an answer is reasonable in size;
- are able to use this knowledge and understanding to carry out calculations mentally, solve problems of increasing complexity and develop an ability to recall and apply knowledge rapidly;
- make use of diagrams and informal notes/ jottings to help record steps and partial answers when using mental methods;
- have an efficient, reliable, compact written method of calculation for each operation, which they can apply with confidence when undertaking calculations;
- be able to identify when a calculator is the best tool for the task and use this primarily as a way of checking, rather than simply a way of calculating;
- be able to explain their strategies to calculate and, using spoken language, give mathematical justification, argument or proof.

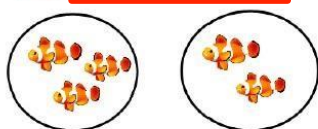
Foundation Stage 1 - Addition

# Curriculum 2014 Statutory Requirements

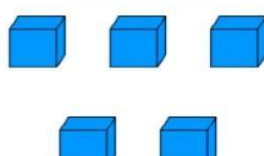
## Pupils should be taught to:

- Birth to 11 months – notice changes in number of objects/ images.
- 8 to 20 months - has some understanding that things exist, even when out of sight.
- 16 to 26 months – begins to organise and categorise objects by sorting.
- 22 to 36 months – knows that a group of things changes in quantity when something is added or taken away.
- 30 to 50 months – separates a group of 3 or 4 objects in different ways beginning to recognise that the total is still the same.
- 40 to 60 months – finds the total number of items in two groups by counting all of them in practical activities and discussions. Begins to use the vocabulary involved in addition and subtraction.

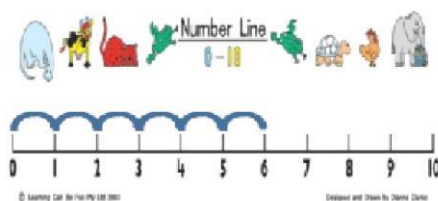
### 1 Using pictures



### 2 Using objects



**NUI2 REG**



## Teaching points:

Use number lines 0-10

Explore numbers in the environment inside and out

Use a range of objects

Model in role play areas

## Key vocabulary

Add, more, and, make, altogether, count on.

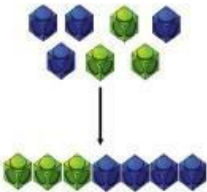
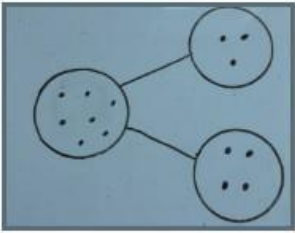
Foundation Stage 2 – Addition

# Curriculum 2014 Statutory Requirements

Pupils should be taught to:

Early Learning Goals:

- Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number.
- Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer.
- Count on from first group to add two groups of objects.

Concrete	Pictorial
<p>Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars).</p> 	<p>Children to represent the cubes using dots or crosses. They could put each part on a part whole model too.</p> 

Teaching points:


Counting and reading numbers to 20

Doubling numbers using objects

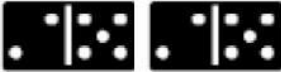
Share board games


Model in role play

Varied examples may include:




$5 + ? = 10$







$9 + 1$



$8 + 2$



$5 + 5$



$3 + 7$

6


+

3

=

9

Put biggest number in your head and count on using fingers or objects



## Key vocabulary

Add, more, and, make, altogether, total, equal to, equals, most, count on, double, one more, two more...

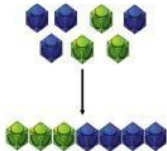
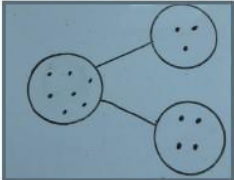
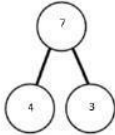

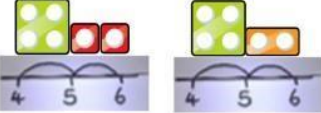
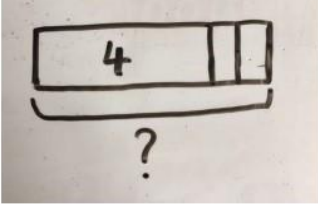


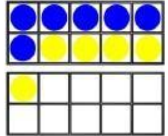
Year 1 – Addition

# Curriculum 2014 Statutory Requirements

## Pupils should be taught to:

- Read, write and interpret mathematical statements involving addition (+) and equals (=) signs – THIS MEANS THE SAME AS – relate this to balance sums and scales.
- Represent and use number bonds and related subtraction facts within 20.
- Add one- digit and two digit numbers to 20, including 0.
- Solve one-step problems that involve addition, using concrete objects and pictorial representations, and missing number problems such as  $9 = ? + 7$ .

## Teaching points:

Concrete	Pictorial	Abstract
<p>Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars).</p> 	<p>Children to represent the cubes using dots or crosses. They could put each part on a part whole model too.</p> 	<p><math>4 + 3 = 7</math> Four is a part, 3 is a part and the whole is seven.</p> 
<p>Counting on using number lines using cubes or Numicon.</p>  	<p>A bar model which encourages the children to count on, rather than count all.</p> 	<p>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? <math>4 + 2</math></p> 
<p>Regrouping to make 10; using ten frames and counters/cubes or using Numicon.</p> <p><math>6 + 5</math></p> 	<p>Children to draw the ten frame and counters/cubes.</p> 	<p>Children to develop an understanding of equality e.g.</p> <p><math>6 + \square = 11</math>  <math>6 + 5 = 5 + \square</math>  <math>6 + 5 = \square + 4</math></p>

## Key vocabulary (new words to year 1 are in red)

add, more, plus, and, make, altogether, total,

equal to, equals, most, count on, double, one more, two more, near double, how many more to make...? How many more is... than...? How much more is...? =, equals, sign, is the same as.

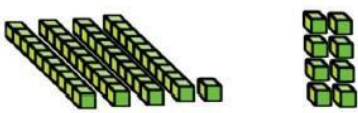
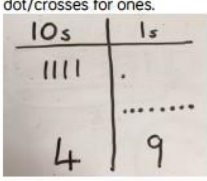
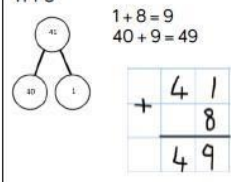
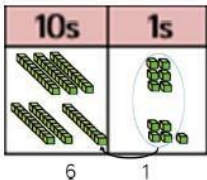
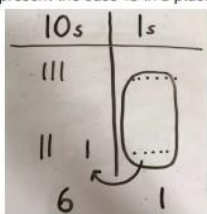

Year 2 - Addition

# Curriculum 2014 Statutory Requirements

## Pupils should be taught to:

- Solve problems with addition using concrete objects and pictorial representations, including those involving numbers, quantities and measures, and applying their increasing knowledge of mental and written methods.
- Recall and use addition facts to 20 fluently, and derive and use related facts up to 100.
- Add numbers using concrete objects, pictorial representations and mentally, including:
  - a two-digit number and ones.
  - a two-digit number and tens.
  - two two-digit numbers.
  - adding three one-digit numbers.
- Show that addition of two numbers can be done in any order (commutative).
- Recognise and use the inverse relationship between addition and subtraction, and use this to check calculations and solve missing number problems.

## Teaching points:

Concrete	Pictorial	Abstract
<p>TO + O using base 10. Continue to develop understanding of partitioning and place value. 41 + 8</p> 	<p>Children to represent the base 10 e.g. lines for tens and dot/crosses for ones.</p> 	<p>41 + 8</p> <p>1 + 8 = 9 40 + 9 = 49</p> 
<p>TO + TO using base 10. Continue to develop understanding of partitioning and place value. 36 + 25</p> 	<p>Children to represent the base 10 in a place value chart.</p> 	<p>Looking for ways to make 10.</p> <p>36 + 25 =</p> <p>30 + 20 = 50 5 + 5 = 10 50 + 10 + 1 = 61</p> <p>1 5</p> <p>Formal method:</p> 

## Key vocabulary (new words to year 2 are in red)

Add, more, plus, and, make, sum, altogether, total, equal to, equals, most, count on, double, near double, **addition, 10 more, one hundred more, tens boundary.** How many more to make...? How many more is... than...? How much more is...? =, equals, sign, is the same as.



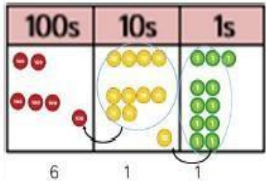
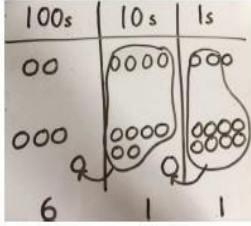
Year 3 - Addition

# Curriculum 2014 Statutory Requirements

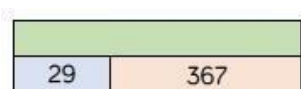
Pupils should be taught to:

- Add numbers mentally including:
  - a 3-digit number and ones.
  - a 3-digit number and tens.
  - a 3-digit number and hundreds.
  - a 3-digit number and thousands.
- Add numbers with up to three digits, using formal written methods of columnar addition.
- Estimate the answer to a calculation and use inverse operations to check answers.
- Solve problems, including missing number problems, using number facts, place value, and more complex addition.

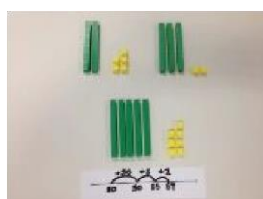
Teaching points:

Concrete	Pictorial	Abstract
<p>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.</p> 	<p>Children to represent the counters in a place value chart, circling when they make an exchange.</p> 	<p>243 +368 ----- 611 1 1</p>

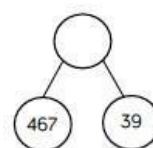
Children should develop understanding alongside other concrete materials (e.g. dienes) and visual representations (bar model, number line, part-whole/ cherry model):



Bar model



Number line



Part-whole/ cherry model

## Key vocabulary (new words to year 3 are in red)

Add, more, plus, and, make, altogether, total, equal to, equals, most, count on, double, near double, addition, 10 more, one hundred more, tens boundary, 100 boundary, expanded, compact how many more to make...? How many more is... than...? How much more is...? =, equals, sign, is the same as.


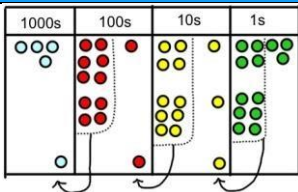
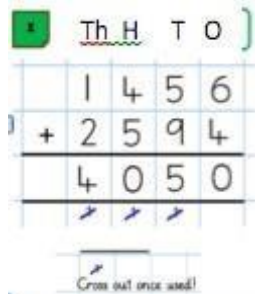
Year 4 - Addition

# Curriculum 2014 Statutory Requirements

## Pupils should be taught to:

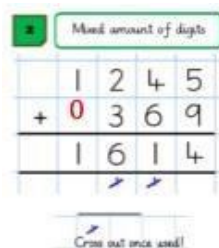
- Add with up to 4 digits using the formal written methods of columnar addition where appropriate.
- Estimate and use inverse operations to check answers to a calculation.
- Solve two-step addition problems in contexts, deciding which operations and methods to use and why.

## Teaching points:

Concrete	Pictorial	Abstract
		

Children should develop understanding alongside other concrete materials and visual representations (Bar, cherry, number line).

Children should also be encouraged to use these methods for adding mixed amount of digits, e.g.:



## Key vocabulary (new words to year 4 are in red)

Add, more, plus, and, make, altogether, **increase**, total, equal to, equals, most, count on, **decimal point**, double, near double, addition, 10 more, one hundred more, tens boundary, how many more to make...?  
How many more is... than...? How much more is...? =, equals, sign, is the same as



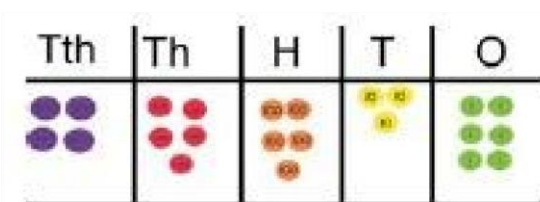
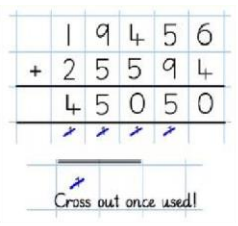
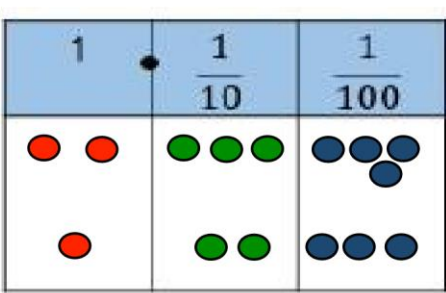
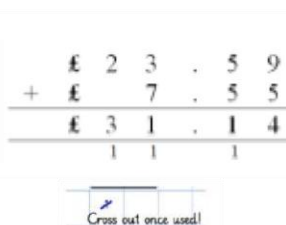
Year 5 - Addition

# Curriculum 2014 Statutory Requirements

## Pupils should be taught to:

- Add whole numbers with more than 4 digits, including using formal written methods (columnar addition).
- Add numbers mentally with increasingly large numbers.
- Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.
- Solve addition multi-step problems in contexts, deciding which operations and methods to use and why.

## Teaching points:

Concrete	Pictorial	Abstract
$23213 + 22323 =$		
		
<p>Children should be encouraged to demonstrate their understanding through the use of concrete materials and images (e.g. place value counters and base 10).</p>		
<p>A similar approach should be used when adding decimals, e.g.</p>		
$2.34 + 1.23$ 		

## Key vocabulary (new words to year 5 are in red)

Add, more, plus, and, make, altogether, increase, total, equal to, equals, most, count on, decimal point, double, near double, addition, 10 more, one hundred more, tens boundary, 100 boundary, inverse, **ones boundary, tenths boundary**, how many more to make...? How many more is... than...? How much more is...? =, equals, sign, is the same as.

Year 6 – Addition

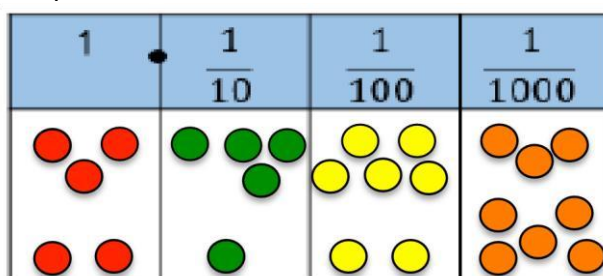
# Curriculum 2014 Statutory Requirements

Pupils should be taught to:

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

## Teaching points:

In Year 6, children build on Year 5 strategies and moving to numbers, when added together make numbers within 10 million and to 3 decimal places.



Children secure strategies through concrete, pictorial approaches for adding more than two numbers including numbers to 3 decimal places.

$$\begin{array}{r}
 1\ 2\ 0\ 5\ 3\ 7 \\
 2\ 3\ 4\ 2\ 7\ 1 \\
 +\ 3\ 2\ 3\ 2\ 2\ 1 \\
 \hline
 6\ 7\ 8\ 0\ 2\ 9 \\
 \text{↑} \quad \text{↑}
 \end{array}$$

$$\begin{array}{r}
 0\ .\ 5\ 5\ 7 \\
 1\ .\ 2\ 1\ 1 \\
 0\ .\ 2\ 0\ 2 \\
 \hline
 1\ .\ 9\ 7\ 0 \\
 \quad \quad 1
 \end{array}$$

## Key vocabulary (new words to year 6 are in red)

Add, more, plus, and, make, altogether, increase, total, equal to, equals, most, count on, double, near double, addition, 10 more, one hundred more, tens boundary, 100 boundary, inverse, ones boundary, tenths boundary, how many more to make...? How many more is... than...? How much more is...? =, equals, sign, is the same as

## Foundation Stage 1 - Division

### Curriculum 2014 Statutory Requirements

#### Pupils should be taught to:

- Birth to 11 months - notice changes in number of objects / images, sounds in groups of and up to 3.
- 8 to 20 months - has some understanding that things exist even when out of sight.
- 16 to 26 months - begins to organise and categorise objects.
- 22 to 36 months - knows that a group of things changes in quantity when something is added or taken away.
- 30 to 50 months - shows an interest in number problems.
- 40 to 60 months - counts objects to 10 and is beginning to count beyond 10.

In practical activities and discussions begins to use the vocabulary involved with multiplying.

#### Teaching points:

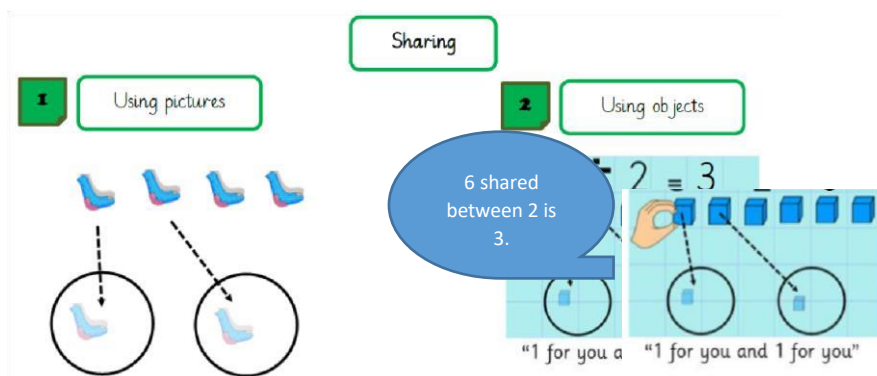
Use number lines 0 – 10.

Explore numbers in the environment, inside and out.

Use a range of objects.

Model in role-play areas.

Start introducing the idea of halving.



#### Key vocabulary

Group of, lots of, count out, share out.

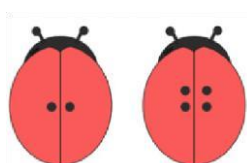
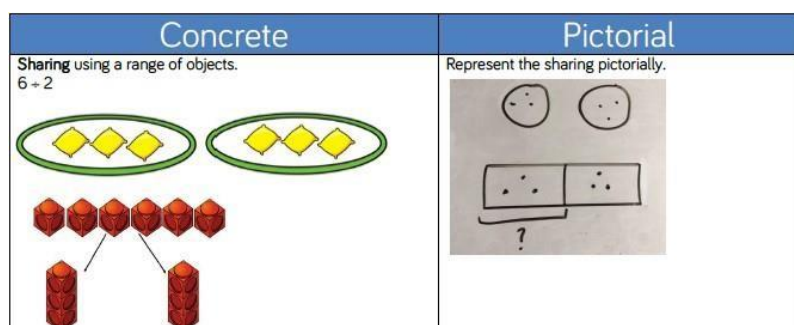
Foundation Stage 2 – Division

# Curriculum 2014 Statutory Requirements

Pupils should be taught to:

Early Learning Goals:

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



Practically halving objects – both halves being exactly the same size. Start with playdough and objects you can cut and then progress to practical objects, e.g. cut the pizza in half to make two pieces. Then add toppings, e.g. If we have 2 tomatoes, we will need to put 1 on each half.

Teaching points:

Use number lines 0 – 20.

Counting and reading numbers to 20.

Halving using objects.

Sharing using objects.

Opportunities to apply in real life situations – role play and sharing out fruit at snack time.

Model in role-play areas, including halving.

Key vocabulary

Group of, lots of, count out, share out, double, halve, half of, halving, times, array.

Year 1 – Division

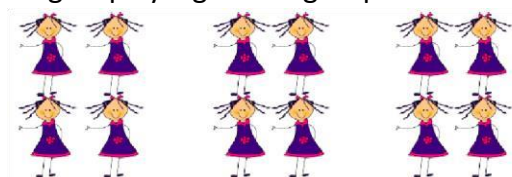
# Curriculum 2014 Statutory Requirements

## Pupils should be taught to:

- Solve one-step problems, including division, by calculating the answer using concrete objects, pictorial representations and arrays, with the support of the teacher.

Pupils begin by reinforcing prior learning where division is understood by grouping and sharing:

12 girls play a game in groups of 4. How many groups are there?



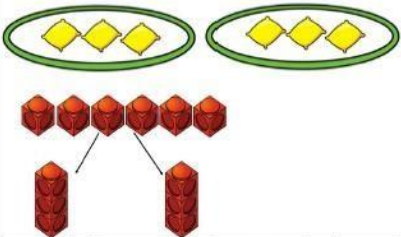
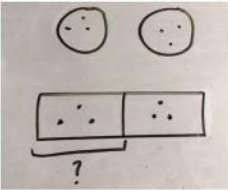
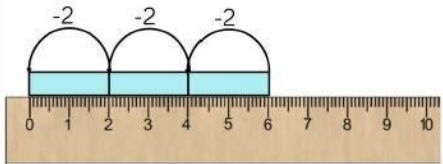
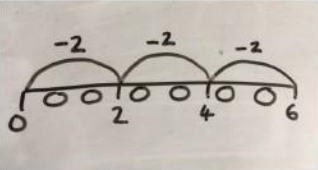
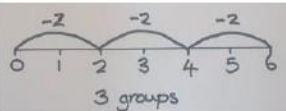
Eg  $15 \div 3 = 5$      $5 \times 3 = 15$   
 $15 \div 5 = 3$      $3 \times 5 = 15$



## Teaching points:

Children physically group items and count in groups. Model forming arrays, to be organised and systematic to aid counting in multiples.

Link division and multiplication by creating an array and thinking about the number sentences that can be created.

Concrete	Pictorial	Abstract		
<p>Sharing using a range of objects. <math>6 \div 2</math></p> 	<p>Represent the sharing pictorially.</p> 	<p><math>6 \div 2 = 3</math></p> <table border="1"><tr><td>3</td><td>3</td></tr></table> <p>Children should also be encouraged to use their 2 times tables facts.</p>	3	3
3	3			
<p>Repeated subtraction using Cuisenaire rods above a ruler. <math>6 \div 2</math></p> 	<p>Children to represent repeated subtraction pictorially.</p> 	<p>Abstract number line to represent the equal groups that have been subtracted.</p> 		

## Key vocabulary (new words to year 1 are in red)

Double, halve, half of, share, array, share equally, one/ two/ three... each, group in pairs, threes...tens, equal groups of,  $\div$ , divide, divided by, divided into, left, left over.

Year 2 - Division

# Curriculum 2014 Statutory Requirements

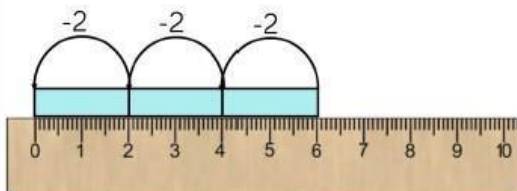
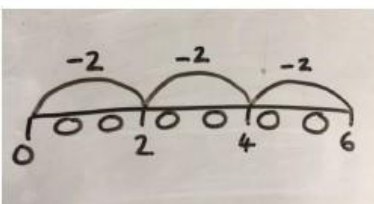
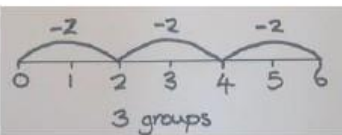

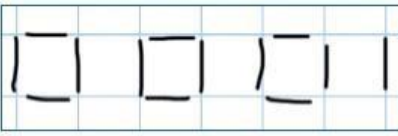
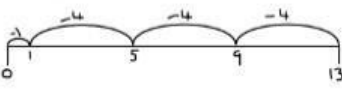
## Pupils should be taught to:

- 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 division within the multiplication tables and write them using the signs  $\div$  and  $=$
- Show that multiplication of two numbers is commutative but division is not.
- Solve problems involving division using materials, arrays, repeated addition, mental methods and division facts, including problems in contexts.

## Teaching points:

Calculations here build on expected known multiplication facts, where division is by a divisor of 2, 5 and 10 initially, progressing to Y3 multiplication facts of 3, 4 and 6 also.

Methods should build on that from Year 1:

<p><b>Repeated subtraction</b> using Cuisenaire rods above a ruler. <math>6 \div 2</math></p>  <p>3 groups of 2</p>	<p>Children to represent repeated subtraction pictorially.</p> 	<p>Abstract number line to represent the equal groups that have been subtracted.</p> 
<p><b><math>2d + 1d</math> with remainders</b> using lollipop sticks. Cuisenaire rods, above a ruler can also be used. <math>13 \div 4</math></p> <p>Use of lollipop sticks to form wholes- squares are made because we are dividing by 4.</p>  <p>There are 3 whole squares, with 1 left over.</p>	<p>Children to represent the lollipop sticks pictorially.</p>  <p>There are 3 whole squares, with 1 left over.</p>	<p><math>13 \div 4 = 3</math> remainder 1</p> <p>Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.</p> <p>'3 groups of 4, with 1 left over'</p> 

## Key vocabulary (new words to year 2 are in red)

Double, halve, half of, share, array, share equally, one/ two/ three... each, group in pairs, threes...tens, equal groups of,  $\div$ , divide, divided by, divided into, left, left over, **remainder**.



Year 3 - Division

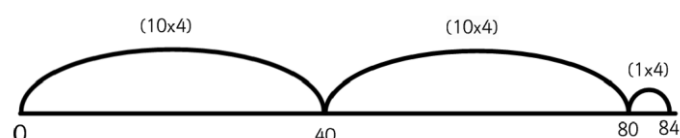
# Curriculum 2014 Statutory Requirements

Pupils should be taught to:

- Recall and use multiplication and division facts for the 3, 4 and 8 x tables.
- Write and calculate mathematical statements for division using the multiplication tables they know, including 2 digit divided by 1 digit using mental and progressing to formal written methods.
- Solve problems, involving missing number problems, involving division, including positive number scaling.
- Problems and correspondence problems where 'n' objects are connected to m objects.

Teaching points:

Build on understanding of using a number line to develop chunks.



Concrete	Pictorial	Abstract
<p>Sharing using place value counters.</p> $42 \div 3 = 14$	<p>Children to represent the place value counters pictorially.</p>	<p>Children to be able to make sense of the place value counters and write calculations to show the process.</p>
		$  \begin{aligned}  42 \div 3 \\  42 &= 30 + 12 \\  30 \div 3 &= 10 \\  12 \div 3 &= 4 \\  10 + 4 &= 14  \end{aligned}  $

Key vocabulary (new words to year 3 are in red)

Double, halve, half of, share, array, share equally, one/ two/ three... each, group in pairs, threes...tens, equal groups of,  $\div$ , divide, **division**, divided by, divided into, left, left over, remainder, **how many groups of ... go into...?**



Year 4 - Division

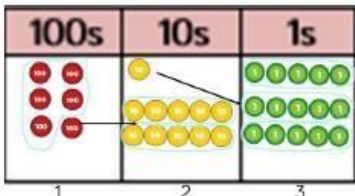
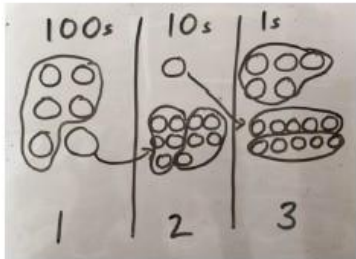
# Curriculum 2014 Statutory Requirements

## Pupils should be taught to:

- Recall multiplication and division facts up to  $12 \times 12$ .
- Use place value, known and derived facts to divide mentally, including dividing by 1.
- Solve problems involving division.

## Teaching points:

Ensuring an understanding of the relationship between  $\div$  and  $\times$ , pupils build on Year 3 to divide 3 digit numbers by 1 digit numbers.

Concrete	Pictorial	Abstract
<p>Short division using place value counters to group. <math>615 \div 5</math></p>  <p>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?</p>	<p>Represent the place value counters pictorially.</p> 	<p>Children to the calculation using the short division scaffold.</p> $\begin{array}{r} 123 \\ 5 \overline{) 615} \end{array}$

## Key vocabulary (new words to year 4 are in red)

Double, halve, half of, share, array, share equally, one/ two/ three... each, group in pairs, threes...tens, equal groups of,  $\div$ , divide, divided by, divided into, divisible by, remainder, factor, quotient, inverse.

Year 5 - Division

# Curriculum 2014 Statutory Requirements

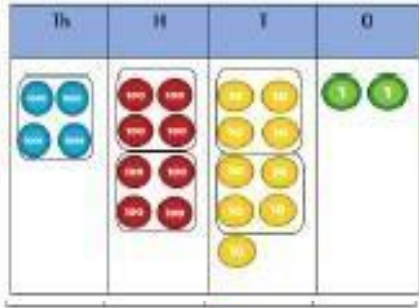
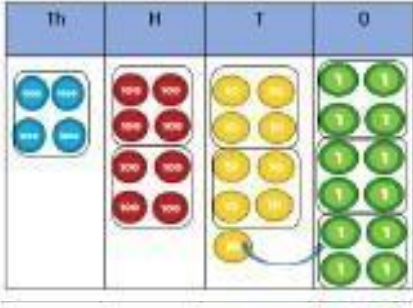
## Pupils should be taught to:

- Identify multiples and factors, including finding all factor pairs of a number, common factors of two numbers, know and use the vocabulary of prime numbers and establish whether a number up to 100 is prime.
- Multiply and divide numbers mentally drawing on known facts.
- Divide numbers up to 4 digits by a one digit number using a written method and interpret remainders appropriately for the context.
- Divide whole numbers and those involving decimals by 10, 100 and 1000.

## Teaching points:

Pupils develop use of the short division method started in Year 4.

These concrete, pictorial and abstract approaches should also be used to develop and consolidate understanding of remainders.

Concrete	Pictorial	Abstract
		$\begin{array}{r} 1223 \\ 4 \overline{) 4894} \text{ r}2 \end{array}$



Place value sliders could be used to support division by powers of 10.

## Key vocabulary (new words to year 5 are in red)

Double, halve, half of, share, share equally, one/ two/ three... each, group in pairs, threes...tens, equal groups of,  $\div$ , divide, divided by, divided into, divisible by, **divisor**, remainder, factor, quotient, inverse, **long division**, **short division**.

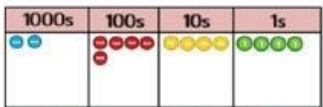
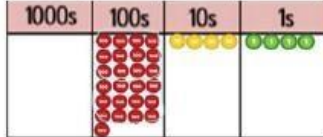
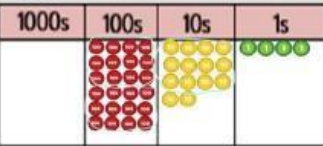
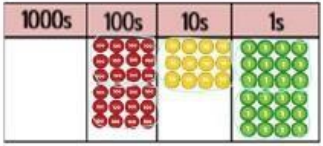
Year 6 - Division

# Curriculum 2014 Statutory Requirements

Pupils should be taught to:

- Divide numbers up to 4 digits by a two-digit 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.
- Divide numbers up to 4 digits by a two-digit number using the formal written method of short division as appropriate.

Teaching points:

Concrete	Pictorial	Abstract
<p>Long division using place value counters</p> <p><math>2544 \div 12</math></p>		
	<p>We can't group 2 thousands into groups of 12 so will exchange them.</p>	
	<p>We can group 24 hundreds into groups of 12 which leaves with 1 hundred.</p>	$\begin{array}{r} 02 \\ 12 \overline{) 2544} \\ \underline{24} \phantom{00} \\ 1 \phantom{00} \end{array}$
	<p>After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens.</p>	$\begin{array}{r} 021 \\ 12 \overline{) 2544} \\ \underline{24} \phantom{00} \\ 14 \phantom{00} \\ \underline{12} \phantom{00} \\ 2 \phantom{00} \end{array}$
	<p>After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder.</p>	$\begin{array}{r} 0212 \\ 12 \overline{) 2544} \\ \underline{24} \phantom{00} \\ 14 \phantom{00} \\ \underline{12} \phantom{00} \\ 24 \phantom{00} \\ \underline{24} \phantom{00} \\ 0 \phantom{00} \end{array}$

Key vocabulary (new words to year 6 are in red)

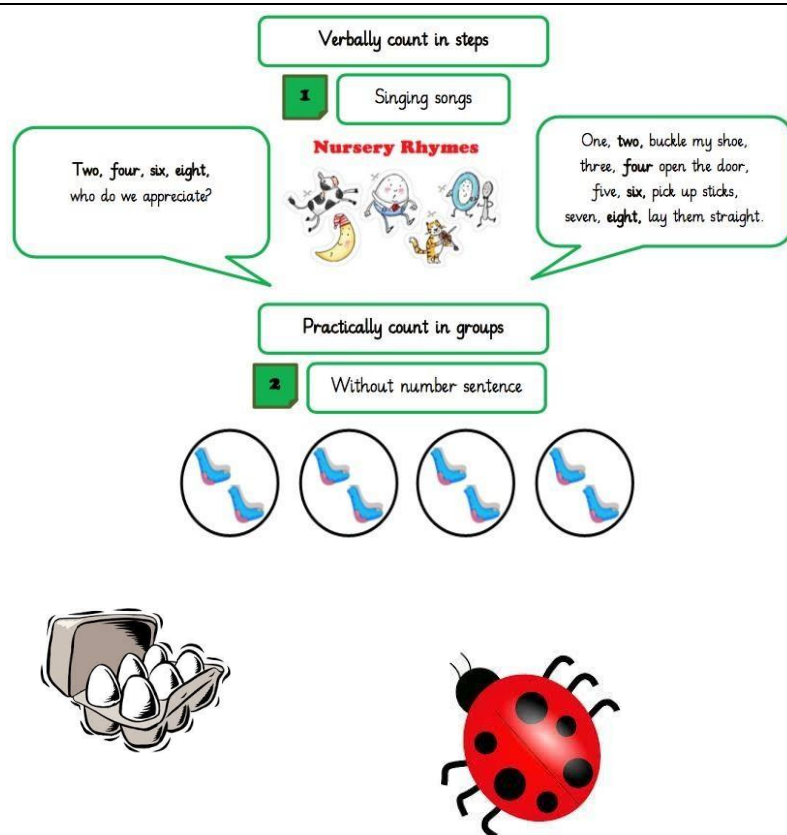
Double, halve share, share equally one each, two each, three each... group in pairs, threes... tens equal groups of divide, divided by, divided into, divisible by, divisor, remainder factor, quotient, divisible by inverse long division, short division

## Foundation Stage 1 - Multiplication

### Curriculum 2014 Statutory Requirements

#### Pupils should be taught to:

- Birth to 11 months – notice changes in number of objects / images, sounds in groups of and up to 3.
- 8 to 20 months – has some understanding that things exist, even when they are out of sight.
- 16 to 26 months – Begins to organise and categorise objects (sorting).
- 22 to 36 months – knows that a group of things changes in quantity when something is added or taken away.
- 30 to 50 months – shows an interest in number problems.
- 40 to 60 months – counts objects to 10 and is beginning to count beyond 10.



#### Teaching points:

Use number lines 0 – 10.

Explore numbers in the environment, both inside and out.

Use a range of objects.

Model in role-play areas.

Start introducing the idea of doubling.

#### Key vocabulary

Group of, lots of, count.

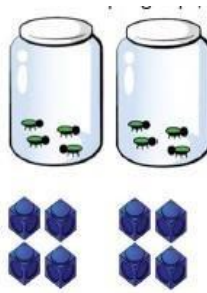
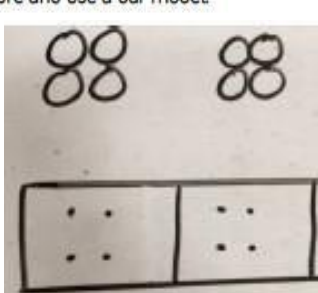
Foundation Stage 2 – Multiplication

# Curriculum 2014 Statutory Requirements

Pupils should be taught to:

Early Learning Goals:

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

Concrete	Pictorial
	<p>Children to represent the practical resources in a picture and use a bar model.</p> 

Varied approaches to include:

Practically count in groups and use pictorial representations

$$2 \times 4 = 8$$

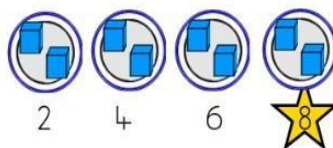
1

Counting in steps

" 2, 4, 6, 8 "

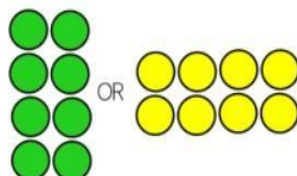
2

Practically counting in groups



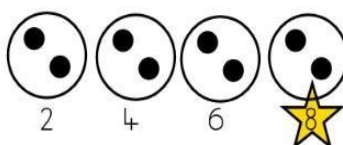
3

Drawing using arrays



4

Drawing using symbols



Teaching points:

Use number lines 0 – 10.

Explore numbers in the environment, both inside and out.

Sharing snacks to reinforce the idea of grouping.

Encourage children to draw or make arrays using counters.

Use a range of objects.

Model in role-play areas, including doubling.

Experience doubling in a variety of contexts.

Key vocabulary

Group of, lots of, count, double, times, array.

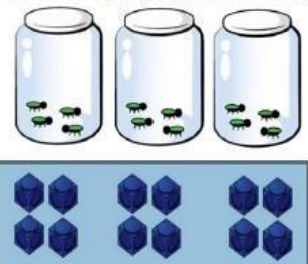
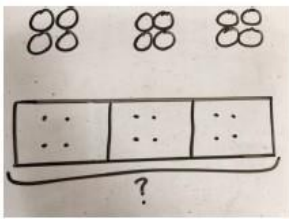
Year 1 – Multiplication

# Curriculum 2014 Statutory Requirements

## Pupils should be taught to:

- Solve one-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays, with the support of the teacher.

## Teaching points:

Concrete	Pictorial	Abstract
<p>Repeated grouping/repeated addition  <math>3 \times 4</math>  <math>4 + 4 + 4</math>                      There are 3 equal groups, with 4 in each group.</p> 	<p>Children to represent the practical resources in a picture and use a bar model.</p> 	<p><math>3 \times 4 = 12</math>  <math>4 + 4 + 4 = 12</math></p>

Ensure that pupils experience contextual links such as:

- Make connections between arrays and number patterns.
- Support problems using images. Count in twos, fives and tens.



## Key vocabulary (new words to year 1 are in red)

Group of, lots of, count, double, times, array, multiply, multiplied once, twice three times, four times, five times ... ten times, repeated addition, equal sets of.



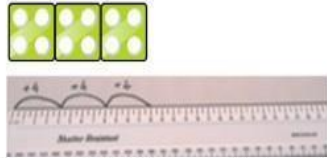
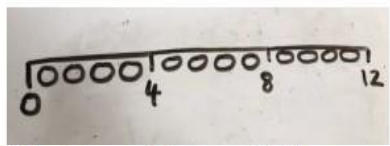
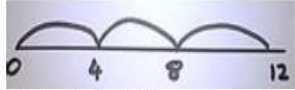
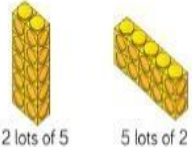
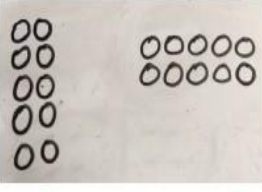
Year 2 - Multiplication

# Curriculum 2014 Statutory Requirements

## Pupils should be taught to:

- Recall and use multiplication facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.
- Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication ( $\times$ ) and equals ( $=$ ) 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.

## Teaching points:

Concrete	Pictorial	Abstract
<p>Number lines to show repeated groups- <math>3 \times 4</math></p> 	<p>Represent this pictorially alongside a number line e.g.:</p> 	<p>Abstract number line showing three jumps of four.</p> <p><math>3 \times 4 = 12</math></p> 
<p>Use arrays to illustrate commutativity counters and other objects can also be used. <math>2 \times 5 = 5 \times 2</math></p>  <p>2 lots of 5      5 lots of 2</p>	<p>Children to represent the arrays pictorially.</p> 	<p>Children to be able to use an array to write a range of calculations e.g.</p> <p><math>10 = 2 \times 5</math>  <math>5 \times 2 = 10</math>  <math>2 + 2 + 2 + 2 + 2 = 10</math>  <math>10 = 5 + 5</math></p>

Pupils explore, practically, commutative multiplication facts, showing that the same product is produced, e.g.  $10 \times 5 = 50$  and  $5 \times 10 = 50$

Pupils recall and use the 2x, 5x, 10x, begin to count in 3s and 4s and start to use doubling to progress onto 6x

## Key vocabulary (new words to year 2 are in red)

Group of, lots of, count, double, times, array, multiply, multiplied once, twice three times, four times, five times ... ten times, repeated addition, **multiplication**.



Year 3 - Multiplication

# Curriculum 2014 Statutory Requirements

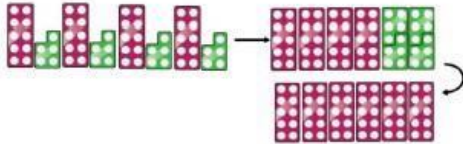
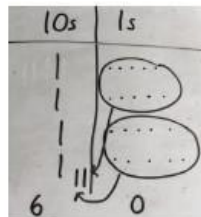
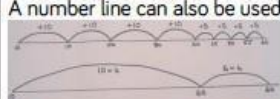
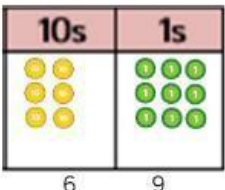
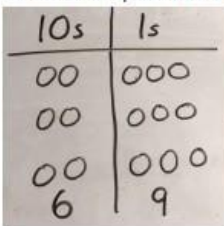
## Pupils should be taught to:

- Recall and use multiplication facts for the 3, 4 and 8 multiplication tables.
- Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
- Solve problems, including missing number problems, involving multiplication and division, including positive number scaling problems and correspondence problems where 'n' objects are connected to 'm' objects.

## Teaching points:

Pupils recall and use facts for: 2x, 5x, 10x, 3x, 4x, 6x 8x

Pupils build on their doubling skills of the 2x to find 4x then 4x to find 8x.

Concrete	Pictorial	Abstract						
<p>Partition to multiply using Numicon, base 10 or Cuisenaire rods.</p> <p><math>4 \times 15</math></p> 	<p>Children to represent the concrete manipulatives pictorially.</p> 	<p>Children to be encouraged to show the steps they have taken.</p> <p><math>4 \times 15</math></p> <p><math>10 \times 4 = 40</math> <math>5 \times 4 = 20</math> <math>40 + 20 = 60</math></p> <p>A number line can also be used</p> 						
<p>Formal column method with place value counters (base 10 can also be used.) <math>3 \times 23</math></p> 	<p>Children to represent the counters pictorially.</p> 	<p>Children to record what it is they are doing to show understanding.</p> <p><math>3 \times 23</math></p> <p><math>3 \times 20 = 60</math> <math>3 \times 3 = 9</math> <math>60 + 9 = 69</math></p> <p><math>23</math> <math>\times 3</math> <math>\hline 69</math></p> <table data-bbox="1291 1487 1461 1666"><tr><td>x</td><td>3</td></tr><tr><td>20</td><td>60</td></tr><tr><td>3</td><td>9</td></tr></table> <p><u>69</u></p>	x	3	20	60	3	9
x	3							
20	60							
3	9							

When calculating a question such as  $43 \times 2$ , model and discuss appropriateness of the approach and refer to doubling. Progress and model doubling, and doubling again when finding 4x..

## Key vocabulary (new words to year 3 are in red)

Group of, lots of, count, double, times, array, multiply, multiplied once, twice three times, four times, five times ... times, repeated addition, multiplication, **product**.

## Year 4 - Multiplication

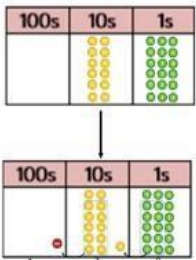
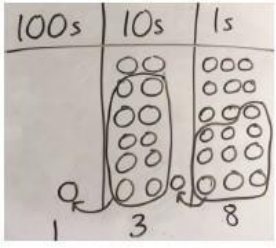
### Curriculum 2014 Statutory Requirements

#### Pupils should be taught to:

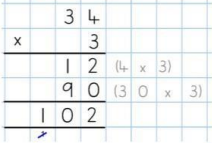
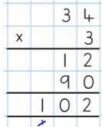
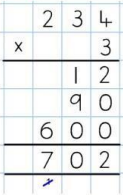
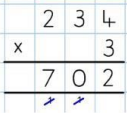
- Recall multiplication and division facts for multiplication tables up to  $12 \times 12$ .
- Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers.
- Recognise and use factor pairs and commutativity in mental calculations.
- Multiply two-digit and three-digit numbers by a one-digit number using formal written layout.
- Solve problems involving multiplying and adding, including using the distributive law to multiply twodigit numbers by 1 digit, integer scaling problems and harder correspondence problems such as 'n' objects are connected to 'm' objects.

#### Teaching points:

Pupils recall and use table facts up to  $12 \times 12$

Concrete	Pictorial	Abstract
<p>Formal column method with place value counters.</p> <p><math>6 \times 23</math></p> 	<p>Children to represent the counters/base 10, pictorially e.g. the image below.</p> 	<p>Formal written method</p> <p><math>6 \times 23 =</math></p> $\begin{array}{r} 23 \\ \times 6 \\ \hline 138 \\ 11 \end{array}$

Small steps to achieving a written method:

Expanded column multiplication			
1	TO x O with brackets	2	TO x O
		3	HTO x O
	Compact column multiplication		
4	HTO x O		

#### Key vocabulary (new words to year 4 are in red)

Group of, lots of, count, double, times, array, multiply, multiplied once, twice three times, four times, five times ... ten times, repeated addition, multiplication, product.

## Year 5 - Multiplication

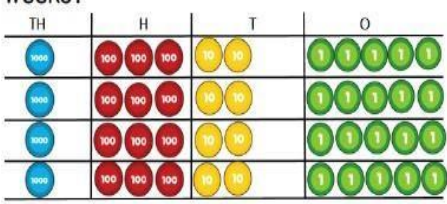
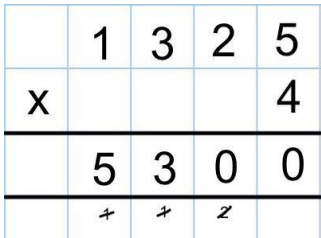
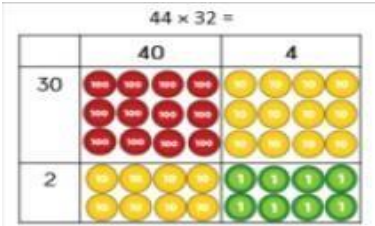
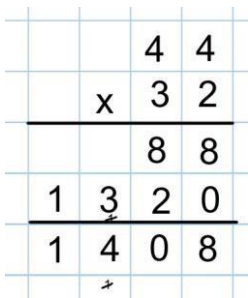
### Curriculum 2014 Statutory Requirements

#### Pupils should be taught to:

- Identify multiples and factors: all factor pairs of a number, common factors of two numbers, establish whether a number up to 100 is prime and recall prime numbers up to 19.
- Multiply numbers up to four digits by a one- or two-digit number using a formal written method.
- Multiply whole numbers and those involving decimals by 10, 100 and 1000.
- Solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes.

#### Teaching points:

Children build on their understanding of short multiplication to use long multiplication to multiply by 2 digit numbers. Understanding should continue to be develop using concrete and pictorial approaches.

Concrete/ Pictorial approaches	Alongside abstract
	
	

Children begin to use their understanding to multiply decimal numbers within the context of money. Use coins to support children's' understanding.

#### Key vocabulary (new words to year 5 are in red)

Group of, lots of, count, double, times, array, multiply, multiplied once, twice three times, four times, five times ... ten times, repeated addition, multiplication, product.

## Year 6 - Multiplication

### Curriculum 2014 Statutory Requirements

Pupils should be taught to:

- ☐ Identify multi-digit numbers up to 4 digits by a two-digit number using formal, long multiplication.
- ☐ Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.
- ☐ Identify common factors, common multiples and prime numbers.
- ☐ Solve problems involving addition, subtraction, multiplication and division.

Children progress to multiplying decimals by a whole number and decimals by decimals. Manipulatives should still be used to support understanding, as suggested in Year 5.

**Short column multiplication**

**1** Multiplying an integer by a decimal

	1	3	.	8	5
x				5	
	6	9	.	2	5

Context of money  
e.g. £13.85 x 5 = £69.25

**Long column multiplication**

**2** THHTO x TO

	2	5	6	4	
x			2	3	
	7	6	9	2	
	5	1	2	8	0
	5	8	9	7	2

Cross out once used!

**3** Decimal x TO

		2	.	4	9
x	2	4			
		9	.	9	6
	4	9	.	8	0
	5	9	.	7	6

**4** Decimal x decimal, e.g. 2.49 x 4.3

Take decimal points out

Multiply

Count total decimal places from original numbers

Add decimal point back in

	2	4	9		
x		4	3		
	7	4	7		
	9	9	6	0	
	1	0	7	0	7

2.49 x 4.3 (3d.p.)

1 0 7 0 7

My answer should be around 600  
as I know that 20 x 30 = 600.

### Teaching points:

Children should be exposed to regular tables practise and recall associated facts.

Children should know how to use multiplication as the inverse of division to check answers.

Children should progress onto finding missing numbers in calculations.

Children should use rounding to estimate answers.

Children should be exposed to multiplication problems in a variety of life contexts.

### Key vocabulary (new words to year 6 are in red)

Group of, lots of, count, double, times, array, multiply, multiplied once, twice three times, four times, five times ... ten times, repeated addition, multiplication, product, **long multiplication**, **short multiplication**.

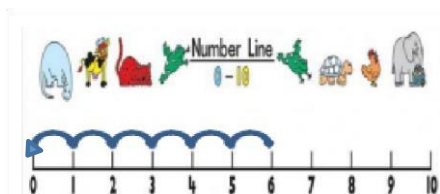
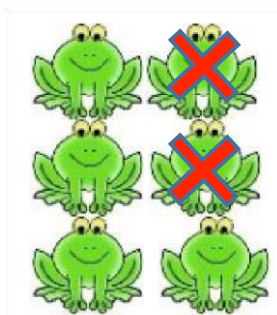
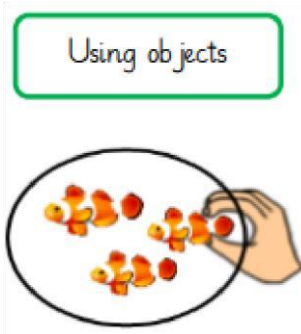
Foundation Stage 1 - Subtraction

# Curriculum 2014 Statutory Requirements

## Pupils should be taught to:

- Birth to 11 months – notice changes in number of objects/ images, sounds in groups of and up to 3.
- 8 to 20 months - has some understanding that things exist, even when out of sight.
- 16 to 26 months – begins to organise and categorise objects (sorting).
- 22 to 36 months – knows that a group of things changes in quantity when something is added or taken away.
- 30 to 50 months – separates a group of 3 or 4 objects in different ways, beginning to recognise that the total is still the same.
- 40 to 60 months – understands subtraction as taking away objects from a group and counting on how many are left.

In practical activities, discussions begin to use the vocabulary involved



## Teaching points:

Use number lines 0-10.

Explore numbers in the environment, both inside and out.

Use a range of objects.

Model in role-play areas.

addition and subtraction.

in

## Key vocabulary

Less, subtract, how many more, how many fewer, less than, most, least, count back, how many left?



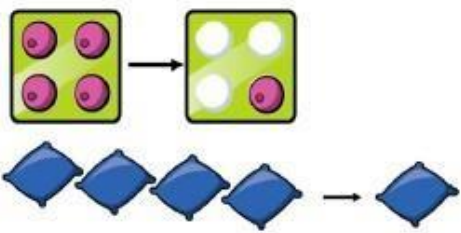
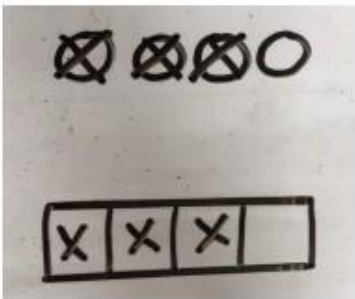
Foundation Stage 2 - Subtraction

# Curriculum 2014 Statutory Requirements

Pupils should be taught to:


Early Learning Goal:

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

Concrete	Pictorial
<p>Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items such as beanbags could be used).</p> <p><math>4 - 3 = 1</math></p> 	<p>Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used.</p> 


Link the actions to a written number sentence.

1 Using objects



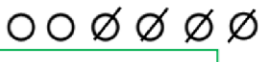
$$3 - 1 = 2$$

2 Drawing using pictures



$$5 - 3 = 2$$

3 Drawing using symbols



$$6 - 4 = 2$$

Teaching points:

Counting and reading objects to 20.

Doubling using objects and numbers.

Halving using objects.

Sharing using objects.

Adding and subtracting two single digit numbers, referring to a number line.

Key vocabulary

Take away, less, subtract, how many more, how many fewer, less than, most, least, count back, how many left, how much less is? How many have gone?

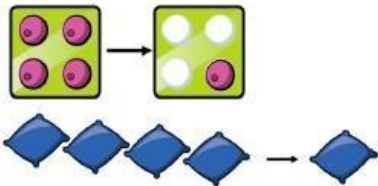
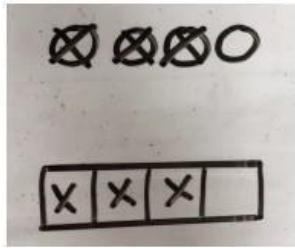
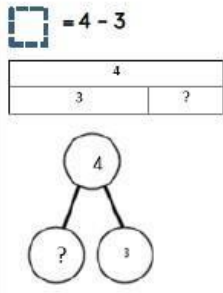

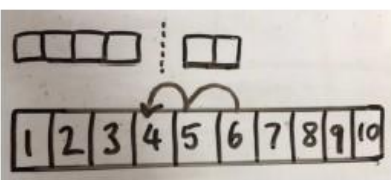
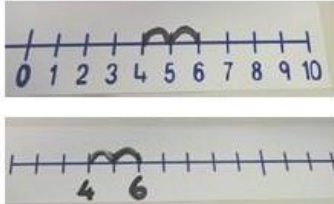
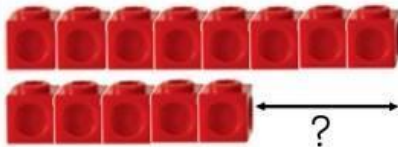
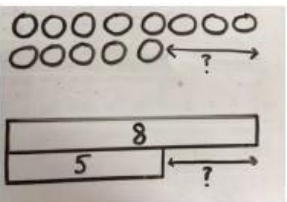
Year 1 - Subtraction

# Curriculum 2014 Statutory Requirements

## Pupils should be taught to:

- Read, write and interpret mathematical statements involving subtraction (-) and equals (=) signs.
- Represent and use number bonds and related subtraction facts within 20 subtract one-digit and two digit numbers to 20, including zero.
- Solve one-step problems that involve subtraction, using concrete objects and pictorial representations, and missing number problems such as  $9 = ? - 7$ .

## Teaching points:

Concrete	Pictorial	Abstract
<p><b>Physically taking away and removing objects from a whole</b> (ten frames, Numicon, cubes and other items such as beanbags could be used).</p> <p><math>4 - 3 = 1</math></p> 	<p>Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used.</p> 	<p><math>4 - 3 =</math></p> <p></p>
<p><b>Counting back</b> (using number lines or number tracks) children start with 6 and count back 2.</p> <p><math>6 - 2 = 4</math></p> 	<p>Children to represent what they see pictorially e.g.</p> 	<p>Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line</p> 
<p><b>Finding the difference</b> (using cubes, Numicon or Cuisenaire rods, other objects can also be used).</p> <p>Calculate the difference between 8 and 5.</p> 	<p>Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate.</p> 	<p>Find the difference between 8 and 5.</p> <p><math>8 - 5</math>, the difference is <input type="text"/></p> <p>Children to explore why <math>9 - 6 = 8 - 5 = 7 - 4</math> have the same difference.</p>

## Key vocabulary (words new to year 1 are in red)

-, subtract, take (away), **minus**, leave, how many are left/left over? How many have gone? One less, two less, ten less... how many fewer is... than...? How much less is...than...? **Difference between, half, halve =, equals, sign**, is the same as.



Year 2 - Subtraction

# Curriculum 2014 Statutory Requirements

Pupils should be taught to:

- Solve problems with subtraction:
  - Using concrete objects and pictorial representations, including those involving numbers, quantities and measures.
  - Applying their increasing knowledge of mental and written methods.
  - Recall and use subtraction facts to 20 fluently, and derive and use related facts up to 100
- Subtract numbers using concrete objects, pictorial representations, and mentally, including:
  - A two-digit number and ones.
  - A two-digit number and tens.
  - Two two-digit numbers.
  - Subtracting three one-digit numbers.
- Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot.
- Recognise and use the inverse relationship between addition and subtraction, and use this to check calculations and solve missing number problems.

Teaching points:

Concrete	Pictorial	Abstract									
<p><b>Making 10 using ten frames.</b> 14 - 5</p>	<p>Children to present the ten frame pictorially and discuss what they did to make 10.</p>	<p>Children to show how they can make 10 by partitioning the subtrahend.</p> $14 - 5 = 9$ $\begin{array}{r} 14 \\ - 5 \\ \hline 4 \quad 1 \end{array}$ <p>14 - 4 = 10 10 - 1 = 9</p>									
<p><b>Column method using base 10.</b> 48 - 7</p>	<p>Children to represent the base 10 pictorially.</p>	<p>Column method or children could count back 7.</p> <table border="1"> <tr><td></td><td>4</td><td>8</td></tr> <tr><td>-</td><td></td><td>7</td></tr> <tr><td></td><td>4</td><td>1</td></tr> </table>		4	8	-		7		4	1
	4	8									
-		7									
	4	1									

Key vocabulary (words new to year 2 are in red)

-, subtract, take away, minus leave, how many are left/left over? one less, two less... ten less... **one hundred less**, how many less is... than...? how much fewer is...? difference between, half, halve =, equals, sign, is the same as, **tens boundary**.

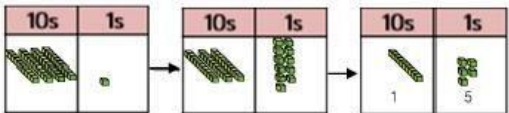
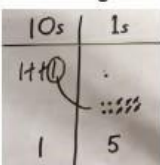

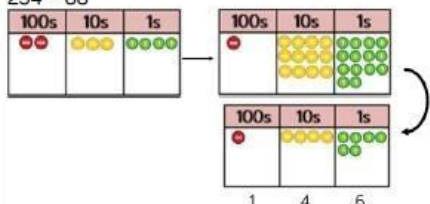
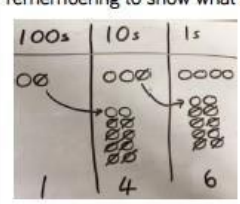
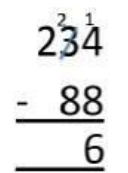
Year 3 - Subtraction

# Curriculum 2014 Statutory Requirements

Pupils should be taught to:

- Subtract numbers mentally, including:
  - A three-digit number and ones.
  - A three-digit number and tens.
  - A three-digit number and hundreds.
  - A three-digit number and thousands.
- Subtract numbers with up to three digits, using formal **written** methods of columnar subtraction.
- Estimate the answer to a calculation and use inverse operations to check answers.
- Solve problems, including missing number problems, using number facts, place value, and more complex subtraction.

Teaching points:

Concrete	Pictorial	Abstract
<p><b>Column method</b> using base 10 and having to exchange. 41 - 26</p> 	<p>Represent the base 10 pictorially, remembering to show the exchange.</p> 	<p>Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because <math>41 = 30 + 11</math>.</p> 
<p><b>Column method</b> using place value counters. 234 - 88</p> 	<p>Represent the place value counters pictorially; remembering to show what has been exchanged.</p> 	<p>Formal column method. Children must understand what has happened when they have crossed out digits.</p> 

Children will then move onto  
3-digit subtract 3-digit with  
exchanging (not crossing 0's).

## Key vocabulary (words new to year 3 are in red)

-, subtract, take away, minus leave, how many are left/left over? one less, two less... ten less... one hundred less, how many less is... than...? how much fewer is...? difference between, half, halve =, equals, sign, is the same as, tens boundary, hundreds boundary.


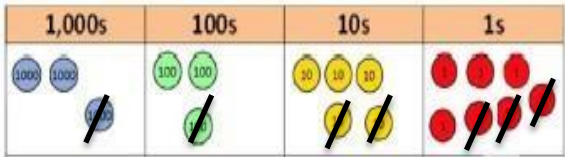
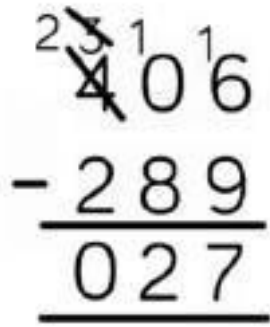
Year 4 - Subtraction

## Curriculum 2014 Statutory Requirements

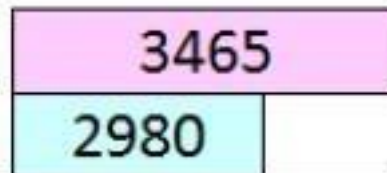
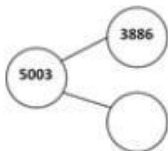
### Pupils should be taught to:

- Subtract with up to 4 digits using the formal written methods of columnar subtraction, where appropriate.
- Estimate and use inverse operations to check answers to a calculation.
- Solve subtraction two-step problems in contexts, deciding which operations and methods to use and why.

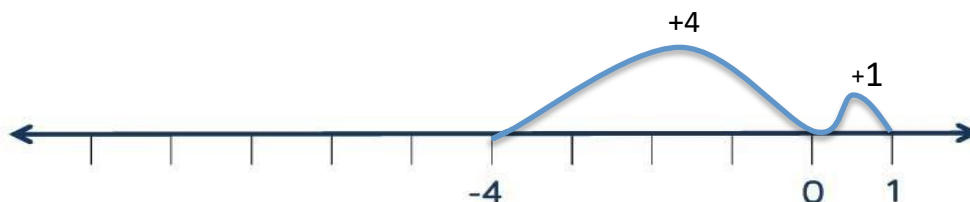
### Teaching points:

Concrete	Pictorial	Abstract
<p>Children use place value grids (or Base 10) to physically subtract</p>  <p>1232 from the number below.</p>	<p>Children draw a representation of a number on a place value chart.</p> 	

Children should also be confident using the cherry and bar method to find subtraction equations



Children should be able to subtract through 0 using a numberline



### Key vocabulary (words new to year 4 are in red)

- ,subtract, subtraction, take away, minus, **decrease**, leave, how many are left/left over? difference between, half, halve how many more/fewer is... than...? how much more/less is...? is the same as, equals, sign tens boundary, hundreds boundary, **ones boundary, tenths boundary, inverse.**

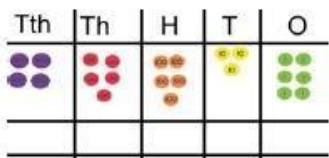
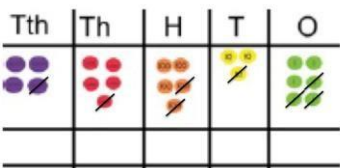
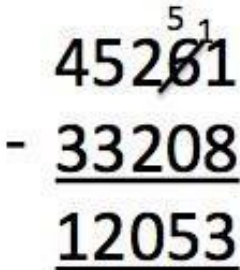
Year 5 - Subtraction

# Curriculum 2014 Statutory Requirements

Pupils should be taught to:

- Subtract whole numbers with more than 4 digits, including using formal written methods (columnar subtraction).
- Subtract numbers mentally with increasingly large numbers.
- Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.
- Solve subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Teaching points:

Concrete	Pictorial	Abstract
<p>Children should be provided with opportunities to build numbers using base 10, arrow cards etc and physically exchange or remove to show the process of subtraction.</p> <p style="text-align: center;"><math>45,536 - 8,426</math></p>  <p>This should also be used when developing subtraction with decimals</p>	<p>Children represent numbers using pictures including place value charts, this should allow them to cross out to show the process of subtraction. (This should also be used to show the process of exchanging when crossing boundaries.</p> <p style="text-align: center;"><math>45,536 - 11,213 =</math></p> 	

Key vocabulary (words new to year 5 are in red)

- ,subtract, subtraction, take away, minus, decrease, leave, how many are left/left over? difference between, half, halve how many more/fewer is... than...? how much more/less is...? is the same as, equals, sign tens boundary, hundreds boundary, ones boundary, tenths boundary, **hundredths**, inverse.

## Year 6 - Subtraction

# Curriculum 2014 Statutory Requirements

Pupils should be taught to:

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

Teaching points:

Concrete and abstract strategies should build on those of Year 5 and involve starting numbers of up to 1,000,000 and progressing to 10,000,000.

Pupils apply their learning of subtraction strategies and combine these with other areas of learning to solve problems using a secure abstract method.

$$632,465 + (745,676 - 325,534) = \text{progressing to}$$

$$8,675,509 - (9,645,253 - 2,867,675) =$$

125.48-72.357

7

Add place holder

~~X~~ | 2 5 . 4 ~~8~~ ○

-     7 2 . 3 5 7

---

5 3 . 1 2 3

---

7 2 3 5

Key vocabulary (words new to year 6 are in red)

- ,subtract, subtraction, take away, minus, decrease, leave, how many are left/left over? difference between, half, halve how many more/fewer is... than...? how much more/less is...? is the same as, equals, sign tens boundary, hundreds boundary, ones boundary, tenths boundary, inverse, **amount, brackets, calculator: clear, display, enter, key, memory, change (money), commutative, complements (in 10, 100), currency, discount, exact, exactly, exchange rate, most/least significant digit**