Farnborough Road Infant School

Policy for
Standard Written Methods of Calculation in Mathematics

Revised February 2023

February 2023

Farnborough Road Infant School

This policy has been largely adapted from the White Rose Hub Calculation Policy. It is a working document and will be revised and amended as necessary.

February 2023

Introduction

It is important that there is an emphasis on teaching mental calculation strategies. We recognise that informal written recordings are of significant importance, should take place regularly and are an important part of learning and understanding. More formal written methods should follow only when the child is able to use a wide range of mental calculation strategies.

This policy demonstrates the concrete, pictorial and abstract calculation approaches for each strand of the Mathematics National Curriculum. It illustrates the large variety of methods taught and the relevant year groups in which they are predominantly covered. However, teachers use their professional judgement as to the appropriateness of each method for their own children and may cover Year 2 calculation strategies in Year 1 and vice versa. Additionally, EYFS teachers will introduce many of the concrete approaches in Reception.

We use an approach in FRIS based upon the concrete-pictorial-abstract cycle of learning which begins early in EYFS. Counting is also a fundamental part of every day.

10 Principles of Counting

1) Stable Order Principle

Numbers are always said in the same order.

1, 2, 3, 4, 5, 6, 7, 8, 9, 10.....

2) 1:1 Correspondence Principle

We always count one number for one object.

3) Cardinality Principle

The last number we say tells us how many there are.

There are 5 in the set

4) Invariance of Number Principle

How objects are arranged doesn't affect how many there are.

Which line has more?

5) Abstraction Principle

We can count different sets within the same set.

How many objects? How many blue objects?
How many balls? How many blue balls?

6) Order Irrelevance Principle

We can count a set in any order, starting anywhere.

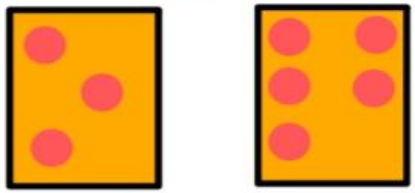
Let's make this bear number 1.

7) Conservation of Number Principle

Once counted, the total never changes, even if objects are covered up or rearranged.

8) Subitising

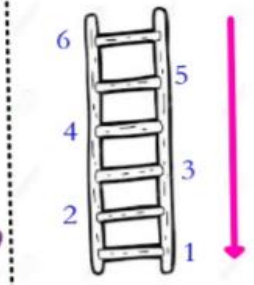
Sometimes we don't need to count. Our brains learn to just 'see' small quantities. This is **perceptual subitising**. Later, we use this to recognise larger numbers. We see, for example, 3 and 2 making 5 in total. This is **conceptual subitising**.



9) Counting Larger Sets

- Cross items off
- Move items into a line
- Move items to side once counted
- Count from left to right
- Count from top to bottom

10) Counting Backwards



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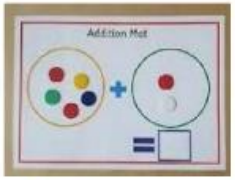
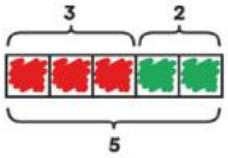
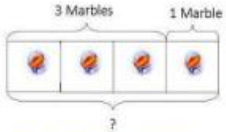
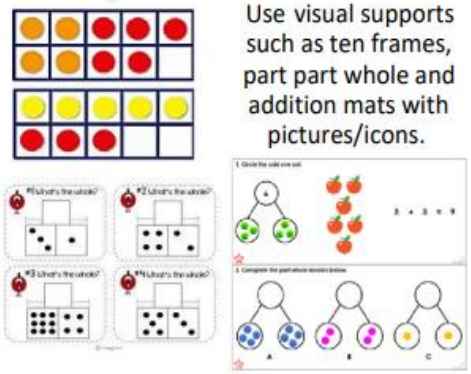
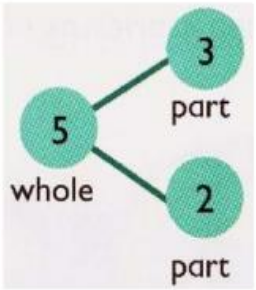
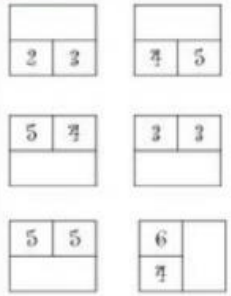
EYFS

ADDITION +

Objectives	Concrete	Pictorial	Abstract
Knows that a group of things change in quantity when something is added. Find the total number of items in two groups by counting all of them. **Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity. ELG** In practical activities and discussion, beginning to use the vocabulary involved in adding. Using quantities and objects, they add two single digit numbers and count on to find the answer. **Have a deep understanding of number to 10, including the composition of each number. ELG**	   Use toys and general classroom resources for children to physically manipulate, group/regroup.  Use specific maths resources such as counters, snap cubes, Numicon etc.   Use  visual supports such as ten frames, part part whole and addition mats, with the physical objects and resources that can be manipulated.	  Two groups of pictures so children are able to count the total.  Bar model using visuals, pictures/icons or colours.  Use visual supports such as ten frames, part part whole and addition mats with pictures/icons. 	A focus on symbols and numbers to form a calculation. $5+2=7$   No expectation for children to be able to record a number sentence/addition calculation.

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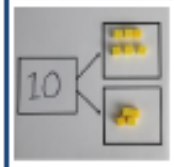
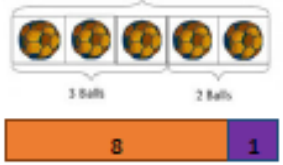
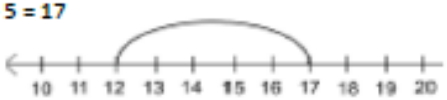
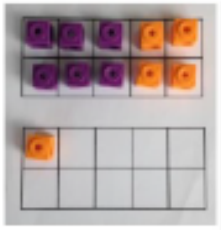
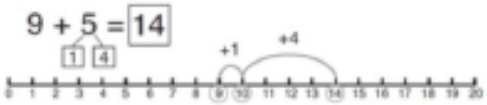
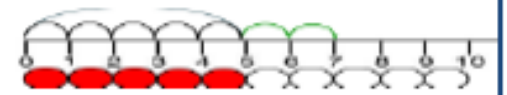
Y1 ADDITION +

Objective & Strategy	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part- whole model	   Use part part whole model. Use cubes to add two numbers together as a group or in a bar. 	   Use pictures to add two numbers together as a group or in a bar.	$4 + 3 = 7$  $10 = 6 + 4$ Use the part-part whole diagram as shown above to move into the abstract.
Starting at the bigger number and counting on	 Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.	12 + 5 = 17  Start at the larger number on the number line and count on in ones or in one jump to find the answer.	5 + 12 = 17 Place the larger number in your head and count on the smaller number to find your answer.
Regrouping to make 10. *This is an essential skill for column addition later.*	 6 + 5 = 11  Start with the bigger number and use the smaller number to make 10. Use ten frames.	 Use pictures or a number line. Regroup or partition the smaller number using the part part whole model to make 10. 	7 + 4= 11 If I am at seven, how many more do I need to make 10. How many more do I add on now?
Represent & use number bonds and related subtraction facts within 20	 2 more than 5.	 	Emphasis should be on the language *'1 more than 5 is equal to 6.'* *'2 more than 5 is 7.'* *'8 is 3 more than 5.'*

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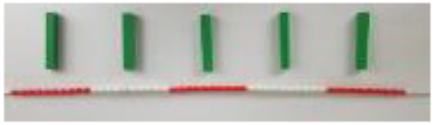
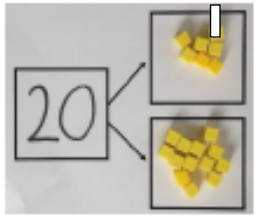
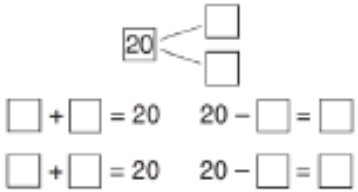
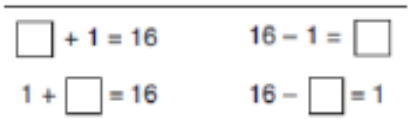
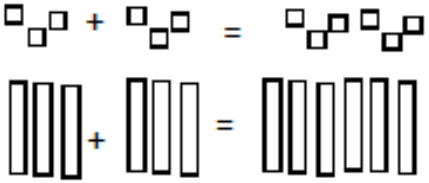
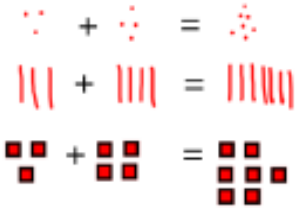
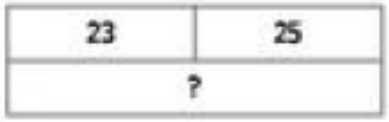
Y2 ADDITION +

Objective & Strategy	Concrete	Pictorial	Abstract
Adding multiples of ten	50= 30 = 20  Model using dienes and bead strings	 Use representations for base ten.	20 + 30 = 50 70 = 50 + 20 40 + □ = 60
Use known number facts Part part whole	 Children explore ways of making numbers within 20		
Using known facts		 Children draw representations of H,T and O	3 + 4 = 7 *leads to* 30 + 40 = 70 *leads to* 300 + 400 = 700
Bar model	 3 + 4 = 7	 7 + 3 = 10	 23 + 25 = 48

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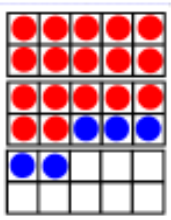
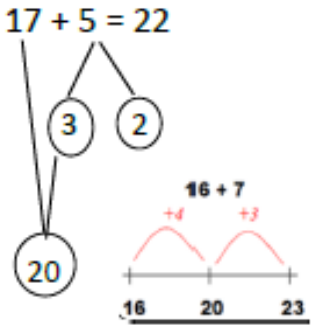
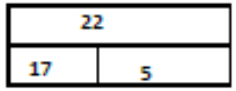
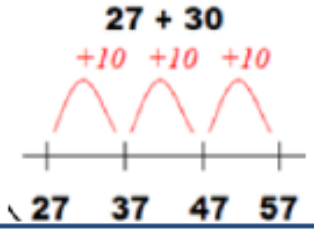
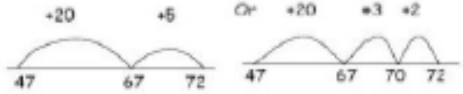
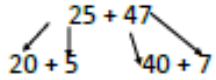
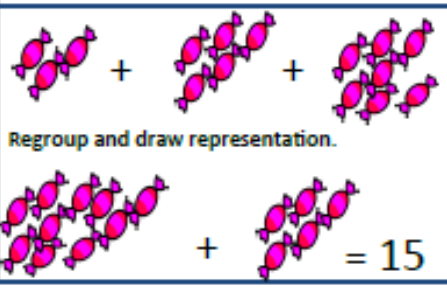
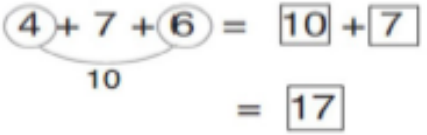
Y2 ADDITION +

Objective & Strategy	Concrete	Pictorial	Abstract
Add a two digit number and ones	 17 + 5 = 22 Use ten frame to make 'magic ten Children explore the pattern. 17 + 5 = 22 27 + 5 = 32	Use part part whole and number line to model. 	17 + 5 = 22 Explore related facts 17 + 5 = 22 5 + 17 = 22 22—17 = 5 22—5 = 17 
Add a 2 digit num-ber and tens	 25 + 10 = 35 Explore that the ones digit does not change		27 + 10 = 37 27 + 20 = 47 27 + □ = 57
Add two 2-digit numbers	 Model using dienes , place value counters and numicon	 Use number line and bridge ten using part whole if necessary.	 20 + 40 = 60 5+ 7 =12 60 + 12 = 72
Add three 1-digit numbers	 Combine to make 10 first if possible, or bridge 1o then add third digit		 Combine the two numbers that make/ bridge ten then add on the third.

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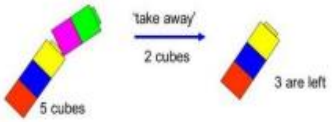
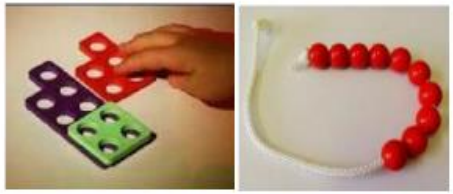
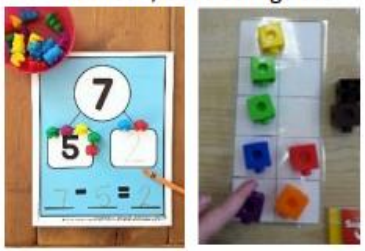
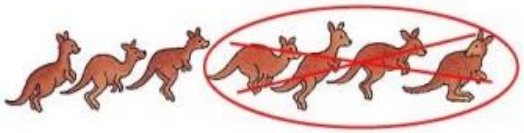
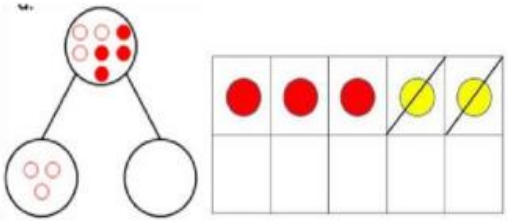
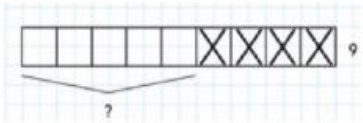
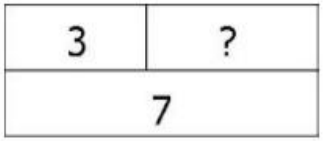
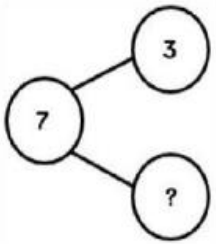
EYFS SUBTRACTION

Objectives	Concrete	Pictorial	Abstract
Knows that a group of things change in quantity when something is taken away Find one less from a group of five objects, then ten objects. In practical activities and discussion, beginning to use the vocabulary involved in subtracting. Using quantities and objects, they subtract two single digit numbers and count back to find the answer. **Automatically recall number bonds including subtraction facts to 5** **ELG**	   Use toys and general classroom resources for children to physically manipulate, group/regroup.   Use specific maths resources such as snap cubes, Numicon, bead strings etc.  Use visual supports such as ten frames, part part whole and subtraction mats, with the physical objects and resources that can be manipulated.	     A group of pictures for children to cross out or cover quantities to support subtraction.   Use visual supports such as ten frames, part part whole and bar model with pictures/icons.	A focus on symbols and numbers to form a calculation.  10 - 6 = 4  7 - 3 = ?  * No expectation for children to be able to record a number sentence/addition calculation.

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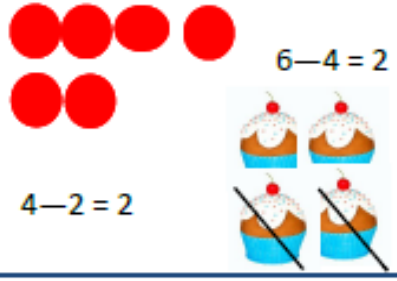
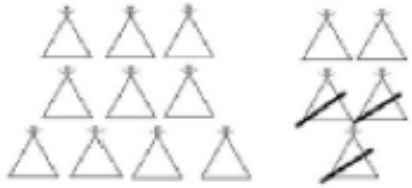
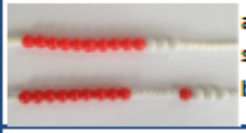
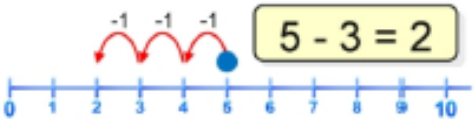
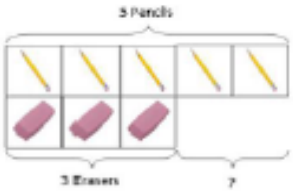
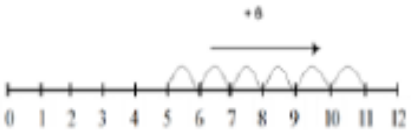
Y1 SUBTRACTION

Objective & Strategy	Concrete	Pictorial	Abstract
Taking away ones.	Use physical objects, counters , cubes etc to show how objects can be taken away. 	 Cross out drawn objects to show what has been taken away.	7—4 = 3 16—9 = 7
Counting back	 Move objects away from the group, counting backwards.  Move the beads along the bead string as you count backwards.	 Count back in ones using a number line.	Put 13 in your head, count back 4. What number are you at?
Find the Difference	Compare objects and amounts  'Seven is 3 more than four' 'I am 2 years older than my sister'  Lay objects to represent bar model.	Count on using a number line to find the difference. 	Hannah has12 sweets and her sister has 5. How many more does Hannah have than her sister.?

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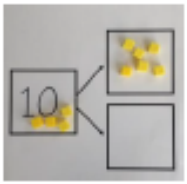
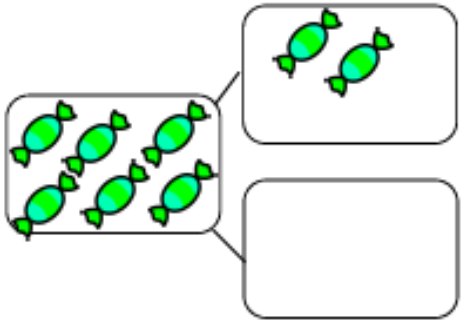
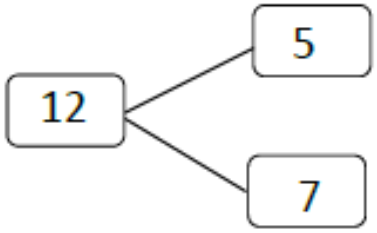
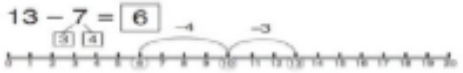
Y1 SUBTRACTION

Objective & Strategy	Concrete	Pictorial	Abstract
Represent and use number bonds and related subtraction facts within 20 Part Part Whole model	 Link to addition. Use PPW model to model the inverse. If 10 is the whole and 6 is one of the arts, what s the other part? 10—6 = 4	 Use pictorial representations to show the part.	Move to using numbers within the part whole model. 
Make 10	14—9  Make 14 on the ten frame. Take 4 away to make ten, then take one more away so that you have taken 5.	13—7  Jump back 3 first, then another 4. Use ten as the stopping point.	16—8 How many do we take off first to get to 10? How many left to take off?
Bar model	 5—2 = 3		 10 = 8 + 2 10 = 2 + 8 10—2 = 8 10—8 = 2

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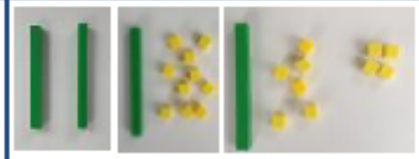
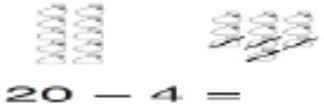
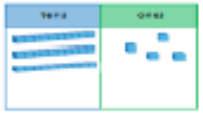
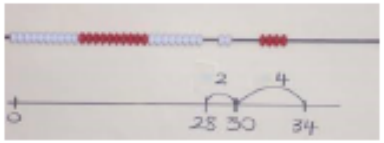
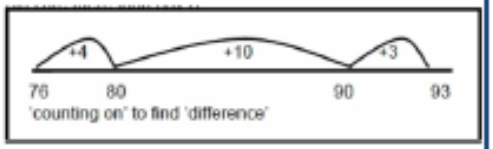
Y2 SUBTRACTION -

Objective & Strategy	Concrete	Pictorial	Abstract
Regroup a ten into ten ones	 Use a PV chart to show how to change a ten into ten ones, use the term 'take and make'		20—4 = 16
Partitioning to subtract without regrouping. *'Friendly numbers'*	34—13 = 21   Use Dienes to show how to partition the number when subtracting without regrouping. 	Children draw representations of Dienes and cross off.  43—21 = 22	43—21 = 22
Make ten strategy *Progression should be crossing one ten, crossing more than one ten, crossing the hundreds.*	 34—28 Use a bead bar or bead strings to model counting to next ten and the rest.	 Use a number line to count on to next ten and then the rest.	93—76 = 17
			Children may use the empty number line method to subtract the tens followed by the ones.

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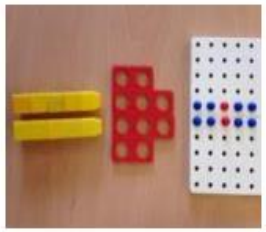
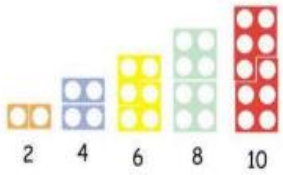
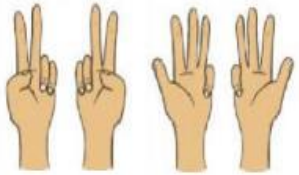
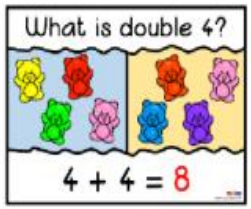
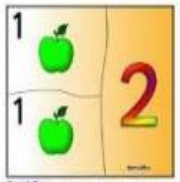
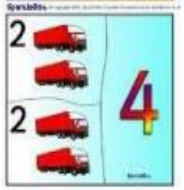
EYFS

MULTIPLICATION

Objectives	Concrete	Pictorial	Abstract
Automatically recall some double facts **ELG**	   Counting and other maths resources for children to make 2 equal groups.  Physical and real life examples that encourage   children to see concept of doubling as adding two equal groups.	    Pictures and icons that encourage children to see concept of doubling as adding two equal groups.	1+1= 7+7= 2+2= 8+8= 3+3= 9+9= 4+4= 10+10= 5+5= 11+11= 6+6= 12+12= Addition calculations to model adding two equal groups.

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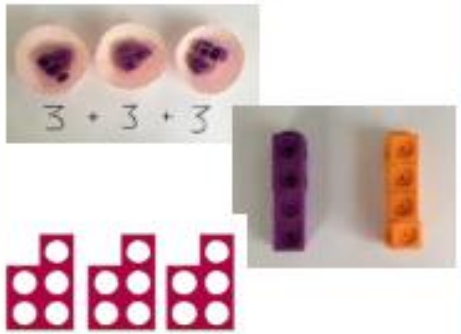
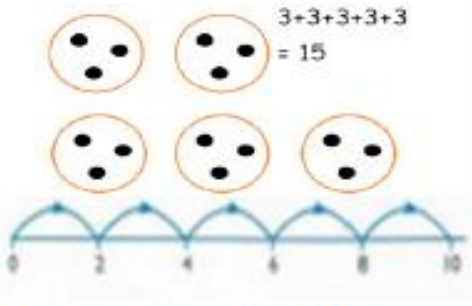
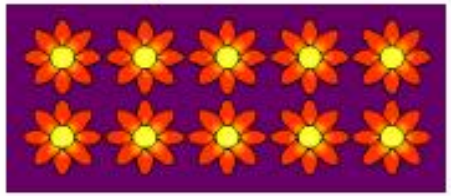
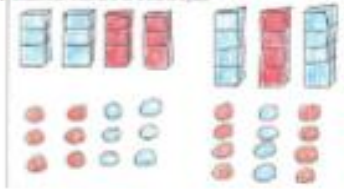
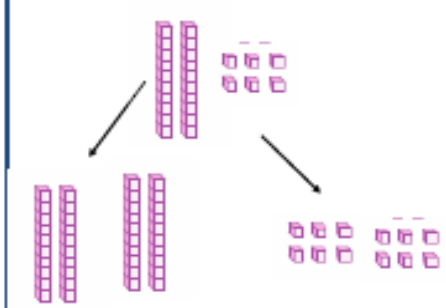
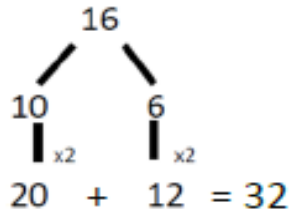
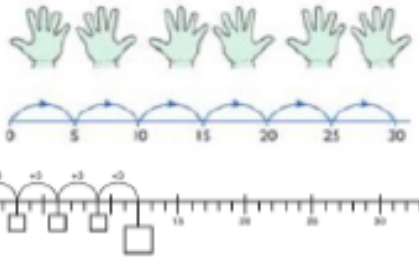
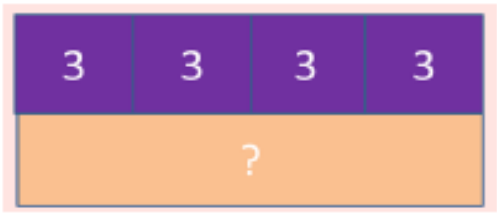
Y1 MULTIPLICATION X

Objective & Strategy	Concrete	Pictorial	Abstract
Repeated addition	 Use different objects to add equal groups	Use pictorial including number lines to solve prob 	Write addition sentences to describe objects and pictures. 
Understanding arrays	Use objects laid out in arrays to find the answers to 2 lots 5, 3 lots of 2 etc. 	Draw representations of arrays to show understanding 	3 x 2 = 6 2 x 5 = 10
			Children may be introduced to the x symbol by the end of Y1 but will not use it in formal calculations. **Vocab – 'times' rather than 'multiplied by'**

Y2 MULTIPLICATION

Objective & Strategy	Concrete	Pictorial	Abstract
Doubling	Model doubling using dienes and PV counters.  40 + 12 = 52	Draw pictures and representations to show how to double numbers	Partition a number and then double each part before recombining it back together.  20 + 12 = 32
Counting in multiples of 2, 3, 4, 5, 10 from 0 (repeated addition)	Count the groups as children are skip counting, children may use their fingers as they are skip counting. Use bar models.  5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = 40  	Number lines, counting sticks and bar models should be used to show representation of counting in multiples.  	Count in multiples of a number aloud. Write sequences with multiples of numbers. 0, 2, 4, 6, 8, 10 0, 3, 6, 9, 12, 15 0, 5, 10, 15, 20, 25 , 30 $4 \times 3 = \square$

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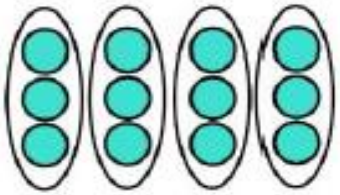
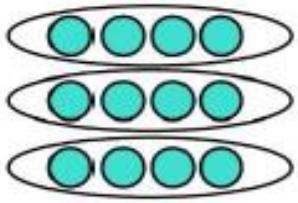
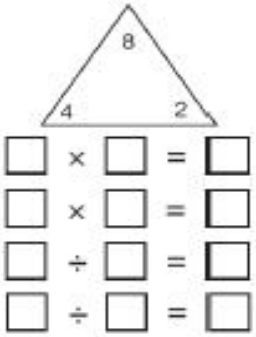
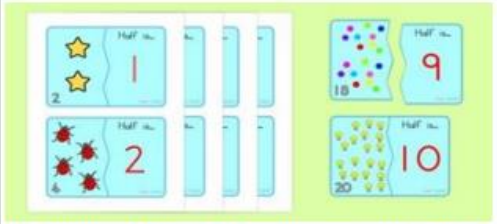
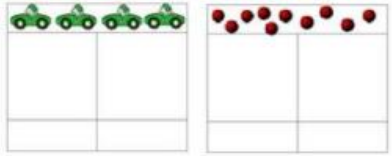
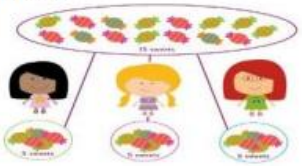
Y2 MULTIPLICATION

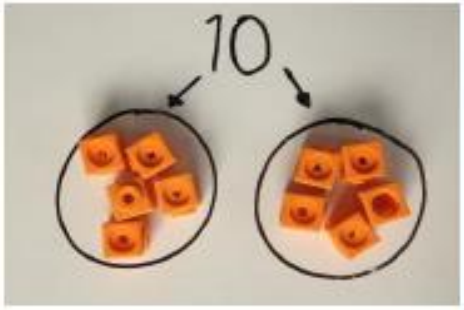
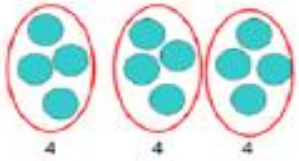
Objective & Strategy	Concrete	Pictorial	Abstract
Multiplication is commutative **Vocab used is 'times' rather than 'multiplied by'**	Create arrays using counters and cubes and Numicon.    Pupils should understand that an array can represent different equations and that, as multiplication is commutative, the order of the multiplication does not affect the answer.  	Use representations of arrays to show different calculations and explore commutativity.  	$12 = 3 \times 4$ $12 = 4 \times 3$ Use an array to write multiplication sentences and reinforce repeated addition.  $5 + 5 + 5 = 15$ $3 + 3 + 3 + 3 + 3 = 15$ $5 \times 3 = 15$ $3 \times 5 = 15$
Using the Inverse *This should be taught alongside division, so pupils learn how they work alongside each other.*			2 x 4 = 8 4 x 2 = 8 8 ÷ 2 = 4 8 ÷ 4 = 2 8 = 2 x 4 8 = 4 x 2 2 = 8 ÷ 4 4 = 8÷ 2 Show all 8 related fact family sentences.

EYFS

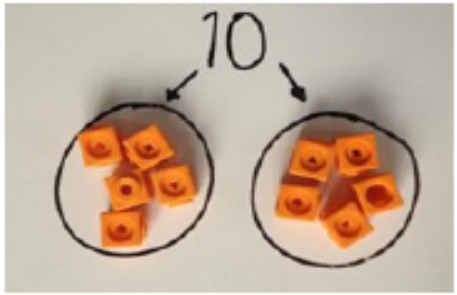
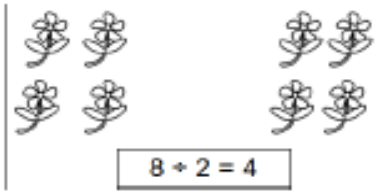
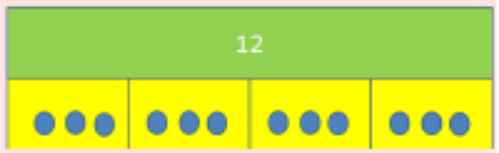
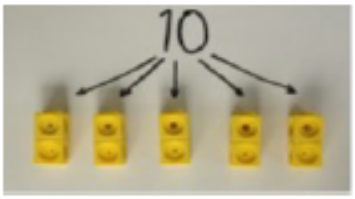
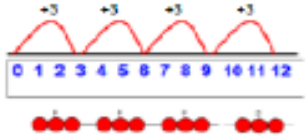
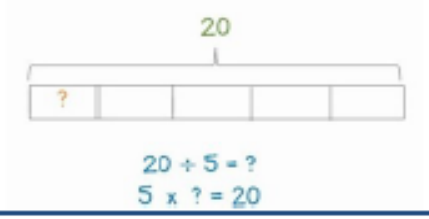
DIVISION ÷

Objectives	Concrete	Pictorial	Abstract
Solve problems including halving and sharing. Halving a whole, halving a quantity of objects. Sharing a quantity of objects. **Explore and represent patterns including how quantities can be distributed equally.** **ELG**	   Children have the opportunity to physically cut objects, food or shapes in half.	 Pictures and icons that encourage children to see concept of halving in relation to subitising, addition and subtraction knowledge. i.e. Knowing 4 is made of 2 groups of 2, so half of 4 is 2.  Bar model with pictures or icons to support understanding of finding 2 equal parts of a number, to further understand how two halves make a whole.  Pictures for children to create and visualise 3 or more	

Y1 DIVISION ÷

Objective & Strategy	Concrete	Pictorial	Abstract
Division as sharing *Use Gord modelling*	   I have 10 cubes, can you share them equally in 2 groups?	Children use pictures or shapes to share quantities.  8 shared between 2 is 4 Sharing:  4 4 4 12 shared between 3 is 4	12 shared between 3 is 4

Y2 DIVISION ÷

Objective & Strategy	Concrete	Pictorial	Abstract
Division as sharing	 I have 10 cubes, can you share them equally in 2 groups?	Children use pictures or shapes to share quantities.  Children use bar modelling to show and support understanding.  12 ÷ 4 = 3	12 ÷ 3 = 4
Division as grouping	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.  	Use number lines for grouping  12 ÷ 3 = 4 Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group. 	28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group?