

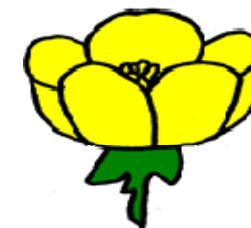
Goldfield Infants' &  
Nursery School



BUILDING LEARNING POWER  
Together

# Calculation Policy

Committee	Resource Matters
Next Review	Summer 2023
Duration	3 years
Approved FGB	Autumn 2020



## 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.

### 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.



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

### 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.

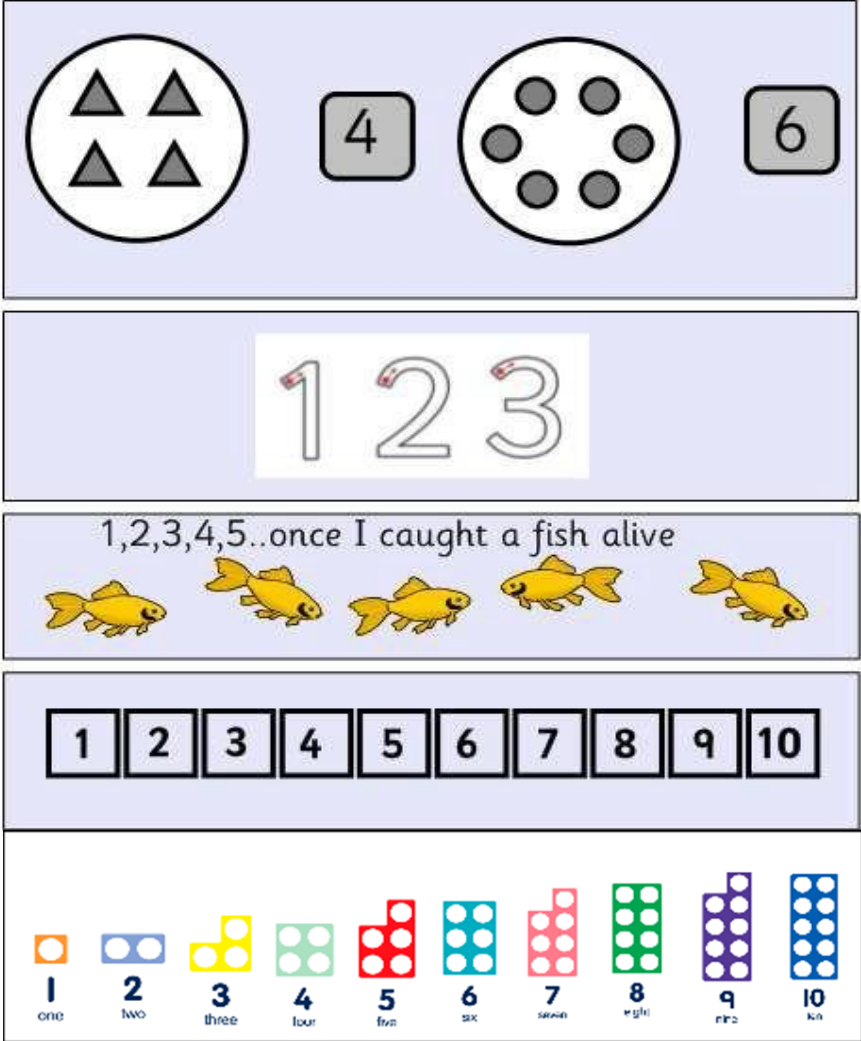
### Problem Solving

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
<p><b>Nursery: Activities always supported with equipment</b></p> <p>Counting sets of objects and assigning a numeral to that set. Initially numerals 0 – 6, then up to 10, then up to 20.</p> <p>Numerals Recognition and formation: 0-6 then to 10 if children are ready</p> <p>Using the language of numbers in counting rhymes and stories</p> <p>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?</p>	 <p>The examples section contains five rows of visual aids:</p> <ul style="list-style-type: none"> <li>Row 1: A circle containing 4 grey triangles, a square containing the numeral '4', a circle containing 6 grey dots, and a square containing the numeral '6'.</li> <li>Row 2: A white box containing the numerals '1', '2', and '3' with red arrows indicating the stroke order for writing.</li> <li>Row 3: The text '1,2,3,4,5..once I caught a fish alive' above five yellow fish icons.</li> <li>Row 4: A row of ten boxes containing the numerals '1' through '10' in order.</li> <li>Row 5: Ten Numicon shapes, each with a colored dot and a numeral below it: 1 (orange), 2 (blue), 3 (yellow), 4 (green), 5 (red), 6 (teal), 7 (pink), 8 (green), 9 (purple), and 10 (blue).</li> </ul>

**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.

1, 2.....3 cats

1, 2, 3 balls.....4

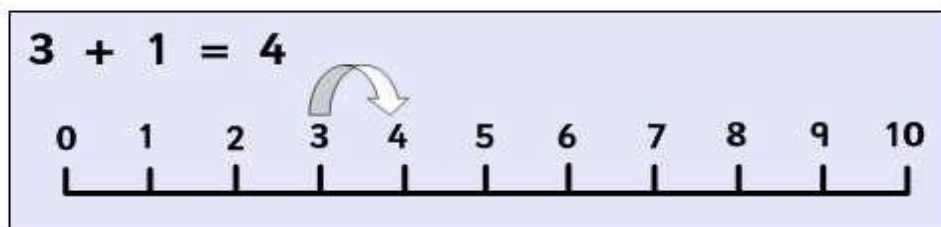
1 2 3 4 4

$2 + 2 = 4$

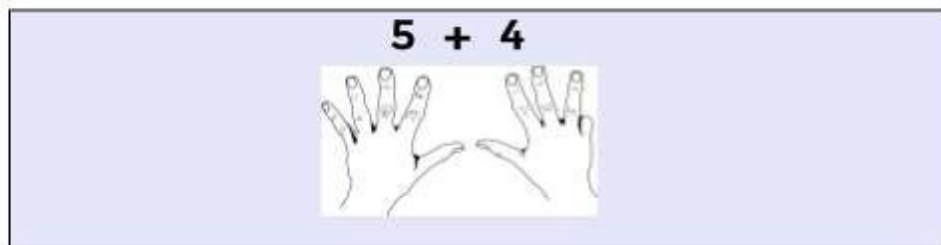
## Reception continued

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

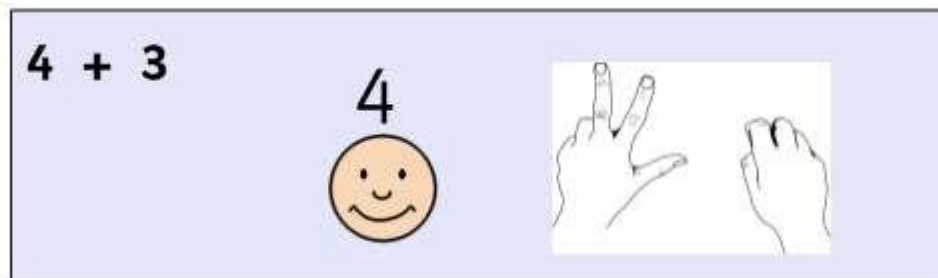


Using a blank number line, starting with the biggest number



**Reception continued**

Counting on – holding the bigger number in your head

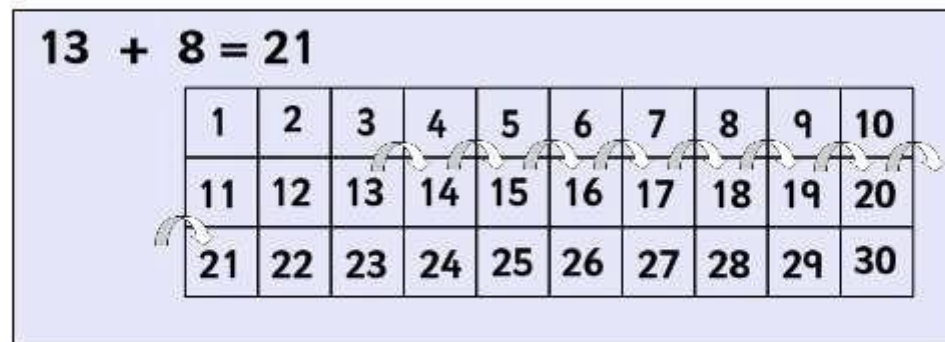
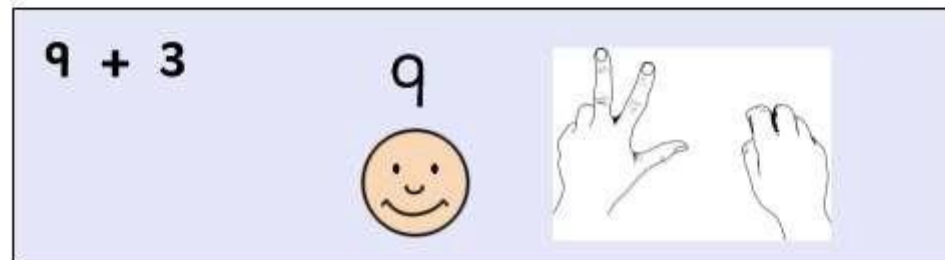
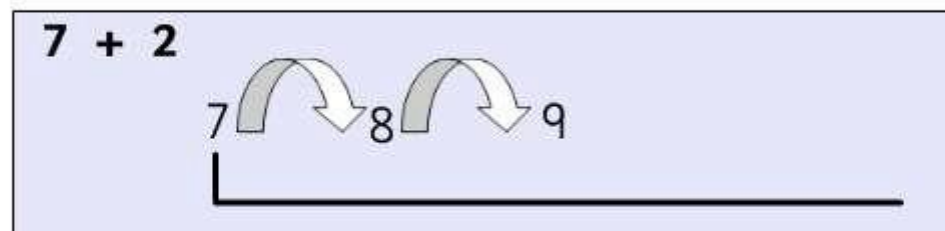


**Year 1: Apparatus available to support activities.**  
**Children encouraged to find what they need**

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

**23 + 15 =**

**23 + 15 = 38**

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40

**23 + 19 =**

**23 + 19 = 42**



**5+5   6+4   7+3   8+2   9+1**

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

Using the symbols < and >

Partitioning 2d numbers and adding using knowledge of place value

Record partitioning horizontally

Record bridging a ten

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

$$6 > 10 \quad 12 > 3$$

$$23 + 15 = 38$$

$$\begin{array}{r} 23 + 15 = 38 \\ / \quad \backslash \quad / \quad \backslash \\ 20 \quad 3 \quad 10 \quad 5 = 30 + 8 = 38 \end{array}$$

$$\begin{array}{l} 23 + 15 = 38 \quad 23 + 10 = 33 \\ \quad \quad \quad \quad \quad 33 + 5 = 38 \end{array}$$

$$\begin{array}{r} 23 + 19 = 30 + 12 = 42 \\ / \quad \backslash \quad / \quad \backslash \quad / \quad \backslash \quad / \quad \backslash \\ 20 \quad 3 + 10 \quad 9 \quad 30 \quad 0 \quad 10 \quad 12 \end{array}$$

**h t u**

1 2 3 = 1 hundred 2 tens 3 units

**Year 2 continued**

More formal written methods using partitioning  
Without bridging e.g.  $22+14=36$

Pictorial

$$\begin{array}{r} 22 + 14 = \\ \text{TO} \quad \text{TO} \\ \text{TO} \quad \quad \text{O} \\ \quad \quad \quad \text{O} \\ \quad \quad \quad \text{O} \end{array}$$

Abstract

$$\begin{array}{r} 22 + 14 = 36 \\ 20 \quad 2 \\ 10 \quad 4 \\ \hline 30 \quad 6 \\ \hline \end{array}$$

With bridging e.g.  $57+35=92$

$$\begin{array}{r} 57 + 35 = 92 \\ \text{T}\emptyset \quad \text{T}\emptyset \\ \text{T}\emptyset \quad \text{T}\emptyset \\ \text{T}\emptyset \quad \text{T}\emptyset \\ \text{T}\emptyset \quad \text{O} \\ \text{T}\emptyset \quad \text{O} \\ \emptyset \quad \text{T} \\ \emptyset \end{array}$$

$$\begin{array}{r} 50 \quad 7 \\ + 30 \quad 5 \\ \hline 80 \quad 12 \\ \hline 10 \quad 2 \end{array}$$

$$90 \quad 2$$

$57+35=92$

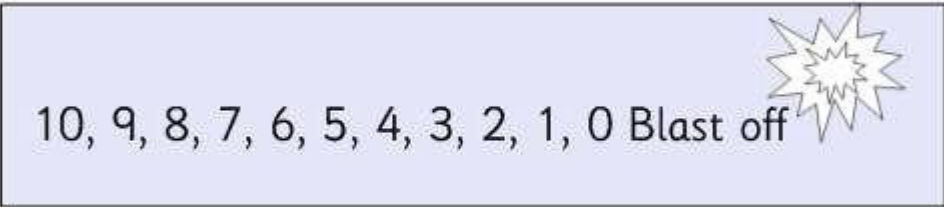

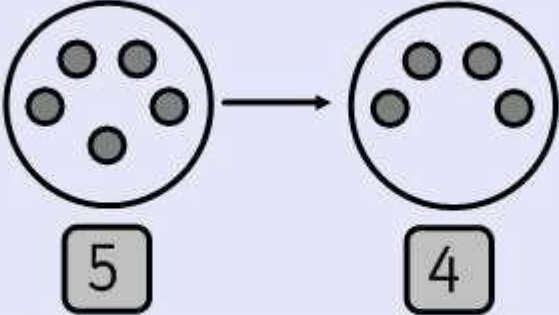
Year 2 CLIC Learn Its and Beat That



## 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
<p><b>Nursery: Activities always supported with equipment</b></p> <p>Rote counting back in ones</p> <p>Number rhymes and stories</p> <p>Practical counting a number of objects in a set and then taking one or more away and recounting</p>	<div data-bbox="1099 555 2040 762">  <p>10, 9, 8, 7, 6, 5, 4, 3, 2, 1, 0 Blast off</p> </div> <div data-bbox="1099 767 2040 1007">  <p>5 current buns in the baker's shop...</p> </div> <div data-bbox="1099 1011 2040 1369">  </div>

**Reception: Supported with apparatus provided by adult**

Using drawings or dots and then crossing out



$$5 - 1 = 4$$

Learning to record subtraction using symbols – and =

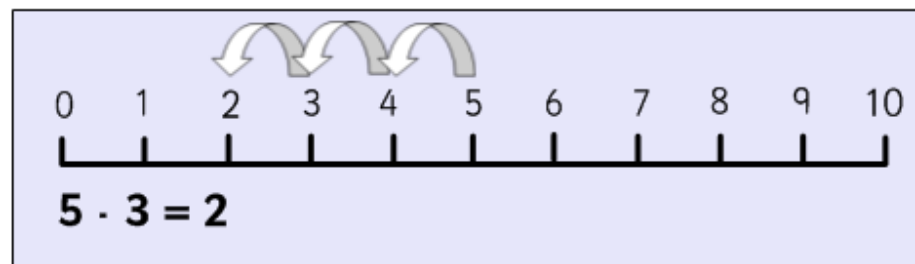
$$5 - 1 = 4$$

Using board games to consolidate

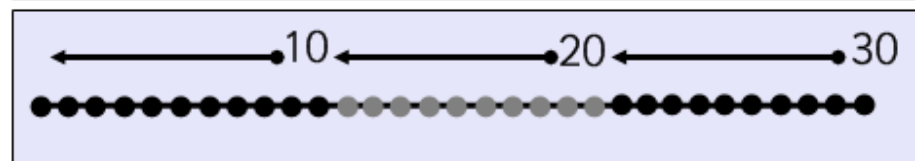


**Year 1: Apparatus available to support activities.**  
**Children encouraged to find what they need**

Counting back in ones using a number line



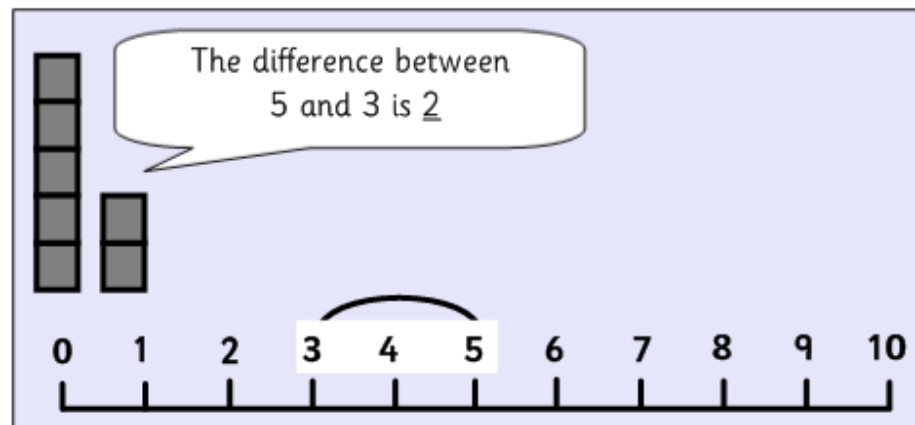
Counting back in tens using apparatus



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

$$3 + 2 = 5 \quad \text{so} \quad 5 - 2 = 3$$

$$2 + 3 = 5 \quad \text{so} \quad 5 - 3 = 2$$

**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

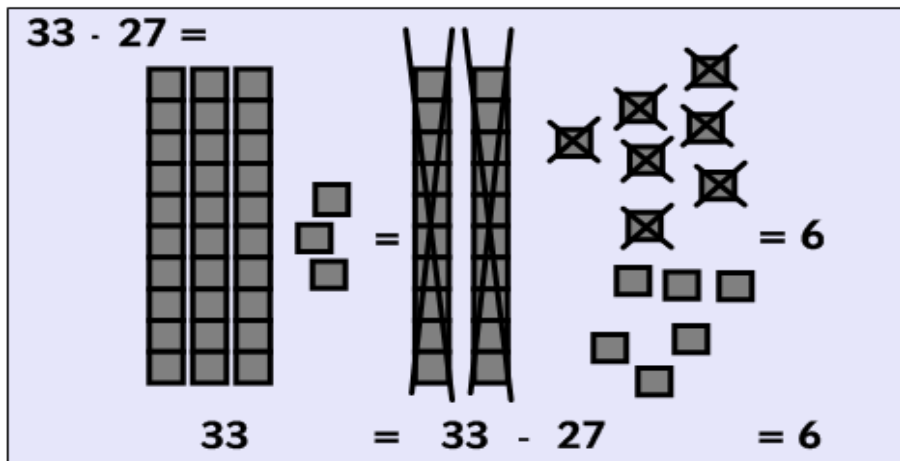
Decomposition of ten using apparatus initially and then learning written method

More formal written methods using partitioning



$$28 - 16 \quad 20 - 10 = 10$$

$$8 - 6 = 2$$



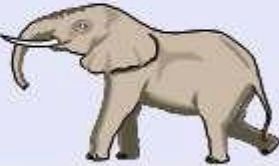

without exchanging  
 $34 - 22 = 12$   
~~30~~  
~~40~~  
 10

with exchanging  
 $34 - 26 = 8$   
~~30~~  
~~40~~  
~~10~~  
 0 ~~0000~~ ~~0000~~  
 exchange a ten for ones  
 now complete the calculation

## 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, multiplication squares, counting stick, place value cards,

Year groups	Examples
<p><b>Reception: Supported with apparatus provided by adult</b></p> <p>Counting in twos, tens and fives through songs and rhymes</p> <p>Count repeated groups of the same size</p>	<div data-bbox="1102 480 2047 735" style="border: 1px solid black; padding: 10px; background-color: #e6e6fa;"> <p>2,4,6,8 Who do we appreciate?</p> <p>5 elephants went out one day</p>  </div> <div data-bbox="1102 871 2069 1126" style="border: 1px solid black; padding: 10px; background-color: #d9e1f2;">  </div>



**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...



$$2 \times 5 = 10$$

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

Recognising that multiplication is repeated addition

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

Use arrays to illustrate multiplication facts

Use known facts and partitioning to solve problems with larger numbers


Learn 3 and 4 times tables

Recognise pattern of the 9 times table

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

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

$$1 \times 2 = 2$$

$$2 \times 2 = 4$$


$$3 \times 5$$


$$5 \times 3$$


$$16 \times 2 = 10 \times 2 = 20$$

$$6 \times 2 = 12 = 32$$

$1 \times 3 = 3$	$1 \times 4 = 4$
$2 \times 3 = 6$	$2 \times 4 = 8$
$3 \times 3 = 9$	$3 \times 4 = 12$

- 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]



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

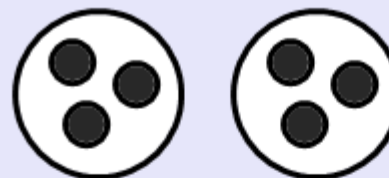
Half (put into two equal groups) even numbers up to 10 and then 20 using cubes

Use “half” or symbol  $\frac{1}{2}$  to record this

Use knowledge of known doubles to find half and understand inverse relationship

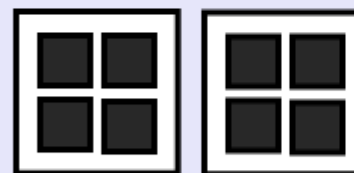
Use equipment to share objects into equal groups and relate this to real situations

Half of 6



half of 6 is 3       $\frac{1}{2}$  of 6 = 3

Double 4 is 8      so      half of 8 is 4



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  $\div$  to record this

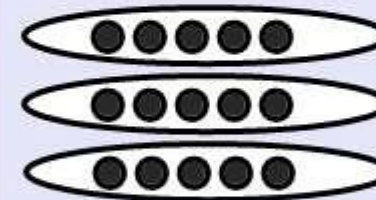
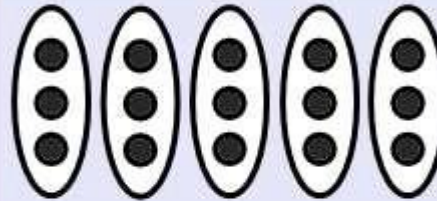
Understand division as grouping and sharing leading to:

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

$$15 \div 5 = 3$$



$$15 \div 3 = 5$$

$$3 \times 5 = 15 \quad \text{so} \quad 15 \div 3 = 5$$

$$15 \div 5 = 3$$

$$15 \div 3$$

$$15 - 3 = 12$$

$$12 - 3 = 9$$

$$9 - 3 = 6$$

$$6 - 3 = 3$$

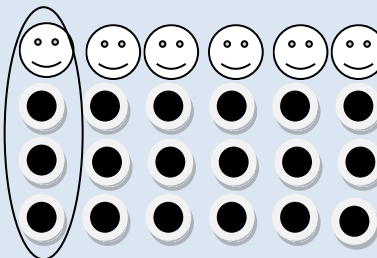
$$3 - 3 = 0$$

**Year 2 Continued**

To use the smiley face method to divide

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.

$$18 \div 6 =$$



Find  $\frac{1}{4}$  of 12

