Calculation policy 2019

Date:	September 2019
Date approved by Management Committee:	18/09/2019
Signature of Chair of Management Committee:	A. Cunningham
To be reviewed:	Annually

Calculation policy

Introduction

"Maths is essential for everyday life and understanding our world. It is also essential to science, technology and engineering and our economic future depends on it. It is therefore fundamentally important to ensure that all pupils have the best possible maths education." (HMCI, 2012)

At the Link school we follow the 'Mastery approach' to teaching mathematics. At the centre of the mastery approach is the belief that all children have the potential to succeed. All children should have access to the same curriculum content, and rather than being pushed on to new learning, they should deepen their conceptual understanding by tackling challenging and varied problems, in a range of contexts. With calculation strategies, children must not simply rote learn procedures but demonstrate their understanding of these procedures through the use of concrete materials and pictorial materials.

Background

The new 2014 primary curriculum introduced a wide ranges of changes to maths, this included changes to expectations, content and procedures. There are expectations set out for each year group, with children following a programme of study appropriate for their ability level (see Maths skills progression lines).

One of the key differences set out in the new curriculum is the level of detail included, indicating what children should be learning and when. The expectation is that by the end of the year the **majority** of the programme of study will have been covered and that **about a third** will be covered each term.

Another key difference is the emphasis on **depth** of conceptual understanding rather than breadth of coverage. The expectation is that children will learn formal methods alongside the use *explicit* use of concrete materials and pictorial representations- this is a key component to the 'Mastery Approach.'

Purpose

This policy is to ensure consistency throughout The Link School. This includes a consistent approach to teaching maths, the progression of skills, opportunities to develop deep understanding of concepts. All teachers will follow the CPA, Mastery approach.

The policy will also ensure a consistent approach to planning and assessing maths, using the Sunderland Solution materials alongside The Link School skills progression grids.

Mathematical language

The 2014 National Curriculum is *explicit* in articulating the importance of children using the correct mathematical language as a central part of their learning. It is essential that teachers use the appropriate mathematical vocabulary consistently and at every possible opportunity. New vocabulary should be introduced in a suitable context (with relevant real objects, with apparatus, pictures or diagrams) and explained carefully.

High expectations of maths language are essential, with teachers modelling correct use of language at all times.

"The quality and variety of language that pupils hear and speak are factors in developing their mathematical vocabulary and presenting a mathematical justification, argument or proof." (Maths Programme of study, 2014)

Children should be encouraged to discuss mathematical concepts, this will help them turn their thoughts into concrete ideas. Discussion and working with others is a vital part of the mastery approach, this should be encouraged at every opportunity in lessons. Children must be encouraged to answer questions in full sentences, explaining their understanding fully. In addition to being actively involved in answering questions, children

should also be encourage to ask questions. Teachers should plan 'talk tasks' into their lessons to develop and extend learning.

Some of the main changes to mathematical language:

Correct	Incorrect
Ones	Units
Is equal to	Equals
Zero	Oh (letter O)
-7 minus 7	-7 negative 7

Problem Solving and reasoning

The new national curriculum for mathematics aims to ensure that all pupils:

- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions

To support this, problem solving will be embedded in all operations rather than taught as a discrete strand. This will develop a more meaningful context and the associated mathematical language will become more fluent. Teachers must provide regular opportunities for children to explain their reasoning during lessons. Maths problems and puzzles should be an integral part of lessons, and every opportunity should be used to develop greater depth of understanding with calculation skills.

The CPA approach

The doing The seeing The symbols

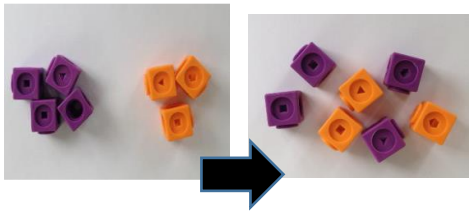
When new concepts are to be introduced to children they should be using all 3 approaches to learning. All 3 do not need to be evident in every lesson but will be used during the progression of skills and knowledge. When new concepts are taught children need an opportunity to firstly explore it using concrete materials, then using images before moving to more abstract work. This is true for every year group, regardless of ability of age. The CPA approach builds a solid foundation for children to develop and extend their depth of knowledge.

Once children are confident with exploring operations with equipment then they are ready to move to the first stages of written presentation. However it is important to understand that once a child has moved to the pictorial or abstract stage them may still use concrete equipment. The phases are not exclusive and it is expected that children will move between them.

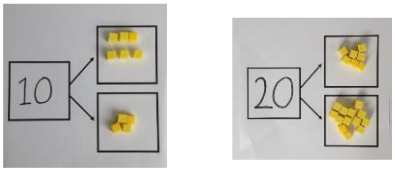
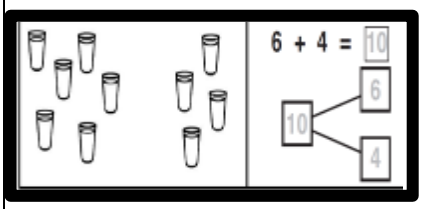
Addition and subtraction

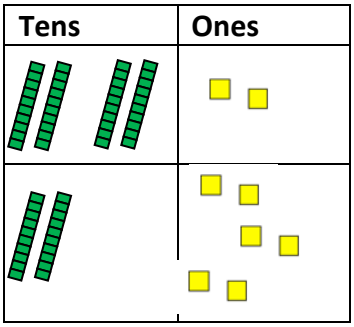
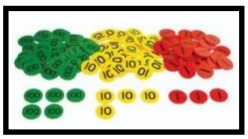
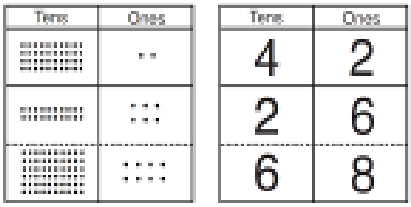
Addition and subtraction should be taught alongside each other so that children can identify and understand the link.

Addition

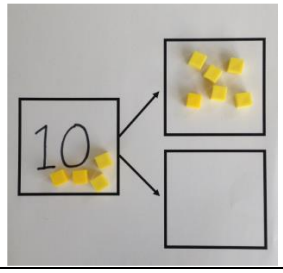
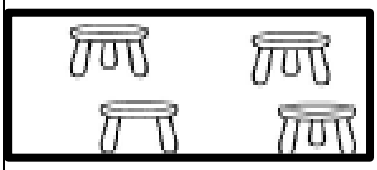
Combining two sets of objects: focus on 1:1 correspondence when counting		
		4 + 3 =
Concrete	**Pictorial**	**Abstract**

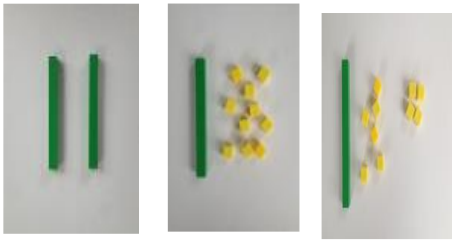
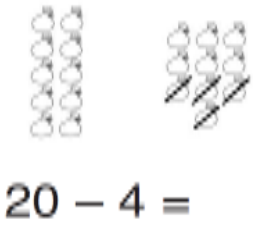
Counting on: from single digit numbers, then double digit numbers		
		8 + 1 = 9
Concrete	**Pictorial**	**Abstract**

Number bonds : Understanding concept of 2 parts making a whole number		
		10= 6+ 4 10 – 6 = 4 10-4 =6 20 = 16+ 4 20 – 6 =1 4 20 - 14 =6
Concrete	**Pictorial**	**Abstract**

Column method of addition: focus is to develop strong understanding of place value		
Dienes at Y1/ Y2 **Tens** | **Ones**   *Move to place value counters at Y3*	 	$\begin{array}{r} 42 \\ +\ 26 \\ \hline 68 \end{array}$
Concrete	**Pictorial**	**Abstract**

Subtraction

Number Bonds: Must be taught at same time as addition bonds		
 		**10- 6 = 4**
Concrete	**Pictorial**	**Abstract**

Column Subtraction : Children should begin to identify whether they are taking away from the tens or the ones		
		20 -4
Concrete	**Pictorial**	**Abstract**

Progression steps for addition and subtraction

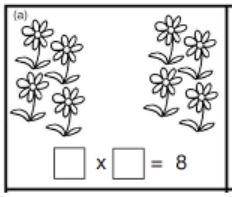
1. Number bonds 10/20/100
2. 2 digit number + - 1 digit number
3. 2 digit number+ - 2 digit number, without crossing barriers
4. 2 digit number + - 2 digit number, with crossing barriers
5. 3 digit number+ - 2 digit number
6. 3 digit + - 3 digit number
7. 4 digit number+ - 3 or 4 digit number
8. + – With decimals eg. Money £ and p

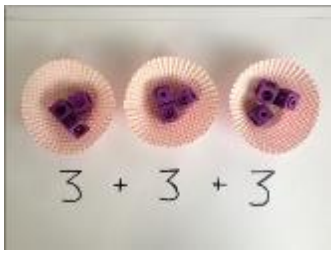
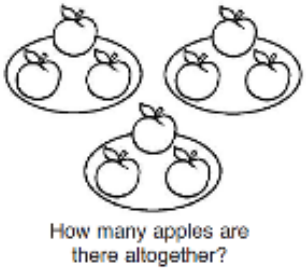
Multiplication and division

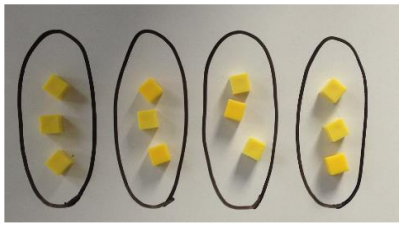
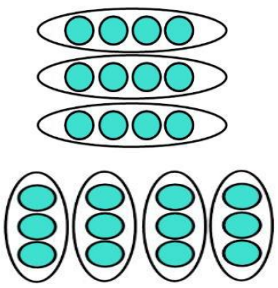
Multiplication and division should be taught alongside each other so that children can identify and understand the link.

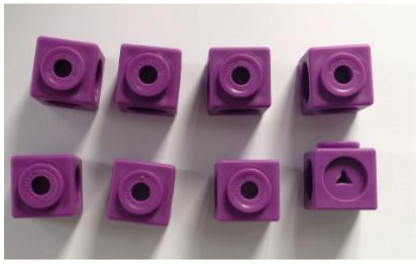
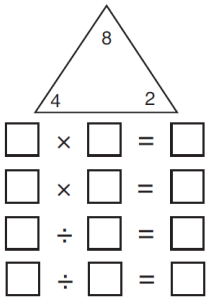
Multiplication

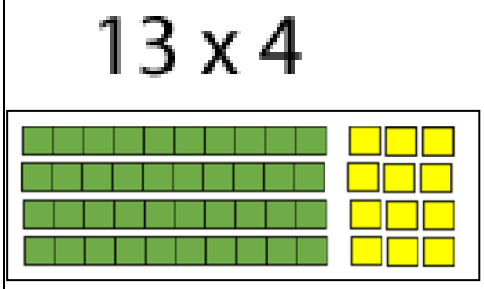
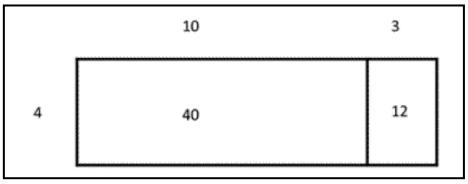
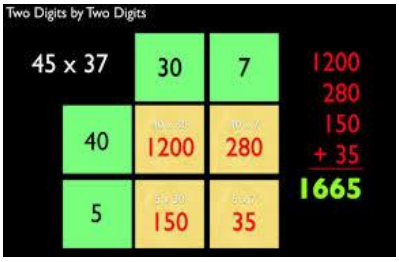
Counting in multiples: Importance should be placed on the vocabulary used		
		2, 4, 6, 8….
Concrete	**Pictorial**	**Abstract**

Making equal groups: Importance should be placed on the vocabulary used		
		**2 X 4 = ?** **4 X 2 = ?**
Concrete	**Pictorial**	**Abstract**

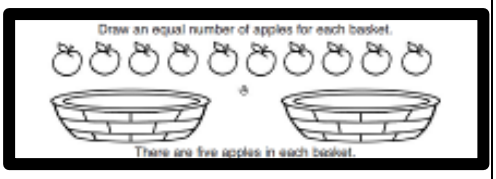
Repeated addition: Recall knowledge of addition skills, transfer to new context		
		**3+ 3 +3 = 9**
Concrete	**Pictorial**	**Abstract**

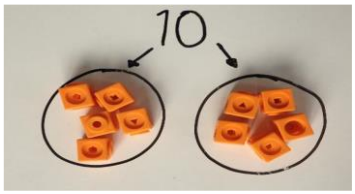
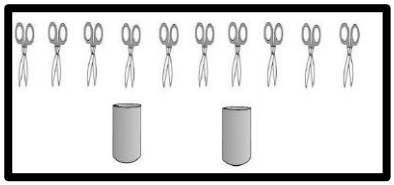
Multiplication as commutative (Arrays): Children should start to understand that x is commutative and the order does not affect the answer		
		**4 x 3 =12** **3 x 4 = 12**
Concrete	**Pictorial**	**Abstract**

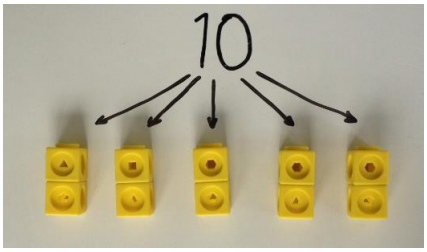
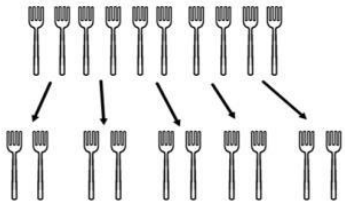
Using the inverse: Must be taught with division to secure understanding of the link		
		
Concrete	**Pictorial**	**Abstract**

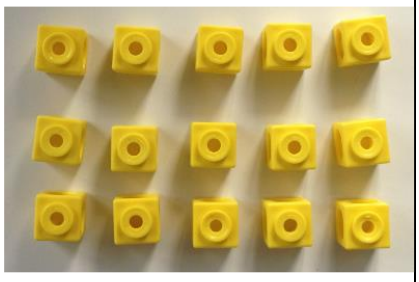
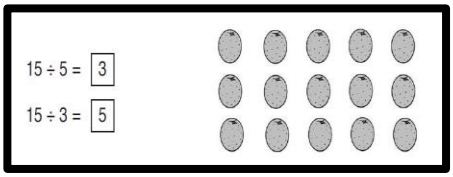
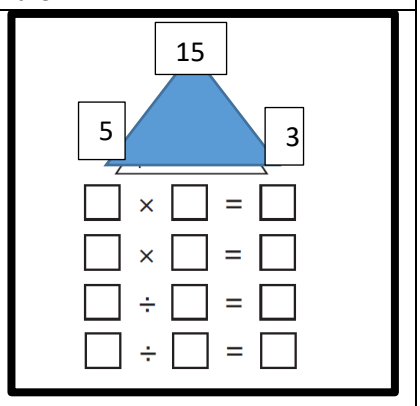
Grid multiplication:		
		
Concrete	**Pictorial**	**Abstract**

Division

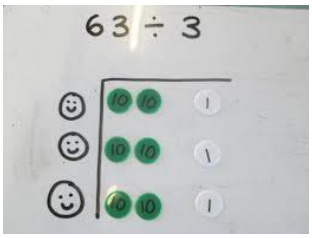
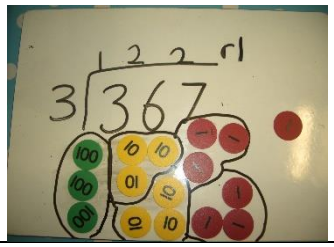
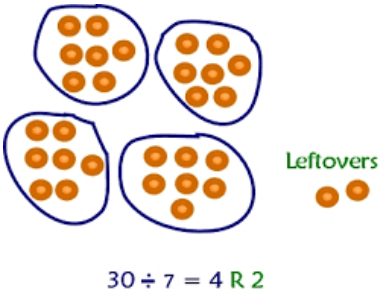
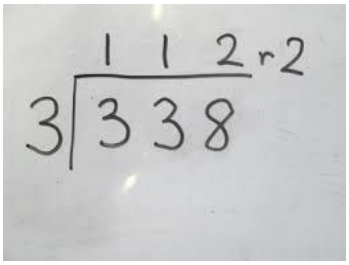
Sharing objects into groups : Children should become familiar with practical division at this stage, the symbol is not taught yet **.**		
 		
Concrete	**Pictorial**	**Abstract**

Division as sharing: Represented as sharing objects between groups, introduction of symbol (informally)		
		10 ÷2= 5 10÷5=2
Concrete	**Pictorial**	**Abstract**

Division as grouping: Thinking of the objects as groups of equal amounts, using formal written methods		
		10 ÷2= 5 10÷5=2
Concrete	**Pictorial**	**Abstract**

Using the inverse: Must be taught with multiplication to secure understanding of the link		
		
Concrete	**Pictorial**	**Abstract**

Short division:

Concrete	Pictorial	Abstract
 	 30 ÷ 7 = 4 R 2	

This policy should be used in conjunction with:

- Maths policy
- Teaching and learning policy
- Assessment policy