Eastfield Infant and Nursery School

Calculation Policy

What is Mathematics?

Mathematics is a creative and highly interconnected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering and necessary for financial literacy and most forms of employment. A high quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject. (National Curriculum 2014)

This policy contains information about the key written methods that are taught at Eastfield Infant and Nursery School. This policy provides a reference point for teachers when planning and teaching maths and will aid consistency and progression in the teaching of maths across EYFS and Key Stage 1.

Although this policy is focussed on written methods, it is important to recognise that the ability to estimate and calculate mentally is an essential skill. Mental methods of calculation are taught systematically from the Foundation Stage onwards and pupils will be given regular opportunities to develop the necessary skills.

However, mental calculation is not at the exclusion of written recording and should be seen as **complementary** to and **not as separate** from it. Sharing written methods with the teacher encourages children to think about the mental strategies that underpin them and to develop new ideas. Therefore, written recording

- helps children to clarify their thinking
- supports and extends the development of more fluent and sophisticated mental strategies.

Children at Eastfield are learning to understand maths through a wide range of practical, oral and written methods of teaching.

We aim to equip children with the knowledge required to work independently in maths, using resources and strategies that work for ***them***. We expose children to many contextualised ways of learning, have a wide range of resources available and teach many mental and written strategies to support their understanding.

During their time at Eastfield, children will be encouraged to see mathematics as both a written and spoken language. Teachers will use modelling to support and guide children through the following important stages:

- developing the use of pictures and a mixture of words and symbols to represent numerical activities;
- using standard symbols and conventions;
- use of jottings to aid a mental strategy;
- use of pencil and paper procedures.

Aims:

- Children should be able to choose an efficient method - mental or written - appropriate to the given task.
- Children should be flexible with their approaches.

General Progression:

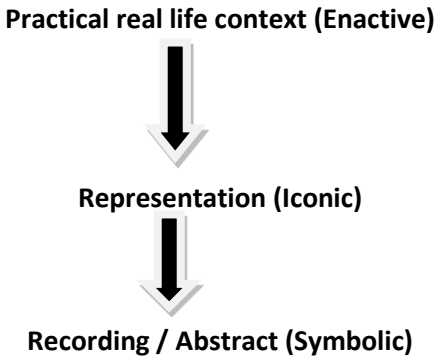
- Develop counting and the language of counting
- Establish mental methods, based on a good understanding of place value
- Develop confidence in mental calculation skills (mental recall should be taught ahead of its application to written methods)
- Use of informal jottings to aid mental calculations
- Develop use of empty number line to help mental imagery and aid recording
- Use partitioning and recombining to aid informal methods

As children make progress in their mathematical understanding and their methods become more efficient and succinct their thinking leads to effective written methods that can be used more generally. It is at this stage that they develop 'number sense'. Before they carry out a calculation they will have the knowledge to consider:

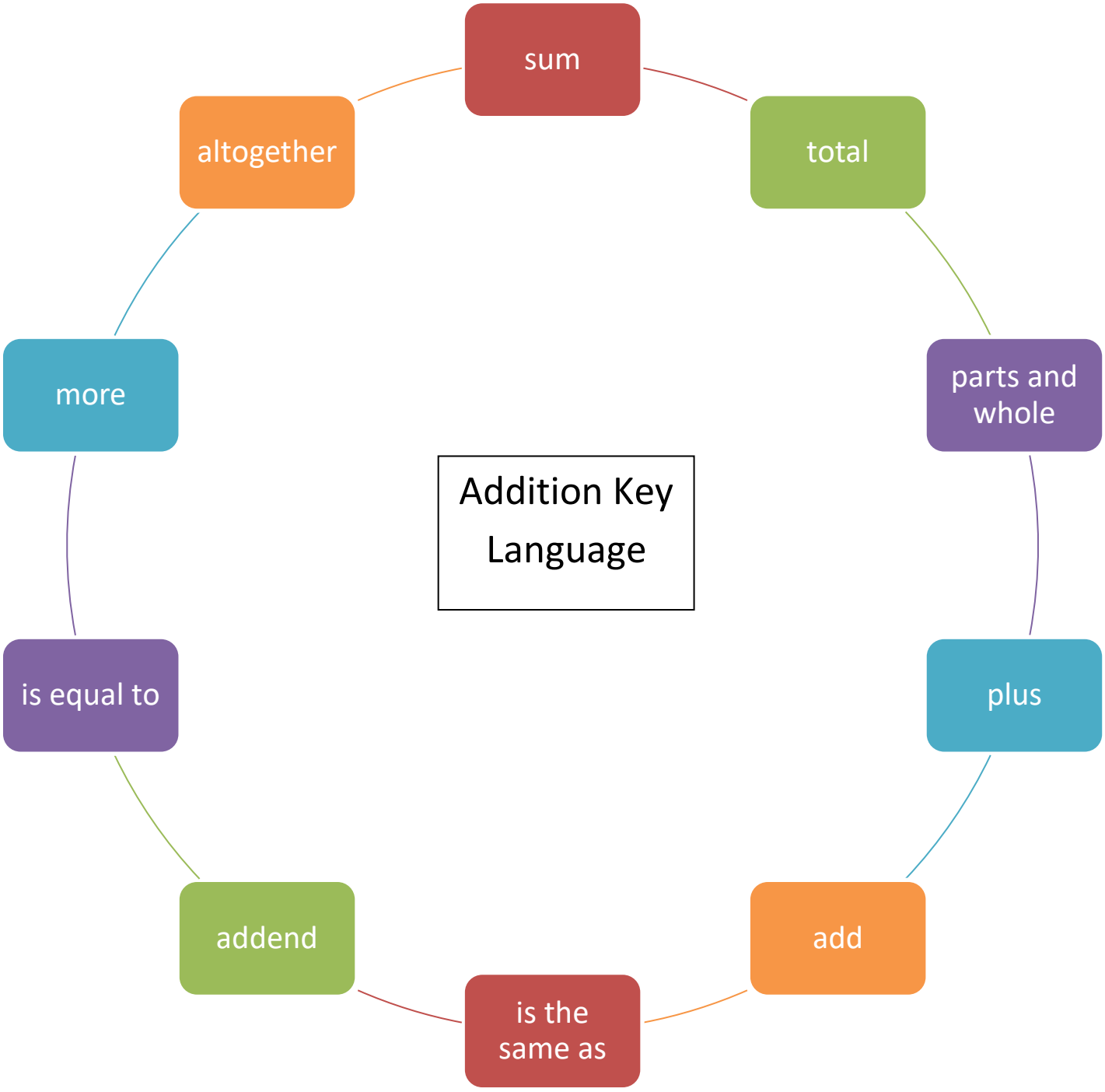
- Can I do it in my head (using rounding, adjustment)?
- The size of an approximate answer (estimation)
- Could I use jottings to keep track of the calculation?
- Which written method is going to be most effective?

From Concrete to Abstract

- When teaching calculation methods teachers will ensure that within a lesson or series of lessons they take the children through the following stages:-



Please Note:
Children may be using procedures from more than one stage in the calculation policy as they are introduced to new methods and consolidate previous learning.

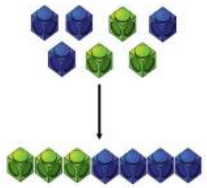
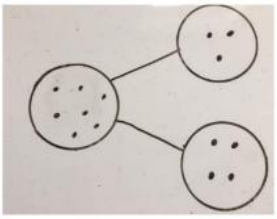
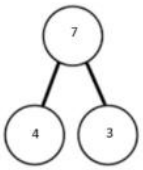
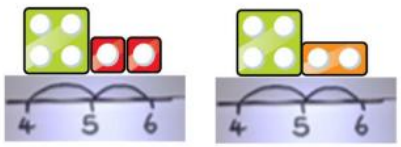
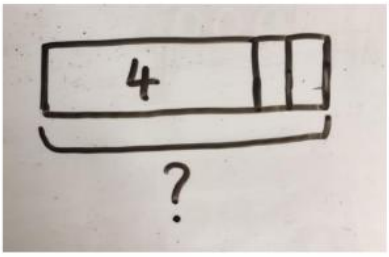

Addition Key Language
sum
total
parts and whole
plus
add
is the same as
addend
is equal to
more
altogether

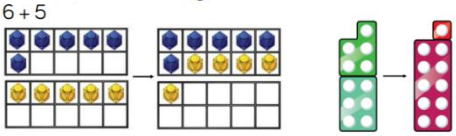
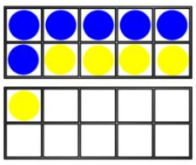
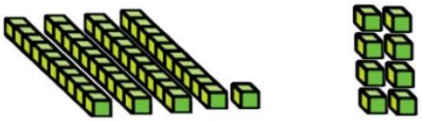
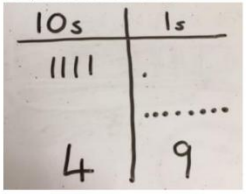
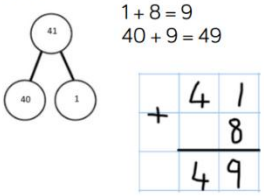
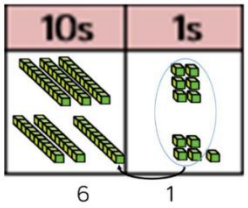
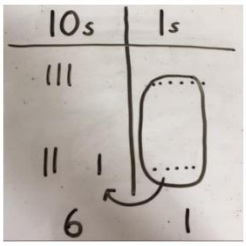
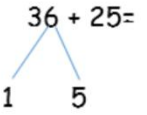
Progression in Addition

Children will need to have the following understanding of addition and they will be used at every stage in the calculation policy:-

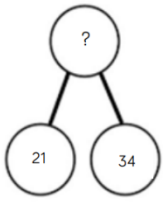
1. **Aggregation** - Combining sets to make a total, e.g. there are 3 children in a classroom and there are 2 children in another classroom. How many are there in total?
2. **Augmentation** – 1 set to begin with and then more are added to it, e.g. there are 3 children in a classroom and 2 more children join them. How many children are there altogether?
3. **Inverse of subtraction**

	EYFS/Year 1	Year 2
Addition	Combining two parts to make a whole: part whole model. Starting at the bigger number and counting on- using cubes. Regrouping to make 10 using ten frame.	Adding three single digits. Use of base 10 to combine two numbers.

Concrete	Pictorial	Abstract
Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars). 	Children to represent the cubes using dots or crosses. They could put each part on a part whole model too. 	4 + 3 = 7 Four is a part, 3 is a part and the whole is seven. 
Counting on using number lines using cubes or Numicon.  	A bar model which encourages the children to count on, rather than count all. 	The abstract number line: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? 4 + 2 

Regrouping to make 10; using ten frames and counters/cubes or using Numicon. 6 + 5 	Children to draw the ten frame and counters/cubes. 	Children to develop an understanding of equality e.g. 6 + □ = 11 6 + 5 = 5 + □ 6 + 5 = □ + 4
TO + O using base 10. Continue to develop understanding of partitioning and place value. 41 + 8 	Children to represent the base 10 e.g. lines for tens and dot/crosses for ones. 	41 + 8 
TO + TO using base 10. Continue to develop understanding of partitioning and place value. 36 + 25 	Chidlren to represent the base 10 in a place value chart. 	Looking for ways to make 10.  30 + 20 = 50 5 + 5 = 10 50 + 10 + 1 = 61 Formal method: 36 +25 61 1

Conceptual variation; different ways to ask children to solve 21 + 34



?	
21	34

Word problems:
In year 3, there are 21 children and in year 4, there are 34 children.
How many children in total?

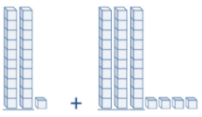
21 + 34 = 55. Prove it

21
+34
___

21 + 34 =

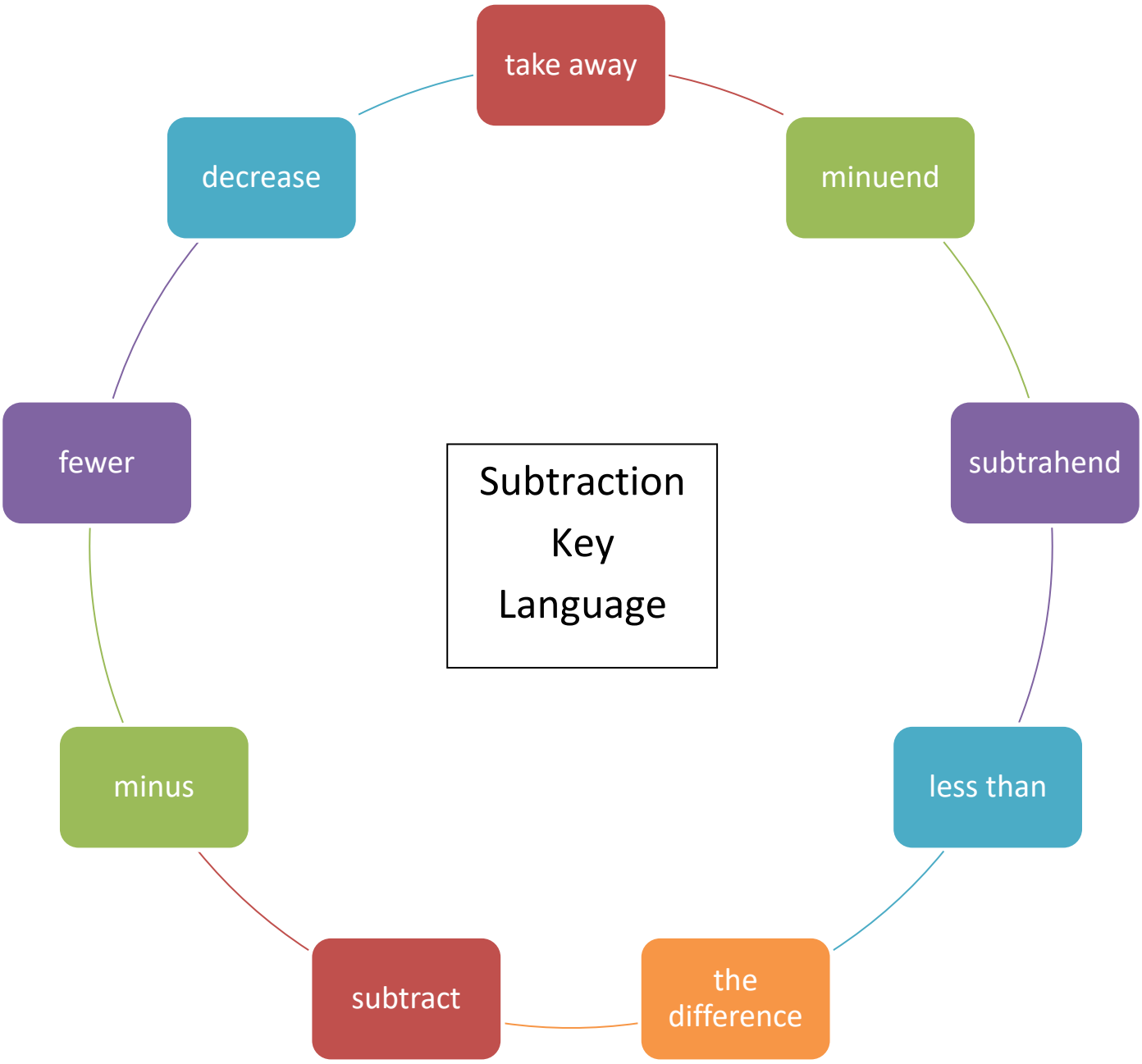
□ = 21 + 34

Calculate the sum of twenty-one and thirty-four.



Missing digit problems:

10s	1s
10 10	1
10 10 10	?
?	5

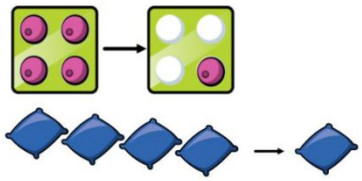
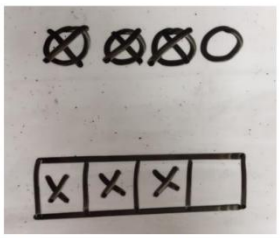
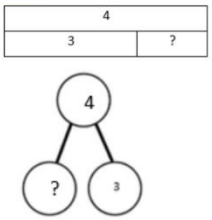
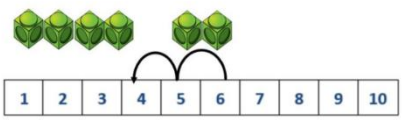
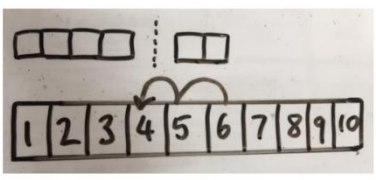
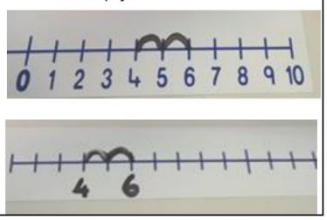

take away
minuend
subtrahend
less than
the difference
subtract
minus
fewer
decrease
Subtraction Key Language

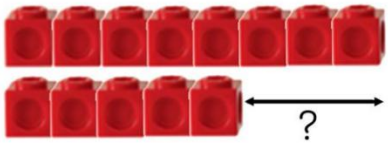
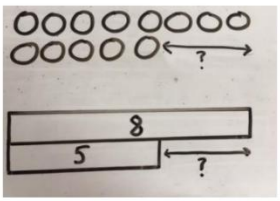
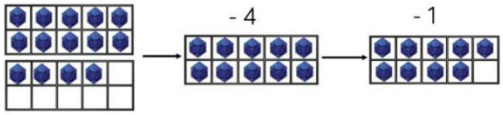
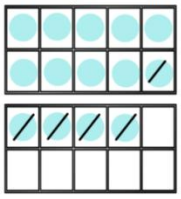
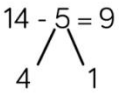
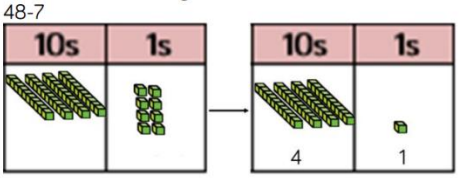
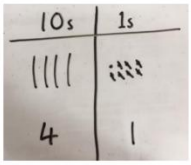
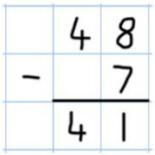
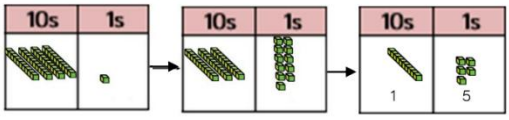
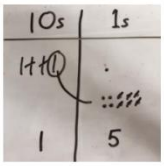
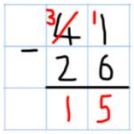
Progression in Subtraction

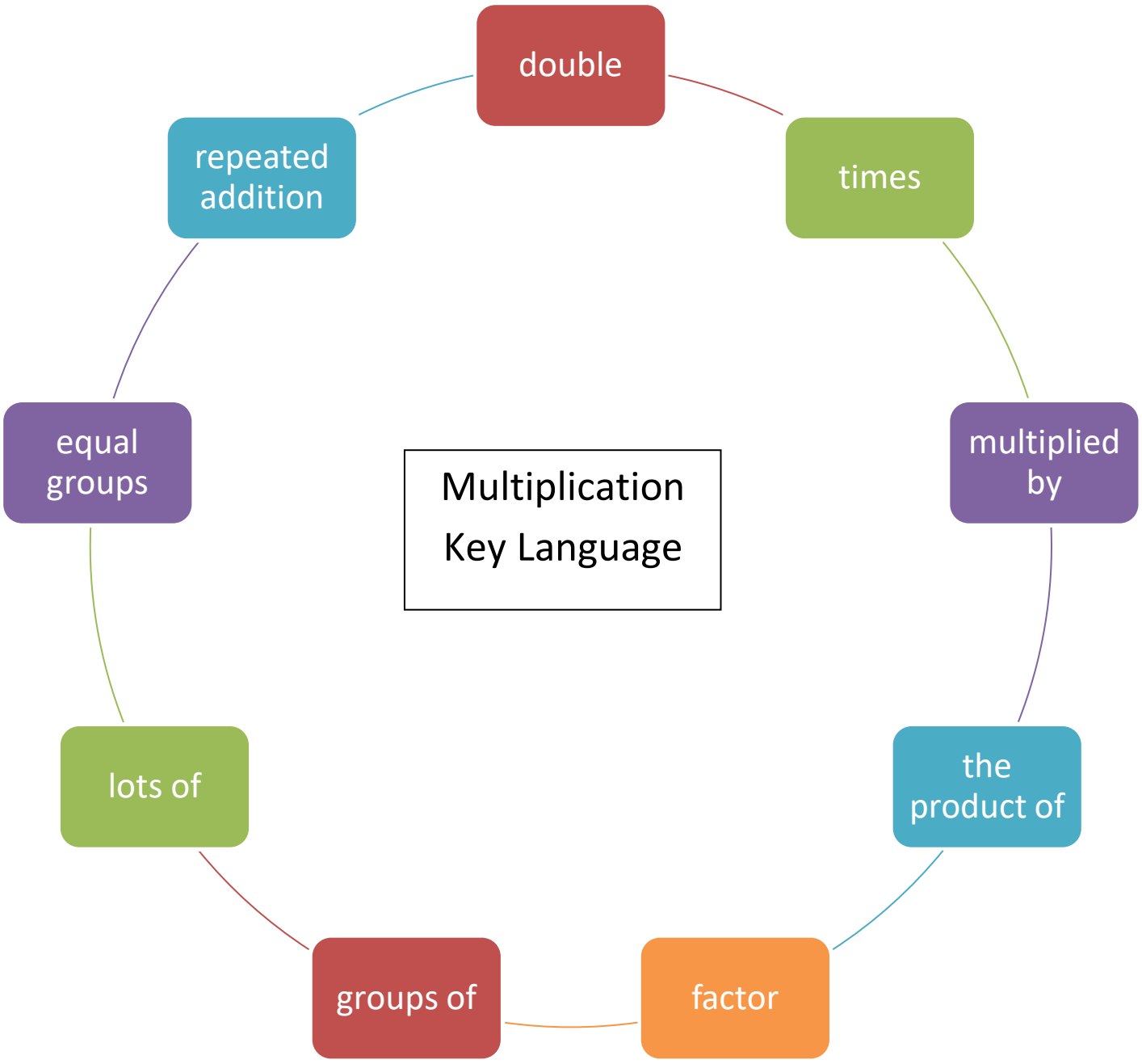
Children will need to have the following understanding of subtraction and they will be used at every stage in the calculation policy:-

1. **Reduction** – Removal from a set, e.g. there are 5 children in a classroom and 2 children leave. How many are left?
2. **Comparison** – finding the difference between two amounts, e.g. there are 3 children in 1 classroom and 5 in another. How many more children are there in the second classroom?
3. **Part-whole –** Finding how many in a set fit a criteria, e.g there are 5 cars, 3 are red and the rest are blue. How many are blue?
4. **Inverse of addition**

	EYFS/Year 1	Year 2
Subtraction	Taking away ones Counting back Find the difference Part whole model Make 10 using the ten frame	Counting back Find the difference Part whole model Make 10 Use of base 10

Concrete	Pictorial	Abstract
Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items such as beanbags could be used). 4 – 3 = 1 	Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used. 	4- 3 = □ = 4 – 3 
Counting back (using number lines or number tracks) children start with 6 and count back 2. 6 – 2 = 4 	Children to represent what they see pictorially e.g. 	Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line 

Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used). Calculate the difference between 8 and 5.  	Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate.  	Find the difference between 8 and 5. 8 – 5, the difference is ☐ Children to explore why 9 - 6 = 8 – 5 = 7 – 4 have the same difference.
Making 10 using ten frames. 14 – 5  	Children to present the ten frame pictorially and discuss what they did to make 10. 	Children to show how they can make 10 by partitioning the subtrahend.  14 – 4 = 10 10 – 1 = 9
Column method using base 10. 48-7  	Children to represent the base 10 pictorially.  	Column method or children could count back 7. 
Column method using base 10 and having to exchange. 41 – 26  	Represent the base 10 pictorially, remembering to show the exchange.  	Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because 41 = 30 + 11. 

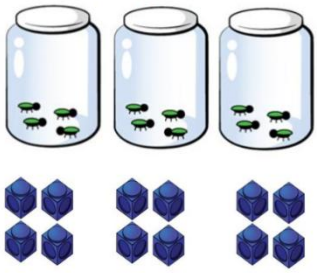
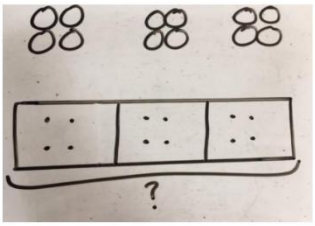
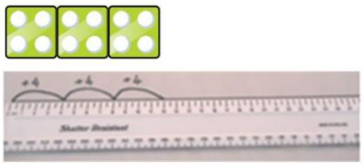
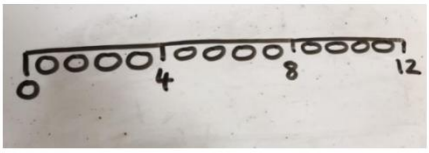
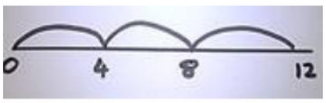
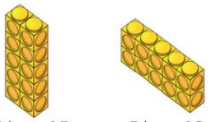
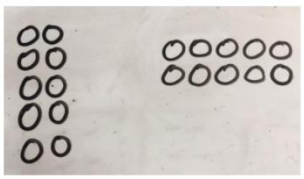

Multiplication
Key Language
double
times
multiplied by
the product of
factor
groups of
lots of
equal groups
repeated addition

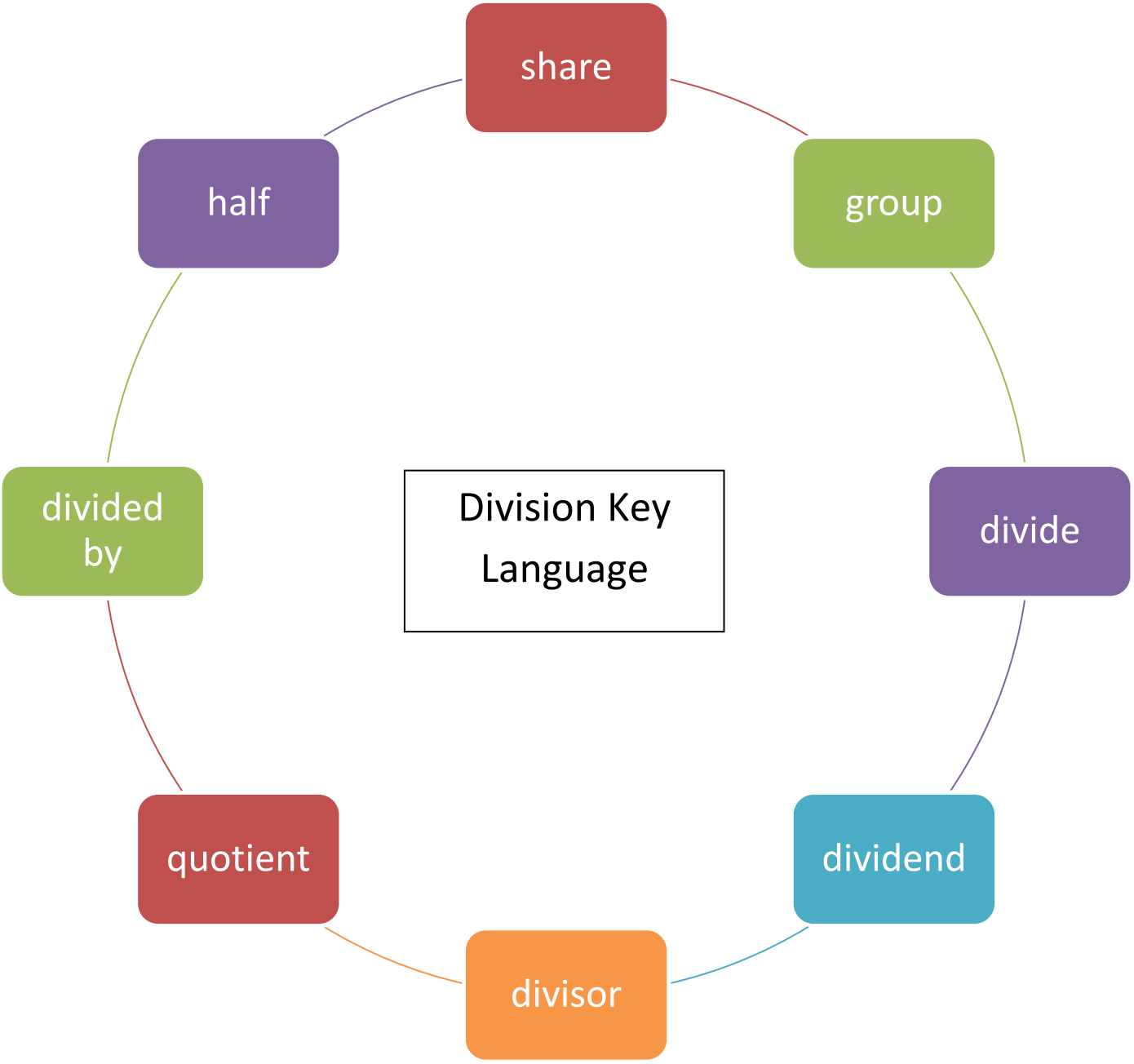
Progression in Multiplication

Children will need to have the following understanding of multiplication and they will be used at every stage in the calculation policy:-

1. **As repeated addition – 6 x 7 = 6+6+6+6+6+6+6**
2. **As an array** – a diagram of dots, representing a multiplication calculation
3. **Inverse of division**

	EYFS/Year 1	Year 2
Multiplication	Recognising and making equal groups. Doubling Counting in multiples Use cubes, Numicon and other objects in the classroom	Arrays- showing commutative multiplication

Concrete	Pictorial	Abstract
Repeated grouping/repeated addition 3 × 4 4 + 4 + 4 There are 3 equal groups, with 4 in each group. 	Children to represent the practical resources in a picture and use a bar model. 	3 × 4 = 12 4 + 4 + 4 = 12
Number lines to show repeated groups- 3 × 4  Cuisenaire rods can be used too.	Represent this pictorially alongside a number line e.g.: 	Abstract number line showing three jumps of four. 3 × 4 = 12 
Use arrays to illustrate commutativity counters and other objects can also be used. 2 × 5 = 5 × 2  2 lots of 5 5 lots of 2	Children to represent the arrays pictorially. 	Children to be able to use an array to write a range of calculations e.g. 10 = 2 × 5 5 × 2 = 10 2 + 2 + 2 + 2 + 2 = 10 10 = 5 + 5

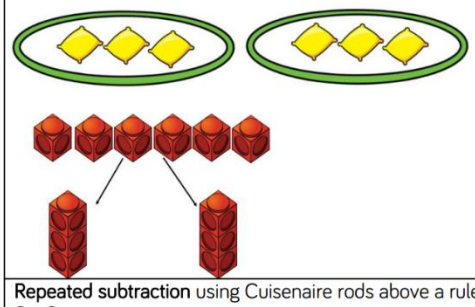
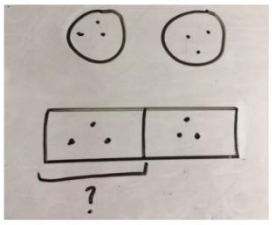
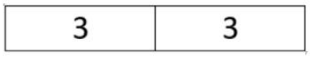
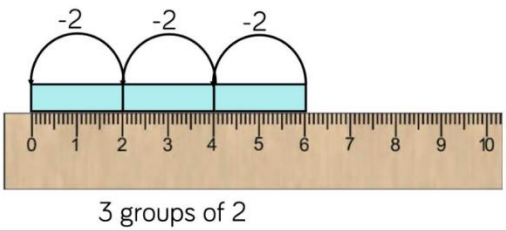
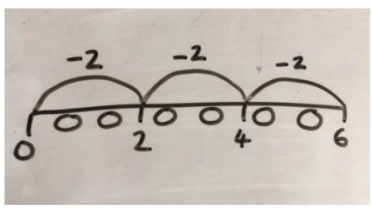

share
group
divide
dividend
divisor
quotient
divided by
half
Division Key Language

Progression in Division

Children will need to have the following understanding of division and they will be used at every stage in the calculation policy:-

1. **Sharing** – Sharing between model you know groups but not how many in each group e.g. John has 36 Smarties and shares them between 4 people how many do they get each?
2. **Grouping**– Grouping model you know how many each person gets but not how many people there are e.g. John has 36 Smarties and each of his friends get 9 sweets each. How many friends does John have?
3. **Fraction–** The idea of equal shares – halving and quartering etc
4. **Inverse of multiplication**

	EYFS/Year 1	Year 2
Division	Sharing objects into groups Division as grouping e.g. I have 12 sweets and put them in groups of 3, how many groups? Use cubes and draw round 3 cubes at a time.	Division as grouping Division within arrays- linking to multiplication Repeated subtraction

Concrete	Pictorial	Abstract
Sharing using a range of objects. 6 ÷ 2 	Represent the sharing pictorially. 	6 ÷ 2 = 3  Children should also be encouraged to use their 2 times tables facts.
Repeated subtraction using Cuisenaire rods above a ruler. 6 ÷ 2  3 groups of 2	Children to represent repeated subtraction pictorially. 	Abstract number line to represent the equal groups that have been subtracted.