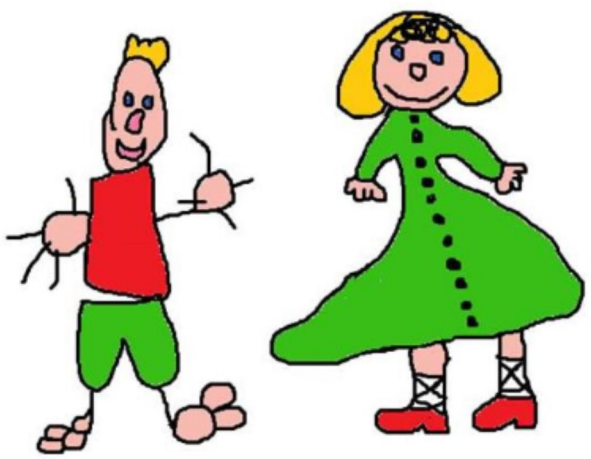
Calculation Policy

March 2020

Southbourne Infant School



Calculation Policy - Concrete, Pictorial and Abstract

Concrete, Pictorial, Abstract (CPA) is a highly effective approach to teaching that develops a deep and sustainable understanding of maths in pupils.

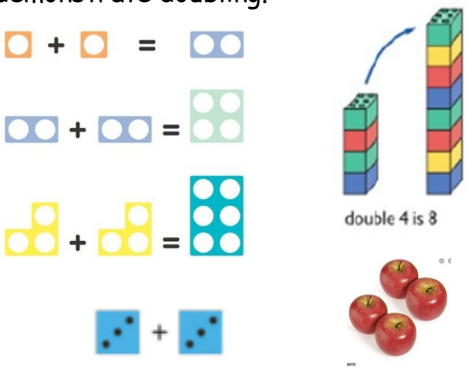
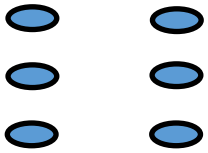
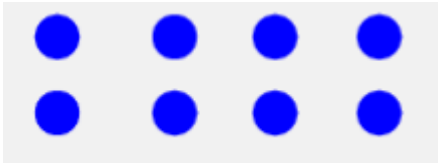
- **Concrete** is the "doing stage, using concrete objects to model problems.

- **Pictorial** is the "seeing" stage, using representations of objects to model problems. This stage encourages children to make a mental connection between the physical object and abstract levels. This may include looking at pictures, drawing representations or diagrams.

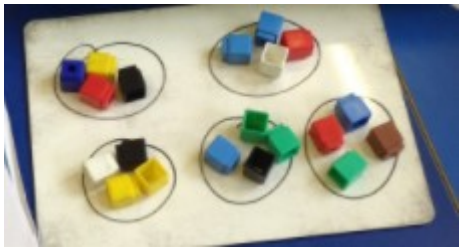
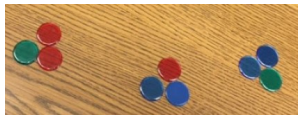
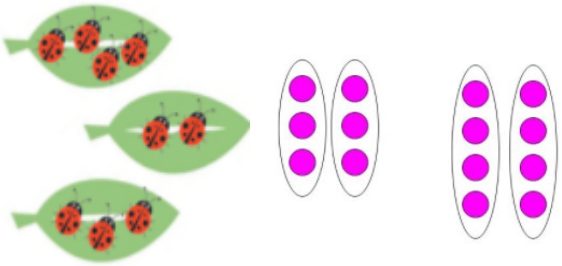
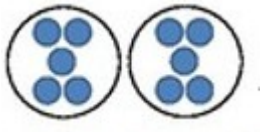
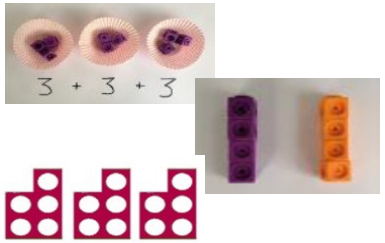
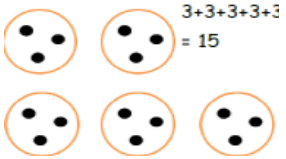
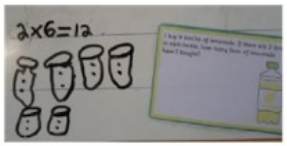
- **Abstract** is the "symbolic" stage, where children are able to use abstract symbols to model problems. Children are introduced to mathematical symbols, for example +, -, x, ÷ to indicate addition, subtraction, multiplication and division.

Calculation Policy—Multiplication

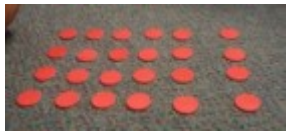
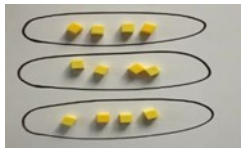
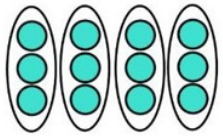
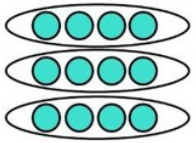
Key language: doubling, times, multiply, multiplied, repeated addition, lots of .

	Concrete	Pictorial	Abstract
Doubling	Use practical manipulatives including cubes, Numicon and real life objects to demonstrate doubling.  	Double 4 is 8  Drawing pictures to represent doubling 	3 + 3 = 6 4 = 4 = 8 Partitioning a number before doubling. Double 12 10 + 10 = 20 2 + 2 = 4 20 = 4 = 24
Counting in multiples 2s, 5s, 10, and 3s. (skip counting)	Count the groups as children are skip counting, children may use their fingers as they are skip counting. 	Children draw representations to show counting in multiples. 	Count in multiples aloud. Write sequences with multiples of numbers including working out missing numbers in sequences. 2, 4, 6, 8, 10, 5, 10, 15, 20, 25, 30, 30, __, 50, __, 70.

Calculation Policy—Multiplication

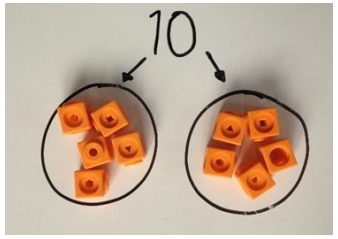
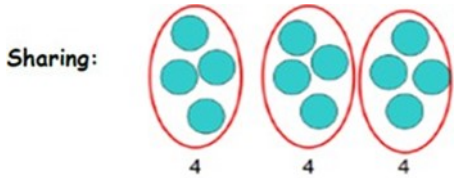
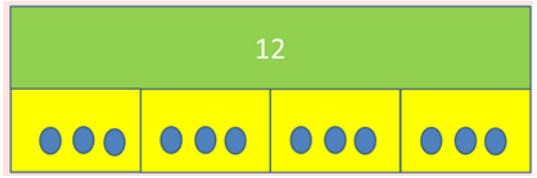
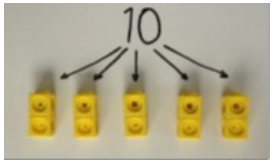
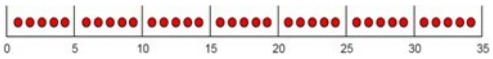
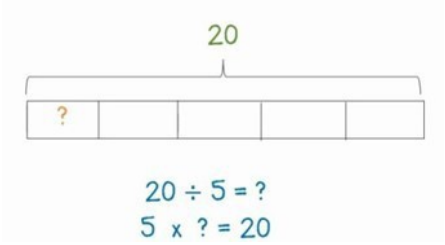
	Concrete	Pictorial	Abstract
Making/recognising equal group	 Using manipulatives to make equal groups. 	Using pictures or drawings to recognise and make equal groups. 	 2 groups of 5 2 x 5 = 8
Repeated addition	Children use concrete objects to make repeated addition number sentences. Skip count to work out the answer.  5 10 15 5 + 5 + 5 = 15	There are 3 sweets in one bag. How many sweets would there be in 5 bags?   Children begin to recognise the relationship between repeated addition and multiplication.	 2 + 2 + 2 + 2 + 2 = 10 2 x 5 = 10 Write number sentences to describe pictures or objects.

Calculation Policy—Multiplication

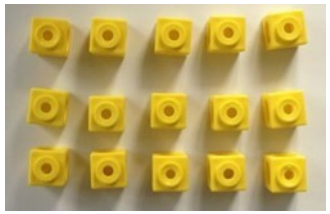
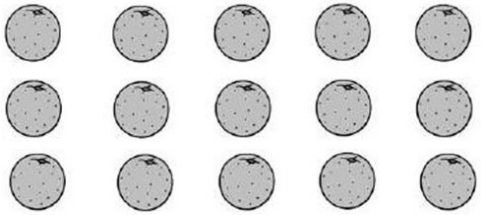
	Concrete	Pictorial	Abstract
Multiplication— using arrays to show multiplication is commutative.	    Children use concrete objects to make arrays and spot them in everyday life.	Draw arrays in different rotations to show multiplication is commutative .  4 groups of 3 4 x 3 = 12  3 groups of 4 3 x 4 = 12	Use an array to write multiplication sentences and reinforce repeated addition.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15

Calculation Policy—Division

Key language: share, equally, groups of, divided by, division.

	Concrete	Pictorial	Abstract
Sharing	  10 cubes shared equally between 2 groups.	 12 shared between 3 is 4 Children use pictures or shapes to share quantities into groups or using a bar model. 	$20 \div 5 = 4$ Use recall of division facts or the inverse multiplication facts $5 \times 4 = 20$ So $20 \div 5 = 4$
Division as grouping	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.  	Use a bar model to split the number into groups and share equally. 	$25 \div 5 = 5$ Divide 25 into 5 groups. How many are in each group? Count in 5s until you reach 25. How many 5s are in 25?

Calculation Policy—Division

	Concrete	Pictorial	Abstract
Division with arrays	 Link division to multiplication by creating an array and thinking about the number sentences that can be created. 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15	Draw an array and use lines to split the array into groups to make multiplication and division sentence.  15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15	Find the inverse of multiplication and division sentences by creating eight linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7 28 = 7 x 4 28 = 4 x 7 4 = 28 ÷ 7 7 = 28 ÷ 4