Calculation Policy: Models and Images

Focus	Addition
Reception	<u>Add two single digit numbers by counting on.</u> Use apparatus or pictures to 'count up' to 'put together'. • Numicon Children should use physical or pictorial representations of Numicon to add single digit numbers. Children should be become familiar with Numicon and recognise different representations of numbers by sight. • Base ten (Tens and ones) Children should use deans sticks to represent numbers and count up how many there is altogether. • Tens frames Tens frames are to be used in conjunction with two sided colour counters. Children place the greatest number on the tens frames, filling in from left to right. Then the contrasting colour counters are added to the ten frame. When used consistently children should be able to recognise the representation of the number by sight as opposed to counting. • Part whole model Objects and pictures to be used within a part whole model representation.

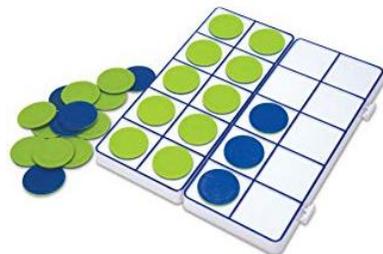| Year 1	Add numbers within 20 Use partitioning to add numbers. • Tens frames Two tens frames to be used to support with addition with 20, using different coloured counters to represent the two numbers being added. The greatest number should be placed in the tens frames first, filling in from left to right. • Numicon Children could use physical or pictorial representations of Numicon to add two digit numbers. • Base ten Children should be able to represent one and two digit numbers using the base ten. When adding, children should use base ten to represent both numbers in the calculation, then to count up the base ten for both numbers starting by counting up the tens sticks then the ones. • Part whole model When children are secure in using the part whole model with objects and images they should progress onto using numbers in the part whole model to support with addition.
Year 2	Add numbers with 100. • Column method When children are secure in concrete and pictorial methods, column addition should be introduced. Emphasis should be place on ensuring the digits are lined up carefully and the children add the numbers in the ones column first. When a ten needs to be carried over, the ten should be placed in the tens column at the bottom. $$\begin{array}{r} 3\ 8 \\ +\ 9\ 3 \\ \hline 1\ 3\ 1 \\ {\scriptstyle 1} \end{array}$$

- Numicon

Children could use physical or pictorial representations of Numicon to add two digit numbers.
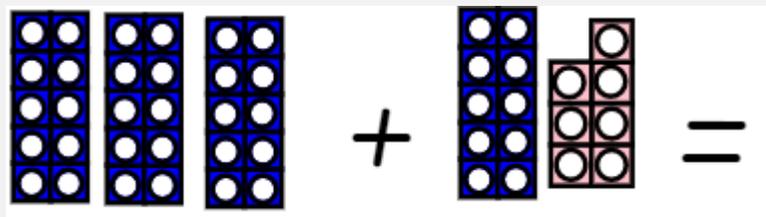
- Part whole

Building on the part whole learning from Year 1, in Year 2 part whole should be used to support addition of 2 digit numbers within 100 and missing number calculations.
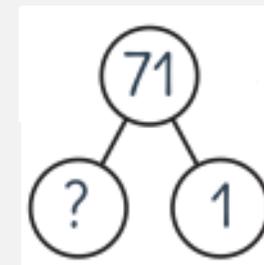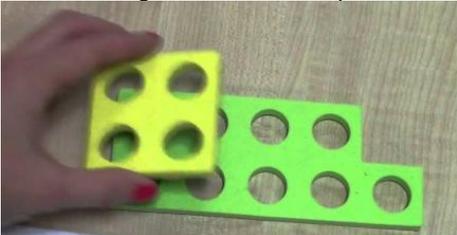

- Base ten

Children should be able to represent numbers within 100 using the base ten. When adding, children should use base ten to represent both numbers in the calculation, then to count up the base ten for both numbers starting by counting up the tens sticks then the ones.

- Bar model

Bar model is another representation introduced in Year 2. Children should be taught the links between part whole and bar model. To also support with missing number calculations within addition.

Whole = 38	
15 toy cars	23 toy soldiers

Charlie has 15 toy cars and Sarah has 23 toy soldiers. How many toys do they have in total? 38

Focus	Subtraction
Reception	<u>Subtract two single digit numbers by counting back.</u> • Tens frames up to 10. Tens frames are to be used in conjunction with two sided colour counters. Children should place the greatest number on the tens frames, filling in from left to right. Then take away the required amount of counters. When used consistently children should be able to recognise the representation of the number by sight as opposed to counting. • Numicon When using Numicon to subtract one digit numbers, the biggest Numicon piece should be covered up by the value being taken away. Then the shape that remains uncovered will provide the answer. 9 – 4 = 5. Starting with the larger number (e.g 9) cover part of the numicon with a piece to represent the amount being taken away. The remaining uncovered shape represents the answer. • Concrete objects Use physical objects, counters, cubes etc to show how objects can be taken away.
Year 1	<u>Subtract numbers within 20.</u> • Base ten Children should be able to represent numbers within 100 using the base ten. When subtracting, children should use base ten to represent the greatest number in the calculation, then they should take away the required amount of tens and ones. If regrouping is required a tens stick should be exchanged for a ten ones and the equivalent value of this should be emphasised. • Tens frames up to 20 Tens frames are to be used in conjunction with two sided colour counters. Children place the greatest number on the tens frames, filling in from left to right. Then take away the required amount of counters. When used consistently children should be able to recognise the representation of the number by sight as opposed to counting.

	• Numicon When using Numicon to subtract within 20, the biggest Numicon piece should be covered up by the value being taken away. Then the shape that remains uncovered will provide the answer. When using pictorial representations the children can cross out the required amount to find the answer. To help children to recognise the representation by sight ensure children cross out starting from bottom right to left. 20 – 6 = 14 • Part whole Objects and pictures are to be used within a part whole model representation.

Year 2	Subtract numbers within 100.
	    • Column method
	When children are secure in concrete and pictorial methods, column subtraction should be introduced. Emphasis should be place on ensuring the digits are lined up carefully and the children subtract the numbers in the ones column first. Regrouping should not be introduced until children are secure with the method. To regroup, the ten should be crossed out with the new value being written to the left and the carried ten being placed next to the ones column.
	
	    • Base ten (tens and ones)
	Children should be able to represent numbers within 100 using the base ten. When subtracting, children should use base ten to represent the greatest number in the calculation, then to take away the required amount of tens and ones. If regrouping is required a tens stick should be exchanged for a ten ones and the equivalent value of this should be emphasised. Children

must be secure in regrouping using concrete and pictorial representation before moving on to regrouping in the column method.
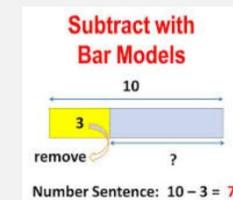
- Numicon

When using Numicon to subtract within 100, the last piece of Numicon should be covered up by the value being taken away. Then the shape that remains uncovered will provide the answer. When using pictorial representations the children can cross out the required amount to find the answer. To help children to recognise the representation by sight ensure children cross out starting from bottom right to left.

- Part whole

Building on the part whole learning from Year 1, in Year 2 part whole should be used to support addition of 2 digit numbers within 100 and missing number calculations.

- Bar model

Bar model is another representation introduced in Year 2. Children to understand the links between part whole and bar model. To also support with missing number calculations within addition.


Subtract with Bar Models

Number Sentence: 10 – 3 = 7

Focus	**Multiplication**

Reception	**Doubling numbers**
	  • Part whole
	When using part whole for doubling children should be the same amount of objects/pictorial representations in the two lower circles then put them together in the whole circle to find the answer.
	  • Tens frames
	Using two representations of the number in contrasting colours placed in the tens frames.
	  • Numicon
	Putting together two of the same numicon pieces to create the doubled value.
	  • Concrete
	Use physical objects such as counters, cubes etc to show how objects can be taken away.

Year 1	**Multiply numbers 2,5, 10**
	  • Repeated addition
	Multiplication should be introduced as repeated addition, using pictorial and concrete representations to support.
	
	  • Circle with written number
	One pictorial method for solving multiplication calculations is using circles with the written number in the middle. For example in 3 x5 children would draw three circles and write the number 5 in the middle of each circle. Children should then count in multiples of the numbers written in the circles to find the answer.
	
	  • Arrays

	Another pictorial method for solving multiplication calculations is arrays. In an array children should do the correct amount of dots in the rows and columns to represent each number in the multiplication. Children should be reminded to place one dot in each square. ●●●●● ●●●●● ●●●●● 3 x 5
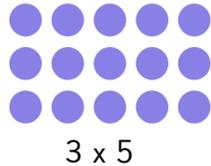
Year 2	Multiply numbers by 2,3,5,10
	   • Mental methods
	Children should use their fingers while counting in the correct multiple. For numbers past ten children should use counters or drawing marks to represent each multiple they count.
	   • Circles with written number
	One pictorial method for solving multiplication calculations is using circles with the written number in the middle. For example in 3 x5 children would draw three circles and write the number 5 in the middle of each circle. Children should then count in multiples of the numbers written in the circles to find the answer.
	
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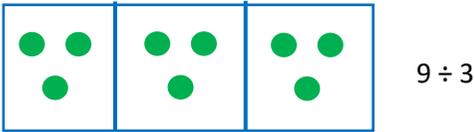|	
Focus	**Division**

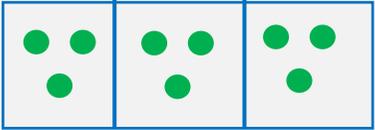| Reception	**Sharing into equal and unequal groups** • Use physical objects such as counters and cubes to show how a number of objects can be shared into groups that are equal and unequal.
Year 1	**Divide numbers by 2,5, 10** • Children should draw a shape (rectangle or circle) and split the shape into how many they are dividing by. They should then share out the value being divided between the parts of the shape. When first introduced the children should share out physical objects then progress onto sharing out pictorial representations such as dots. $9 \div 3$
Year 2	**Divide numbers by 2,5, 10** • Children should draw a shape (rectangle or circle) and split the shape into how many they are dividing by. They should then share out the value being divided between the parts of the shape. When first introduced the children should share out physical objects then progress onto sharing out pictorial representations such as dots. • Mental methods Children should count in the multiple of the division sum until they say the first number in the calculation, recording how many they've count on their fingers which will provide them with the answer. E.g For $12 \div 3$, children should count in 3's,

	putting up a finger every time they say a number stopping when they get to twelve. They should then have four fingers showing which is the answer.

Focus	**Fractions**
Reception	<u>Sharing into equal and unequal groups</u> • Use physical objects such as counters and cubes to show how a number of objects can be shared into groups that are equal and unequal.
Year 1	<u>Recognise, find and name half and quarter of a shape, object, quantity</u> • Children should draw a shape (rectangle or circle) and split the shape into the fraction in the calculation. They should then share out the number between the parts of the shape. When first introduced the children should share out physical objects then progress onto sharing out pictorial representations such as dots. 1/3 of 9
Year 2	<u>Find ½, ¼, 1/3, 2/4, 3/4 of a length, shape, objects or quantity.</u> • Children should draw a shape (rectangle or circle) and split the shape into the fraction in the calculation. They should then share out the number between the parts of the shape. In Year 2 children should progress onto sharing out pictorial representations such as dots.

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