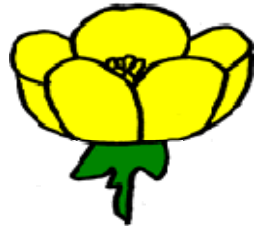
Goldfield Infants' & Nursery School

BUILDING LEARNING POWER Together

Calculation Policy

Committee	Resources Matters
Next Review	Spring 2020
Duration	3 years
Approved FGB	Summer 2017



Calculation Policy

Introduction

At Goldfield we are committed to maintaining a high standard of Mathematics. A key element in Maths is numeracy, particularly calculation. This policy sets out how calculation is taught throughout the school.

The aims of this policy are:

- To record methods, vocabulary and notation that have been agreed
- To ensure that the calculation methods agreed are based on sound educational research and practice
- To ensure a consistency in teaching methods by setting out the school's agreed approach, leading to good or outstanding progress in the children's learning
- To inform parents, governors and other stakeholders of these methods and reduce confusion and anxiety
- To help staff build on pupil's previous knowledge and cognitive development
- To encourage children to use practical, pictorial, mental and written methods of calculation

Rationale

Calculation is much more than simply knowing about number and the number operations. It requires practical understanding of the number system, and number relationships that then leads to the ability to manipulate numbers confidently to solve mathematical problems. This ability is an essential life skill. Our aim is for our children to be able to select an efficient and appropriate method to solve the given task. We would encourage them to ask themselves:

- Can I do this in my head?
- Can I do this, using drawings or objects to help me?
- Do I need to use a written method?
- How can I record how I have solved the problem?
- Can I select the correct operation to use?
- Can I explain how I worked it out?

At Goldfield we want our children to become confident mathematicians, who enjoy working with numbers and have a clear understanding of what to do and why they are doing it. We want the children to select the appropriate operation and be able to explain how they are solving a problem and use their skills in ever more challenging calculations.

Maths and Child Development

At Goldfield, calculation is always reinforced with practical activities and where ever possible rooted in concrete examples, using real life situations. Even as they progress to more mental methods of calculation, children need to ground calculation in reality. Young children would find the abstract nature of maths confusing without this. Using practical equipment such as: Numicon, cubes, beads, number lines, number squares and – of course fingers – is essential in the early years.

Rote Learning – Learning by heart to develop fluency

In order to calculate successfully and confidently, children must first be confident in their counting – **forwards** and **backwards** in ones. They are then taught to count in twos, tens and fives to eventually help develop greater competency in mental maths. This begins as counting by rote and is very natural. As long as eventually the child can assign meaning to his or her rote learning, this is a valuable skill to have. This is where Numicon is very effective as each number is seen as a quantity not just a numeral. Indeed, the children are encouraged to learn addition facts by heart like number bonds within 10 and double facts as well as multiplication facts, alongside practical activities to reinforce the meaning of those facts.

Resources such as Unifix cubes and Numicon help children to see abstract concepts through concrete practical applications.

CPA – Concrete, Pictorial, Abstract

In all areas of Maths we believe the children need a solid understanding and strong foundation to build upon.
We therefore encourage children to explore number and calculation using concrete apparatus and we have a range of manipulatives available for the children to use, including, Numicon shapes, unifix, Numicon rods.
We then explicitly encourage the children to move onto pictorial representation, helping the children to visualise number. We want our children to be very secure in the concrete and pictorial application before moving onto the abstract.

Bar Modelling

To help represent numbers pictorially and select the correct operation children are encouraged to use bar modelling
Please refer to HfL Progression in Bar Modelling

Equals

Along with the four operations the children are taught the importance of equivalency and to balance both sides of an equal sign.

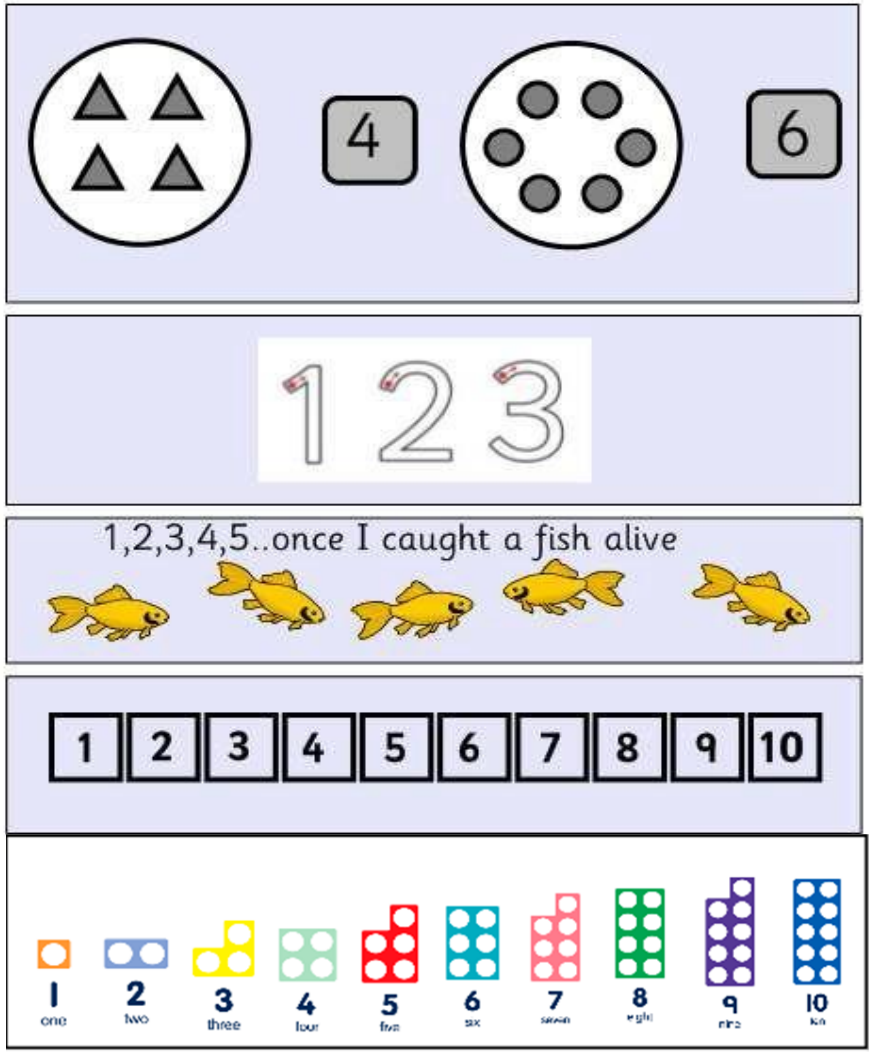
Problem Solving

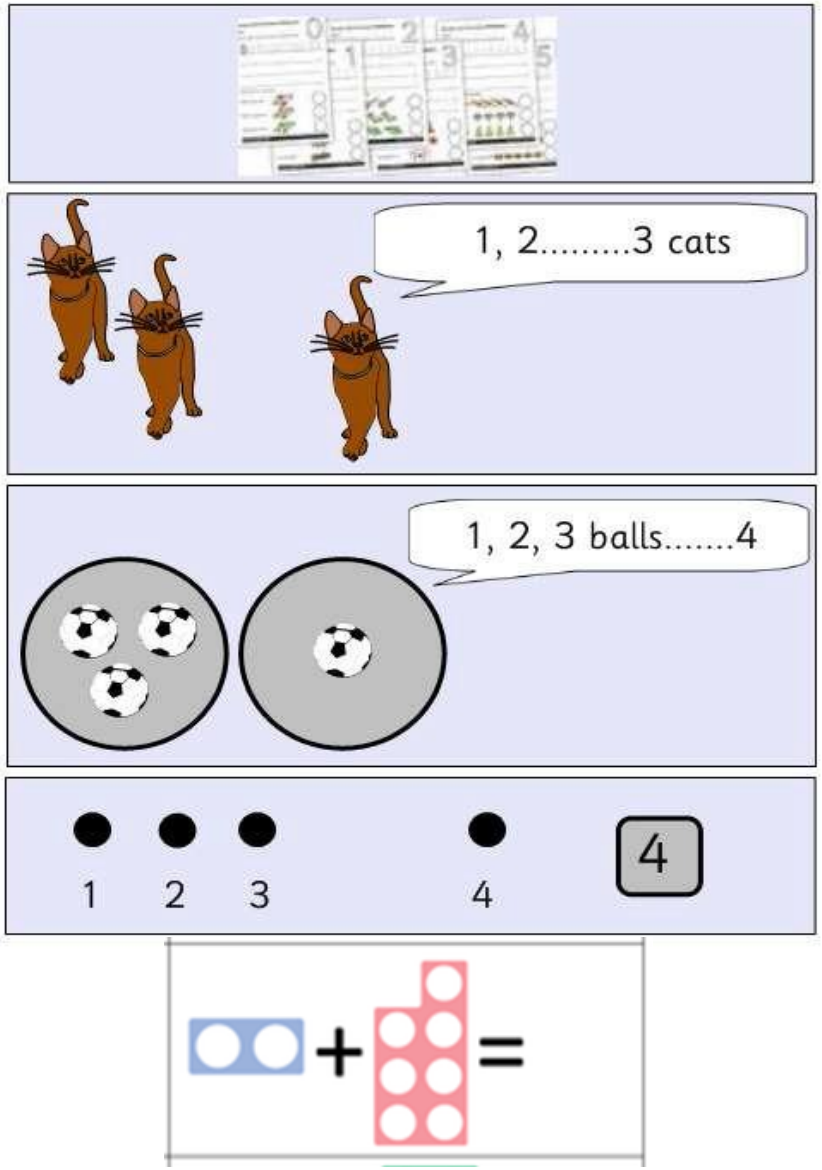
We encourage children to work through word problems using RUCSAC (Read, Understand, Choose operation, Solve, Answer and check)
Children will be expected to initially solve one step problems but as they develop they will move on to multi-step and even multi-operational problems.
We want our children to see how calculations are used in real-life and be able to apply their calculation understanding to a range of measures including money.

Progression in understanding number and calculation: Addition (Aggregation and Augmentation)

Key Vocabulary: add, addition, and, plus, count on, more, altogether, more than, sum, total

Equipment: counting apparatus (cubes, pegs, beads etc), number lines, hundred squares, counting stick, place value cards, Numicon

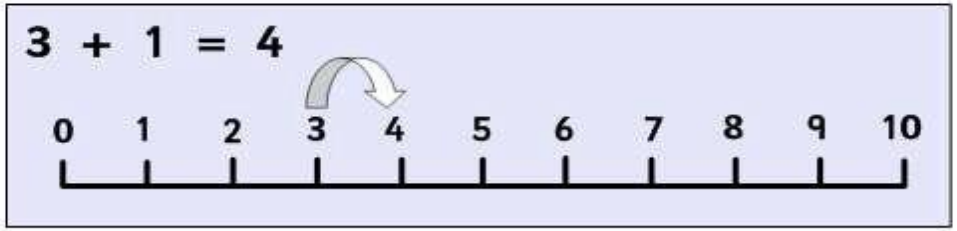
Year groups	Examples
Nursery: Activities always supported with equipment Counting sets of objects and assigning a numeral to that set. Initially numerals 0 – 6, then up to 10, then up to 20. Numeral Recognition and formation: 0-6 then to 10 if children are ready Using the language of numbers in counting rhymes and stories Ordering numbers – using Numicon shapes and Numerals to develop a sense of number quantity Comparing quantities - Which has more? Which has less? When are they the same?	

Reception: Supported with apparatus provided by adult Consolidation of number recognition and formation to 10 and then to 20 Finding one more/one less than Combining two sets of objects into one group and counting practically. Using drawings, dots to replace objects then counting Using Numicon Shapes to count practically and help visualize quantity.	

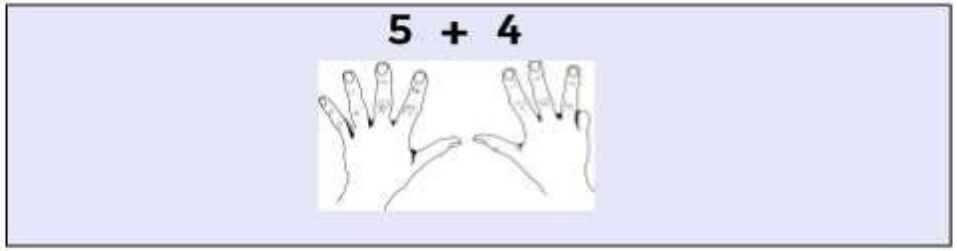
Reception continued

Learning to record this formally using + and =

Counting on using a number line



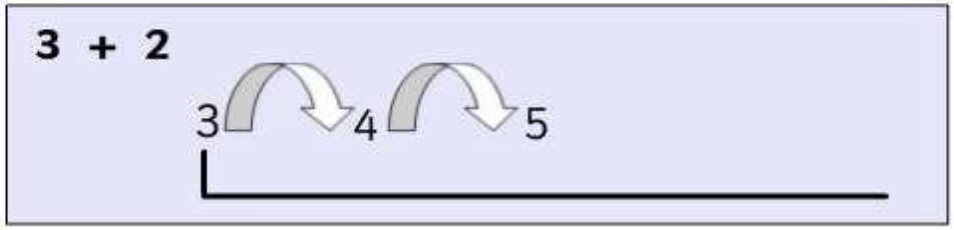
Counting on using fingers

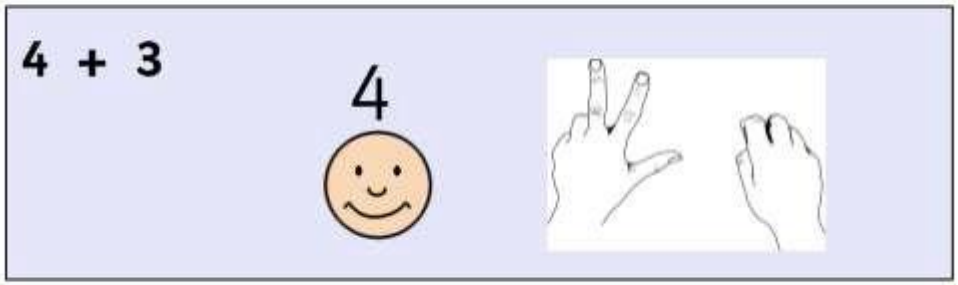


Learning the Reception CLIC Learn Its

Playing board games to reinforce counting on

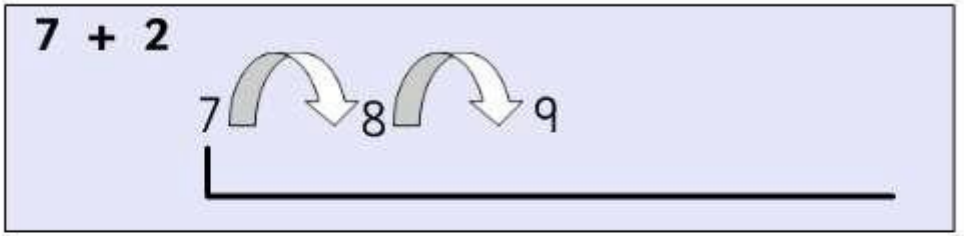
Using a blank number line, starting with the biggest number



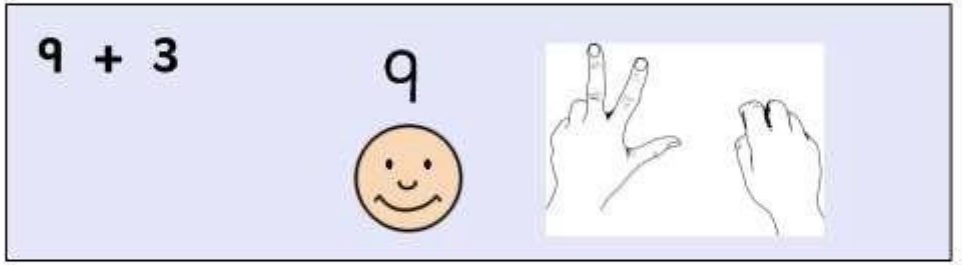
Reception continued	
Counting on – holding the bigger number in your head	

Year 1: Apparatus available to support activities. Children encouraged to find what they need

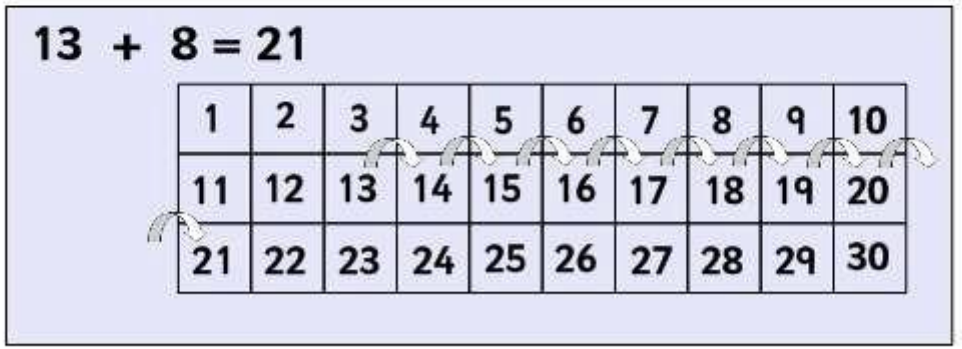
Using a blank number line, starting with the biggest number to calculate addition



Counting on – holding the biggest number in your head

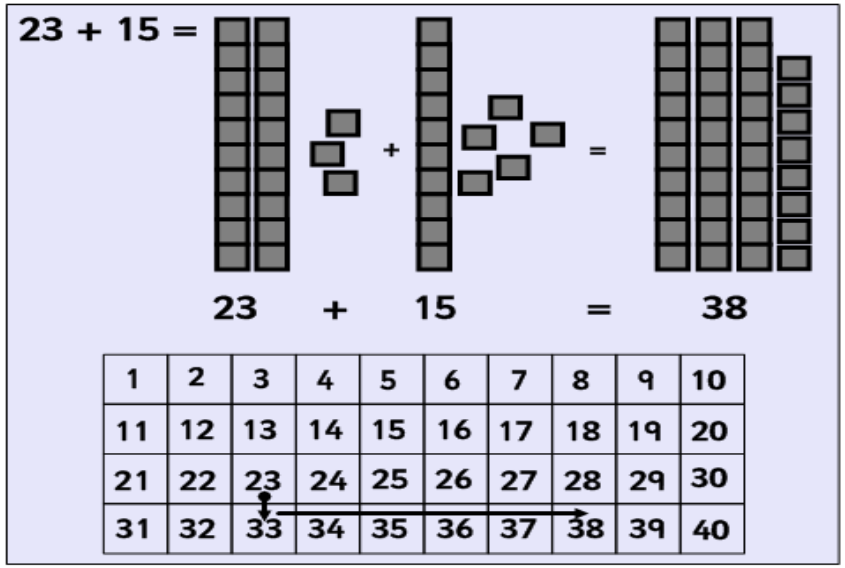


Adding a single digit number (1d) to a two digit number (2d) by counting on with a number square

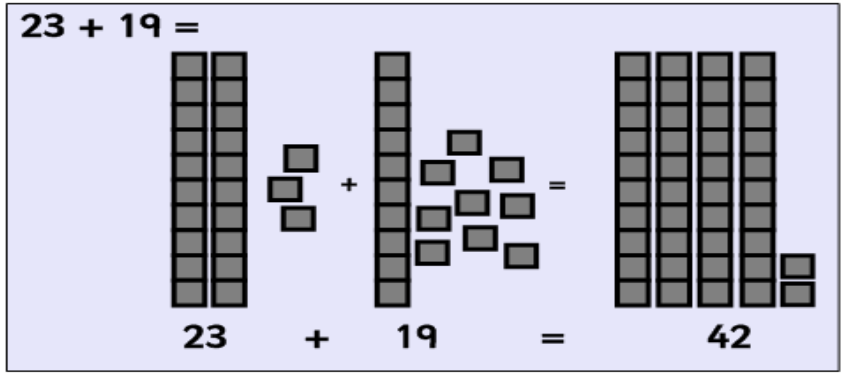


Year 1 continued

Understanding place value to add two 2d numbers by partitioning the smaller number and counting on using apparatus initially and then a hundred square – tens down, units across

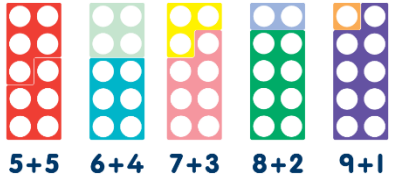


Using apparatus to bridge a ten



Year 1 CLIC Learn Its and Beat That

Use Numicon shapes to make number bonds and find double facts



Year 2: Children expected to make informed choices about resources and equipment

Using the symbols < and >

$6 > 10 \qquad 12 > 3$

Partitioning 2d numbers and adding using knowledge of place value

$23 + 15 = 38$

$23 + 15 = 38$

$20 \quad 3 \quad 10 \quad 5 = 30 + 8 = 38$

Record partitioning horizontally

$23 + 15 = 38 \qquad 23 + 10 = 33$

$33 + 5 = 38$

Record bridging a ten

$23 + 19 = 30 + 12 = 42$

$20 \quad 3 + 10 \quad 9 \qquad 30 \quad 0 \qquad 10 \quad 12$

Recognising 3 digit numbers and beyond and explaining what each digit represents

h	t	u
1	2	3

= 1 hundred 2 tens 3 units

More formal written methods using partitioning

22 + 15 =

O 2 + 5 = 7

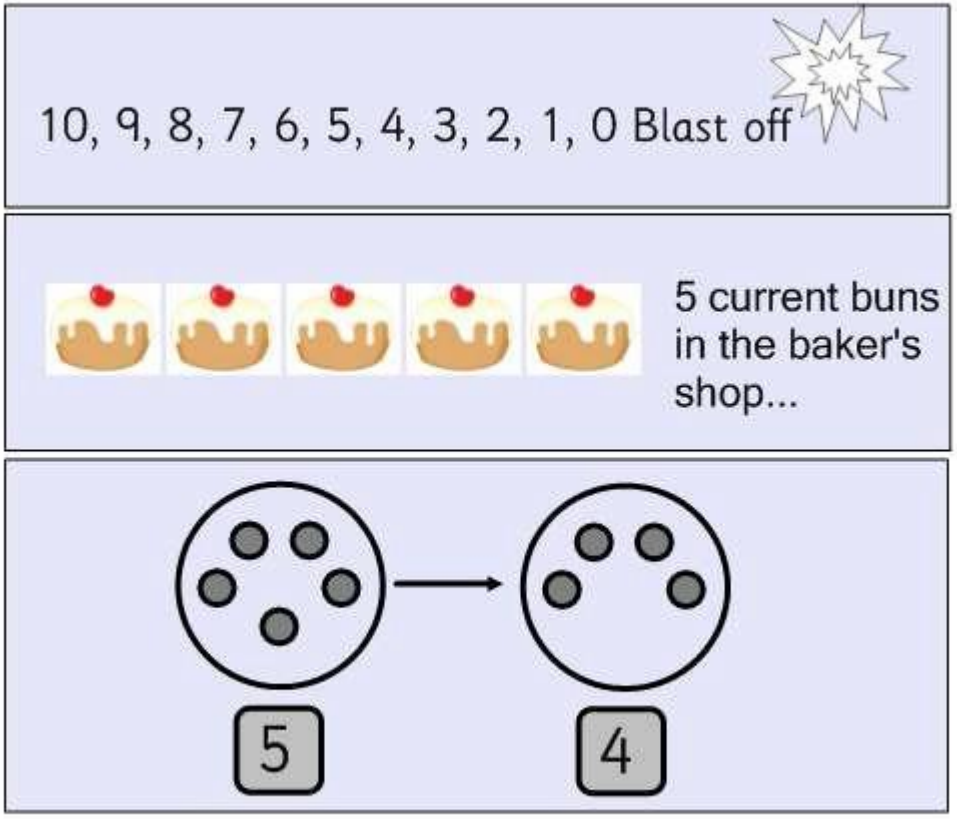
T 20 + 10 = 30

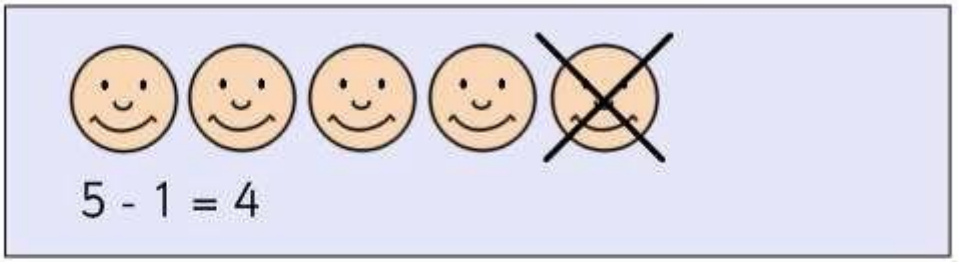
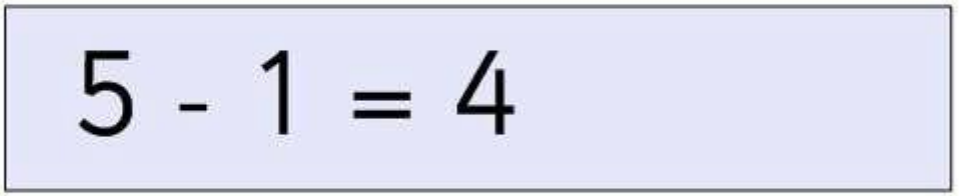
30 + 7 = 37

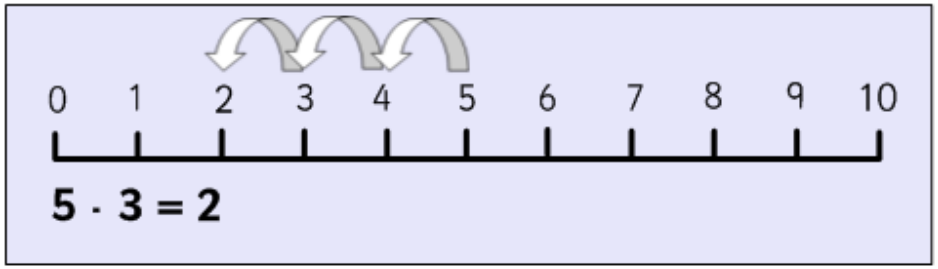
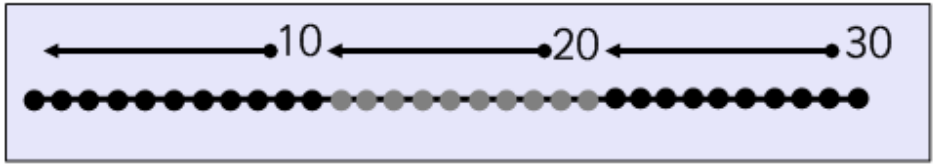
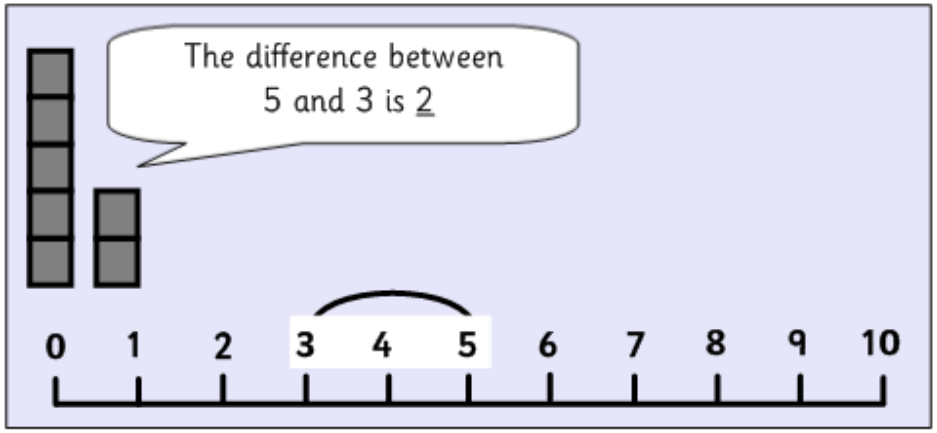
Year 2 continued Year 2 CLIC Learn Its and Beat That	

Progression in understanding number and calculation: Subtraction

Key vocabulary: subtract, subtraction, take away, minus, count back, less than, fewer, difference
Equipment: counting apparatus (cubes, pegs, beads etc), number lines, blank number lines, hundred squares, counting stick place value cards, numicon

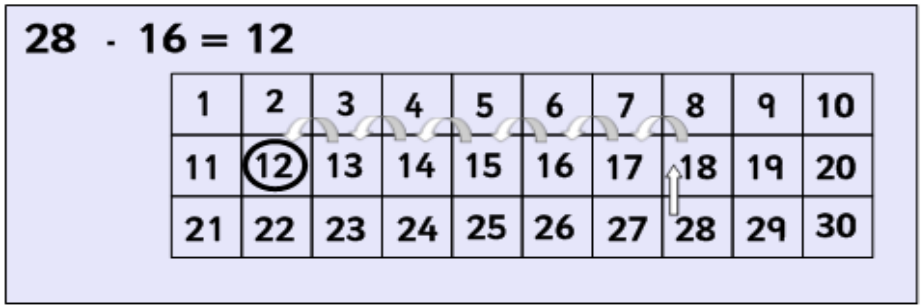
Year groups	Examples
Nursery: Activities always supported with equipment Rote counting back in ones Number rhymes and stories Practical counting a number of objects in a set and then taking one or more away and recounting	

Reception: Supported with apparatus provided by adult	
Using drawings or dots and then crossing out	
Learning to record subtraction using symbols – and =	
Using board games to consolidate	

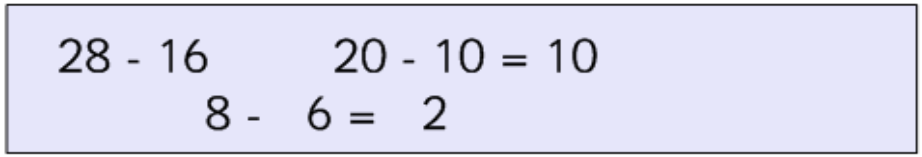
Year 1: Apparatus available to support activities. Children encouraged to find what they need	
Counting back in ones using a number line	
Counting back in tens using apparatus	
Counting back in tens by rote	100 - 90 - 80 - 70 - 60 - 50 - 40 - 30 - 20 - 10 - 0
Find the difference by counting on from the smallest number to the largest, first with objects and then using a number line	
Recognise that subtraction is the inverse of addition and to be able to construct number families. This is well represented using Numicon and Bar Modelling	3 + 2 = 5 so 5 - 2 = 3 2 + 3 = 5 so 5 - 3 = 2

Year 2: Children expected to make informed choices about resources and equipment

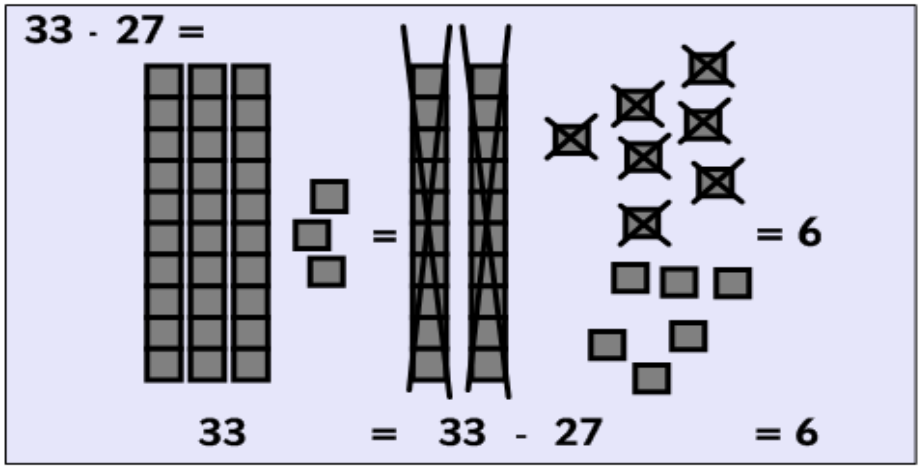
Subtract larger numbers using a hundred square and knowledge of partitioning



Record subtraction by partitioning



Decomposition of ten using apparatus initially and then learning written method



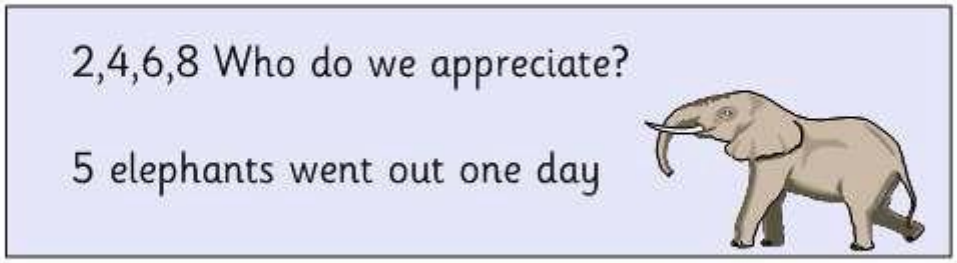
More formal written methods using partitioning

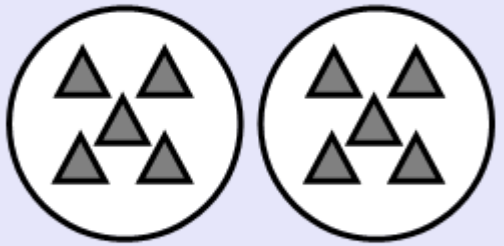
22 - 15 =
O 22 - 5 = 17
T 17 - 10 = 7

Progression in understanding number and calculation: Multiplication

Key vocabulary: lots of, groups of, double, times, multiply, multiplication, multiple, array, row, column, repeated addition, product

Equipment: counting apparatus (cubes, pegs and peg boards, beads etc), bowls, multipication squares, counting stick, place value cards,

Year groups	Examples
Reception: Supported with apparatus provided by adult Counting in twos, tens and fives through songs and rhymes Count repeated groups of the same size	

Year 1: Apparatus available to support activities. Children encouraged to find what they need Counting in twos, tens and fives by rote Using objects to make sets of..and counting them Introduce x to represent “groups of/lots of”	2, 4, 6, 8, 10... 5, 10, 15, 20... 10, 20, 30, 40...  2 lots of 5 = 10 2 x 5 = 10

Year 2: Children expected to make informed choices about resources and equipment

Recognising that multiplication is repeated addition

$2 \times 5 = 5 + 5$
$5 \times 2 = 2 + 2 + 2 + 2 + 2$

Setting out the 2, 10 and 5 times tables and using drawings to represent the sum

$1 \times 2 = 2$
$2 \times 2 = 4$

Use arrays to illustrate multiplication facts

3×5

5×3

Use known facts and partitioning to solve problems with larger numbers

$16 \times 2 = 10 \times 2 = 20$
$6 \times 2 = 12$
$= 32$

Learn 3 and 4 times tables

$1 \times 3 = 3$
$2 \times 3 = 6$
$3 \times 3 = 9$

$1 \times 4 = 4$
$2 \times 4 = 8$
$3 \times 4 = 12$

Recognise pattern of the 9 times table

9, 18, 27, 36, 45, 54, 63, 72, 81...

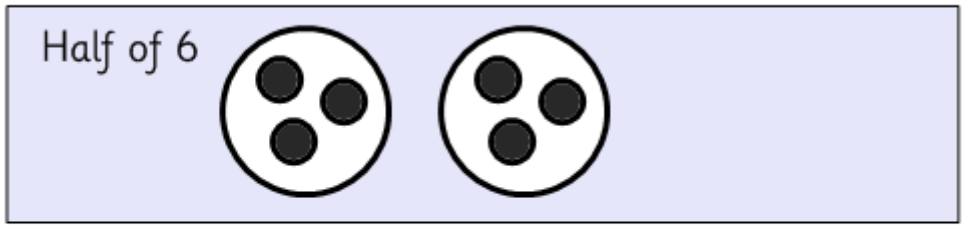
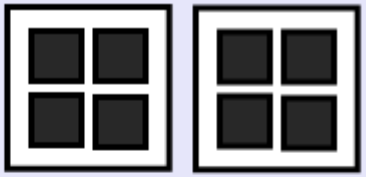
- Ten digit increases by 1 ten
- Unit digit decreases by 1 unit
- Digits in answer add up to 9 [digital root]

Progression in understanding number and calculation: Division

Key Vocabulary: share, divide, equal sets

Equipment: counting apparatus (cubes, pegs, beads etc.) number lines, blank number lines, hundred squares, counting stick, place value cards, multiplication squares

Year groups	Examples
Reception: Supported with apparatus provided by adult Understanding of half using shape (i.e. cut/fold into two **EQUAL** pieces) Halve by sharing	 A teacher has four apples. If there are two children how many apples will they have each?

Year 1: Apparatus available to support activities. Children encouraged to find what they need	
Half (put into two equal groups) even numbers up to 10 and then 20 using cubes	
Use “half” or symbol ½ to record this	half of 6 is 3 1/2 of 6 = 3
Use knowledge of known doubles to find half and understand inverse relationship	Double 4 is 8 so half of 8 is 4 
Use equipment to share objects into equal groups and relate this to real situations	15 balloons are shared between 5 children. How many does each child get?

Year 2: Children expected to make informed choices about resources and equipment

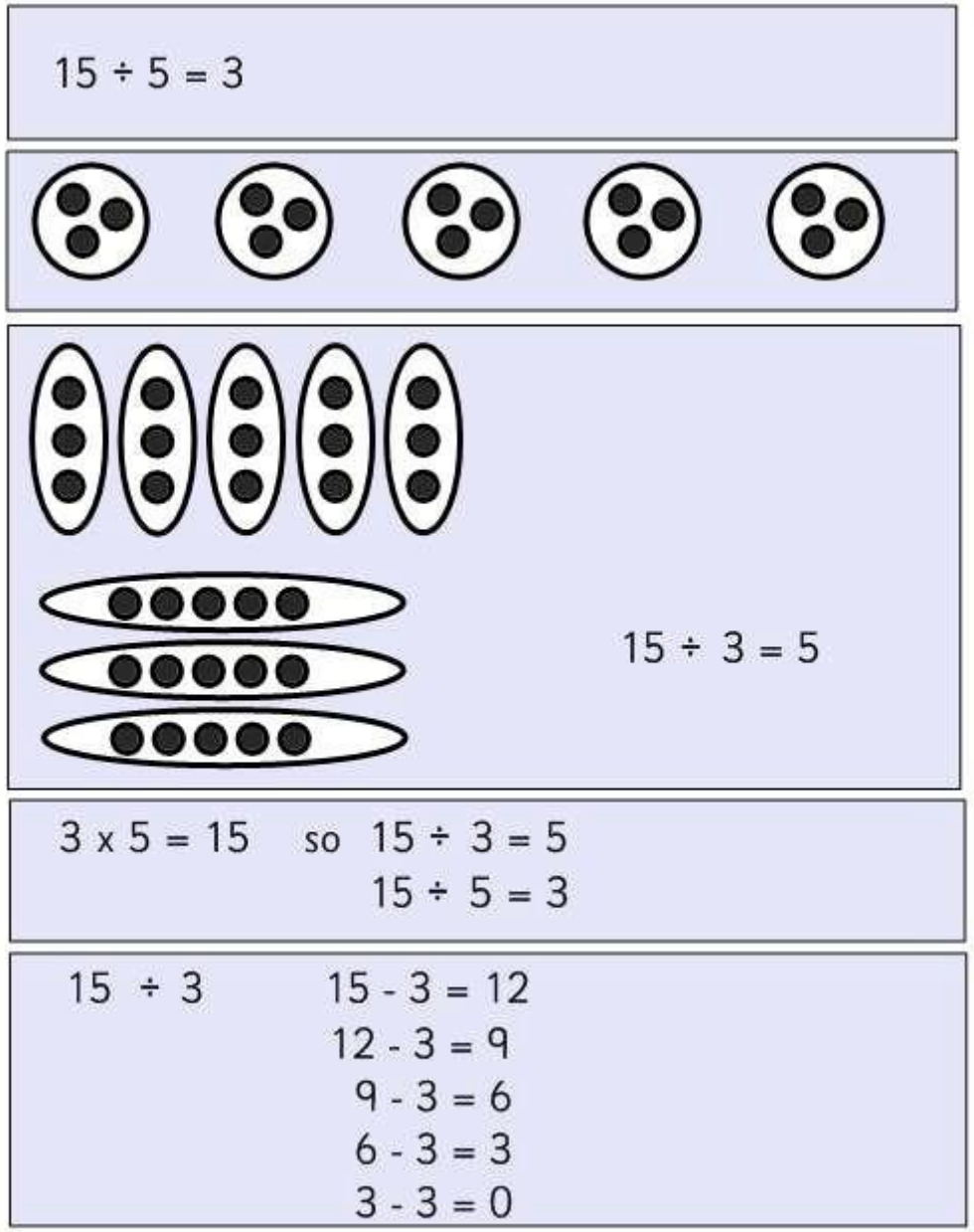
Learn and use the symbol ÷ to record this

Understand division as grouping and sharing leading to:

Reinforcing division as grouping through the use of arrays – linking these to multiplication

Using known multiplication facts to work out corresponding division facts.

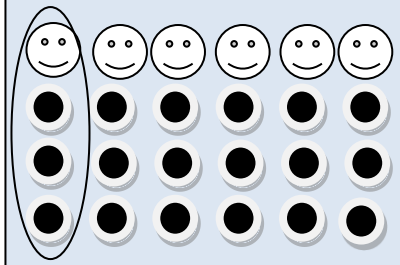
Recognise that repeated subtraction can be used to solve a division problem

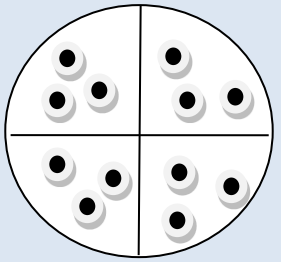


Year 2 Continued

To use the smiley face method to divide

18 ÷ 6 =



To find fractions of amounts by using the pizza method. You split your pizza into equal parts using the denominator then share the whole number equally out.

Find ¼ of 12