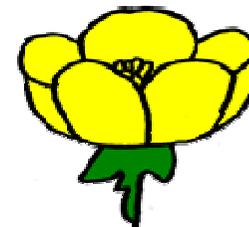


Goldfield Infants' and Nursery School

Calculation Policy

Committee	Resources Matters
Next Review	Summer 2017
Duration	3 years
Approved FGB	Summer 2014

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 pupils previous knowledge and cognitive development
- To encourage children to use practical, 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 in order 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?

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 be able to explain how they are solving a problem and use their skills in ever more challenging calculations.

Using this policy

There follows four tables, one for each operation. Within each table various stages are explained and illustrated. I have called them stages rather than assign ages or year groups to them, as individual children within the same class may not be at the same stage of understanding or competency. So within a class, the teacher may be using methods from different stages to accommodate this.

Maths and Child Development

In the infant school, 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 aged seven or younger need to ground calculation in reality. Young children would find the abstract nature of maths confusing without this. Using practical equipment such as: cubes, beads, number lines, number squares and – of course fingers – is essential in the early years.

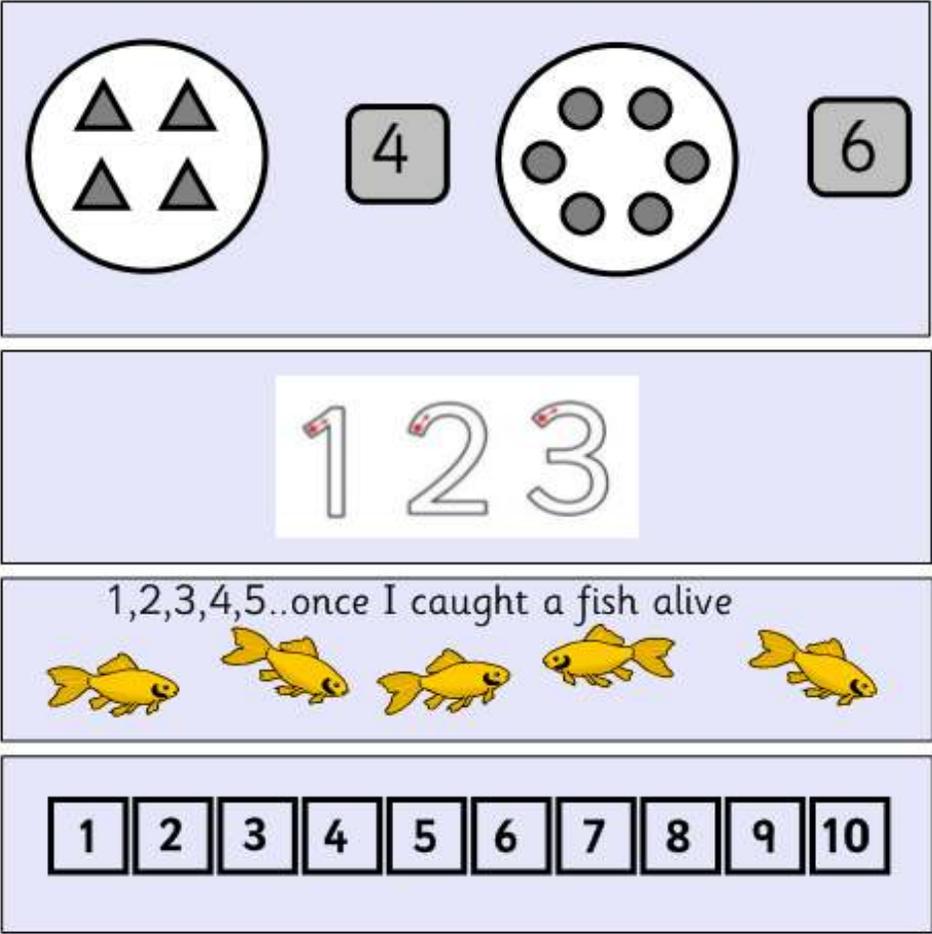
Rote Learning – Learning By Heart

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. Indeed, the children are encouraged to learn addition and multiplication facts by heart, alongside practical activities to reinforce the meaning of those facts.

Progression in understanding number and calculation: Addition

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>Nursery: Activities always supported with equipment</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>Numeral 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</p>	 <p>The examples section contains four rows of visual aids:</p> <ul style="list-style-type: none"> Row 1: A circle containing four grey triangles, a square containing the numeral '4', a circle containing six grey dots, and a square containing the numeral '6'. Row 2: A white box containing the numerals '1', '2', and '3' in a large, hollow font, with small red arrows indicating the starting point and direction of the stroke for each numeral. Row 3: The text '1,2,3,4,5..once I caught a fish alive' above five yellow cartoon fish arranged in a horizontal line. Row 4: A horizontal row of ten small squares, each containing a numeral from 1 to 10 in order.

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

0 1 2 3 4 5

1, 2.....3 cats

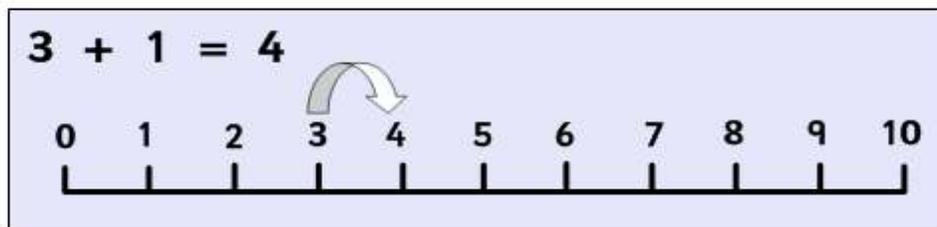
1, 2, 3 balls.....4

1 2 3 4 4

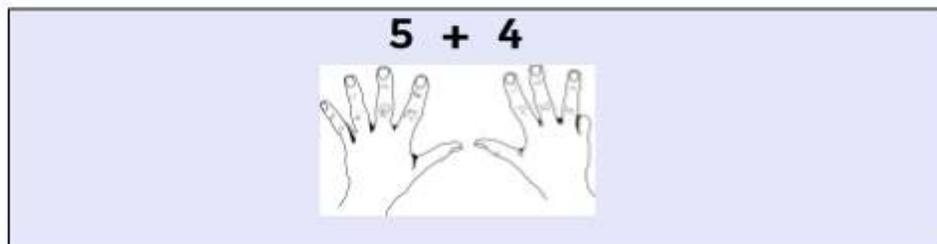
Reception continued

Learning to record this formally using + and =

Counting on using a number line



Counting on using fingers



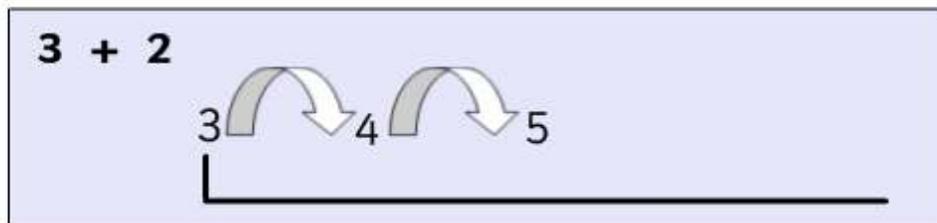
Learning the Reception CLIC Learn Its



Playing board games to reinforce counting on

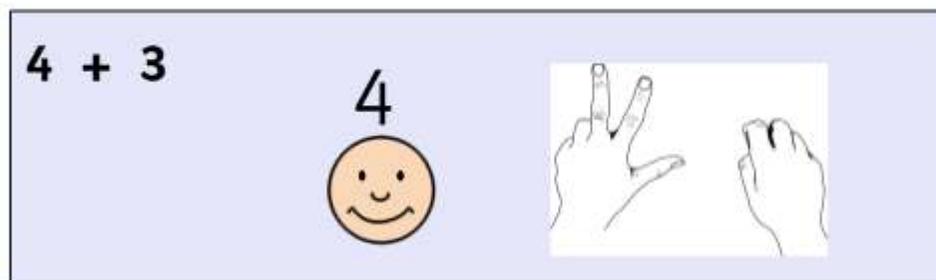


Using a blank number line, starting with the biggest number



Reception continued

Counting on – holding the bigger number in your head

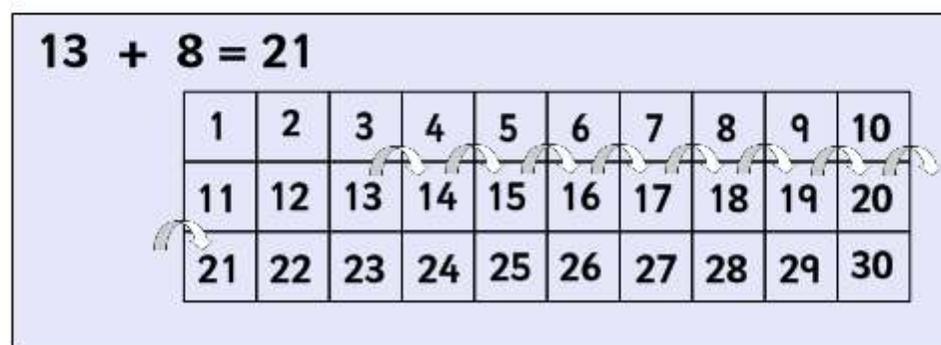
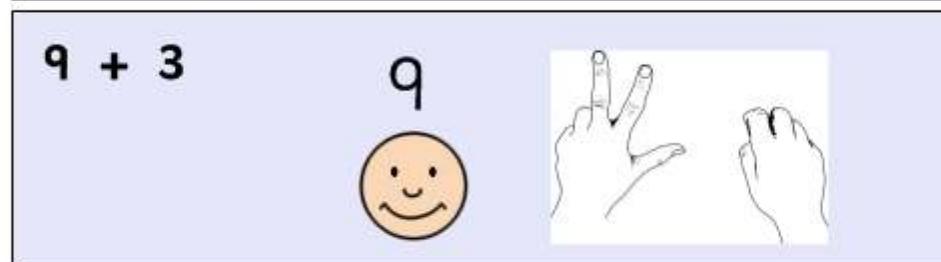
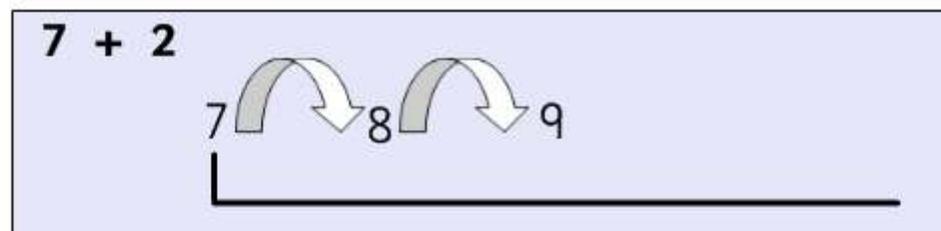


Year 1: Apparatus available to support activities.
Children encouraged to find what they need

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

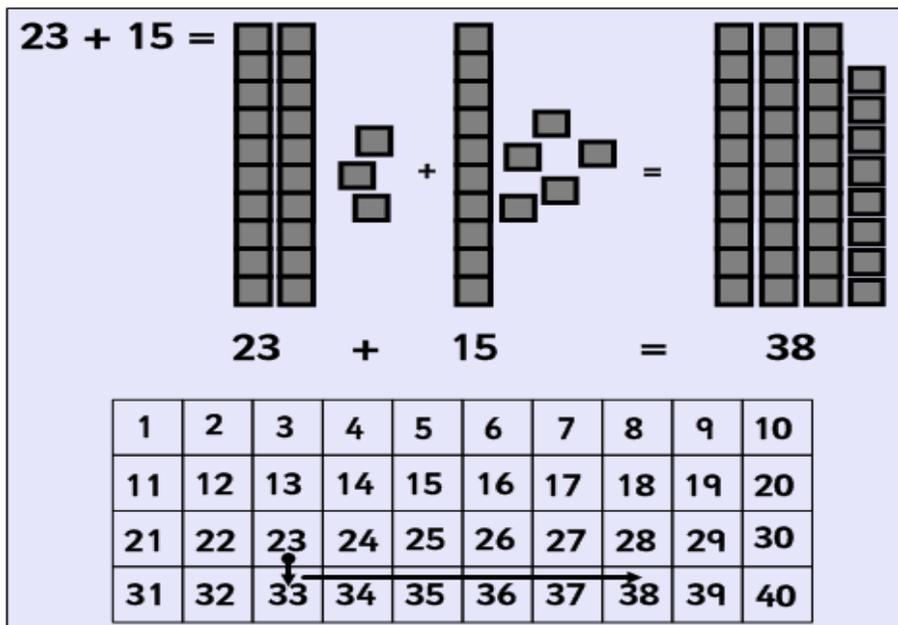
Counting on – holding the biggest number in your head

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

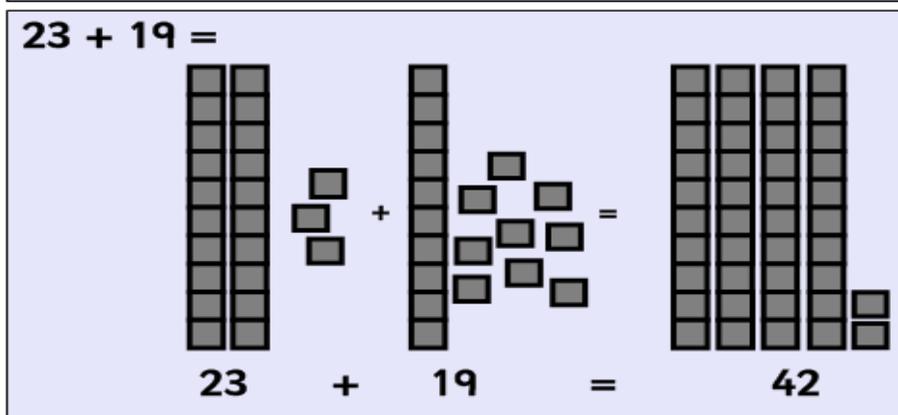


Year 1 continued

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



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

Using the symbols < and >

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

Partitioning 2d numbers and adding using knowledge of place value

$$23 + 15 = 38$$

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

Record partitioning horizontally

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

$$33 + 5 = 38$$

Record bridging a ten

$$23 + 19 = 30 + 12 = 42$$

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

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

h t u

1 2 3 = 1 hundred 2 tens 3 units

Year 2 continued

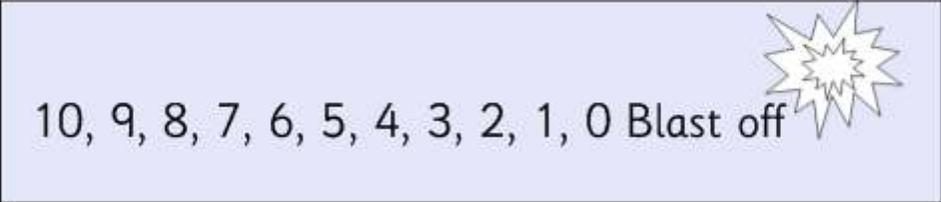
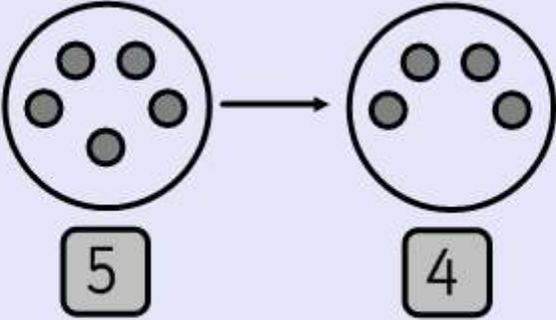
Year 2 CLIC Learn Its and Beat That



Progression in understanding number and calculation: Subtraction

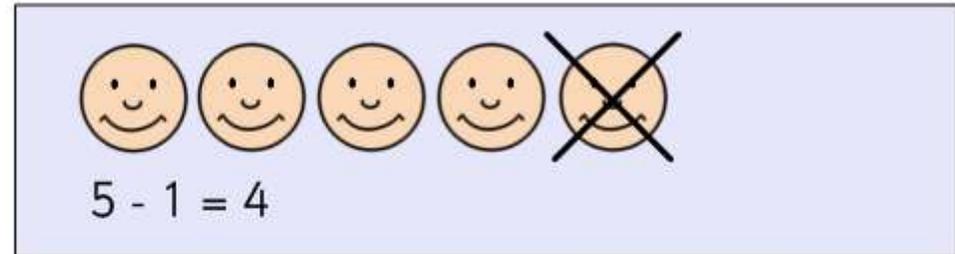
Key vocabulary: subtract, subtraction, take away, minus, count back, less than, fewer, difference

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

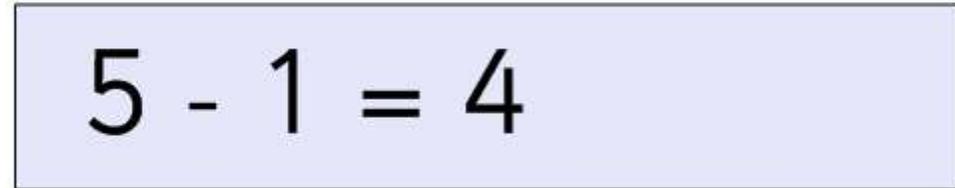
Year groups	Examples
<p>Nursery: Activities always supported with equipment</p> <p>Rote counting back in ones</p> <p>Number rhymes and stories</p> <p>Practical counting a number of objects in a set and then taking one or more away and recounting</p>	<div data-bbox="1099 560 2040 762">  <p>10, 9, 8, 7, 6, 5, 4, 3, 2, 1, 0 Blast off</p> </div> <div data-bbox="1099 770 2040 1007">  <p>5 current buns in the baker's shop...</p> </div> <div data-bbox="1099 1015 2040 1370">  </div>

Reception: Supported with apparatus provided by adult

Using drawings or dots and then crossing out



Learning to record subtraction using symbols – and =

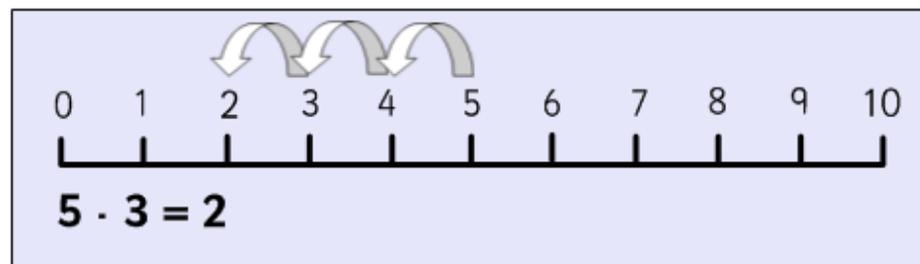


Using board games to consolidate

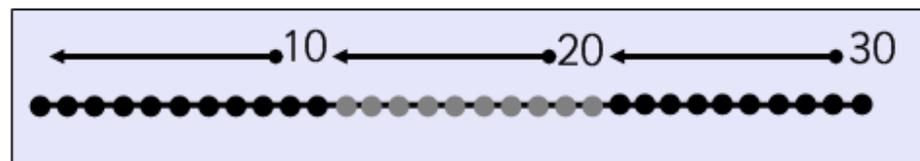


Year 1: Apparatus available to support activities.
Children encouraged to find what they need

Counting back in ones using a number line



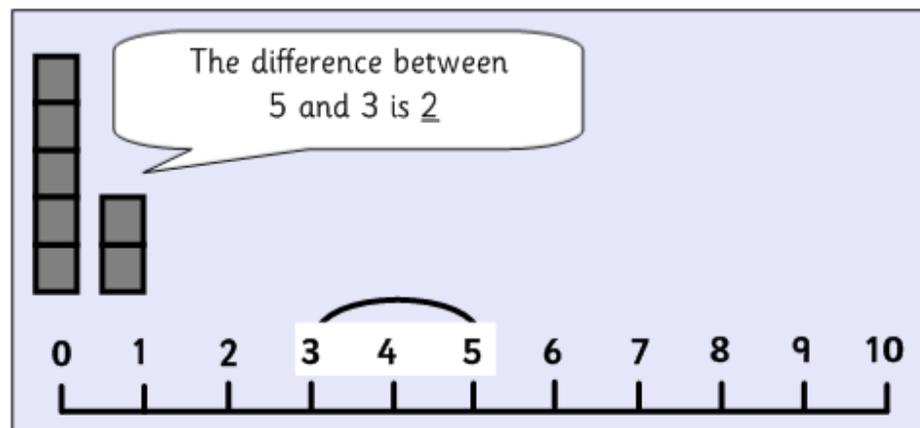
Counting back in tens using apparatus



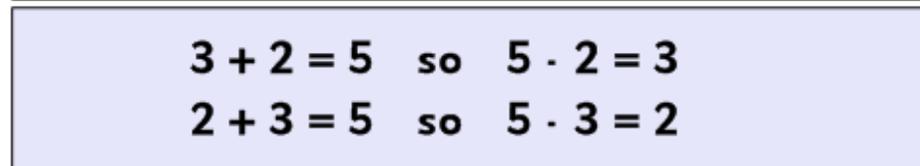
Counting back in tens by rote



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



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

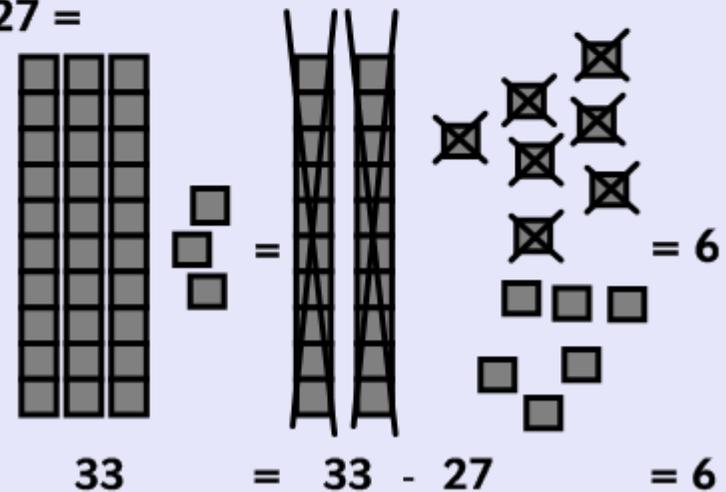
$$28 - 16 = 12$$

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

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

$$8 - 6 = 2$$

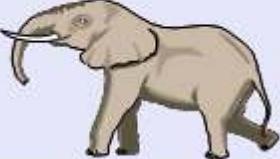
$$33 - 27 =$$



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 data-bbox="73 336 920 368">Reception: Supported with apparatus provided by adult</p> <p data-bbox="73 520 913 552">Counting in twos, tens and fives through songs and rhymes</p>	<p data-bbox="1167 520 1727 568">2,4,6,8 Who do we appreciate?</p> <p data-bbox="1167 627 1697 675">5 elephants went out one day</p> 

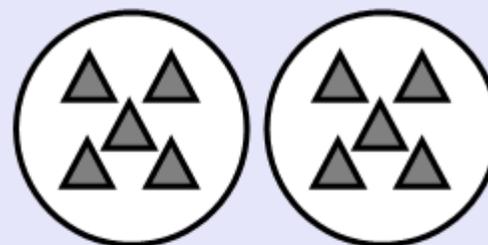
Year 1: Apparatus available to support activities. Children encouraged to find what they need

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

$$2 \times 5 = 10$$

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

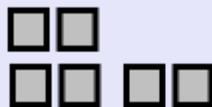
Learn 3 and 4 times tables

Recognise pattern of the 9 times table

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

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

$$1 \times 2 = 2$$

$$2 \times 2 = 4$$


$$3 \times 5$$


$$5 \times 3$$


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

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

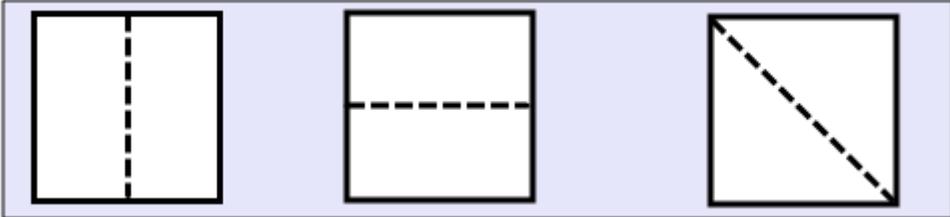
$1 \times 3 = 3$	$1 \times 4 = 4$
$2 \times 3 = 6$	$2 \times 4 = 8$
$3 \times 3 = 9$	$3 \times 4 = 12$

- 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]

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
<p>Reception: Supported with apparatus provided by adult</p> <p>Understanding of half using shape (i.e. cut/fold into two EQUAL pieces)</p>	 Three squares are shown side-by-side, each with a dashed line representing a cut. The first square has a vertical dashed line down the center. The second square has a horizontal dashed line across the middle. The third square has a diagonal dashed line from the top-left corner to the bottom-right corner. The squares are set against a light blue background.

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

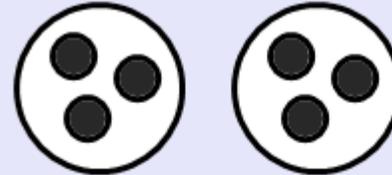
Half (put into two equal groups) even numbers up to 10 and then 20 using cubes

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

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

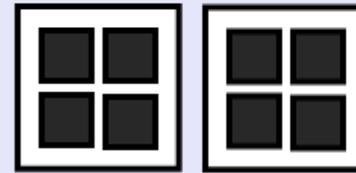
Use equipment to share objects into equal groups and relate this to real situations

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

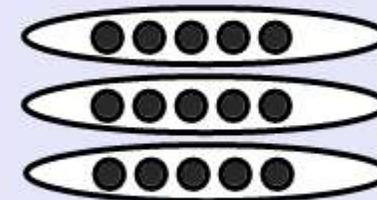
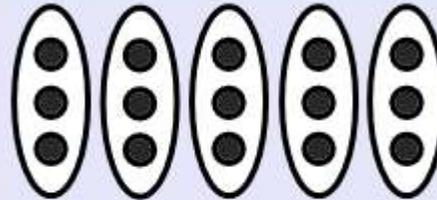
Understand division as grouping leading to:

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

$$15 \div 5 = 3$$



$$15 \div 3 = 5$$

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

$$15 \div 5 = 3$$

$$15 \div 3 \quad 15 - 3 = 12$$

$$12 - 3 = 9$$

$$9 - 3 = 6$$

$$6 - 3 = 3$$

$$3 - 3 = 0$$

