North Star Federation – Maths Calculation Policy

This calculation policy is not intended to stand-alone. It is intended to complement the broader Vision Statement for the whole of maths teaching at North Star by showing the journey children take with their learning and understanding of calculations. When reading either document, it is important to keep in mind the aims of the 2014 National Curriculum in maths, which are for children to:

- be fluent - able to quickly remember number bonds, times tables, shape names & more
- reason - explain their work, and explain why something works or doesn't
- solve problems - use things like bar models to know how to solve a problem

Fundamental to achieving these goals is a solid foundation in place value (the value of each digit in a number). This enables children to understand ***why*** a particular method works rather than simply following a process in 'parrot fashion'. Without the conceptual understanding to fall back on, children are more likely to hit a glass ceiling in what they understand and can do. Whether that is with us at North Star, at high school or beyond, it is something we work from their very first day with us in Early Years to avoid, through:

- Curriculum structure – We follow White Rose Maths' structure, which is a 'mastery' style approach where children spend longer learning each area of maths and do not move on until they have 'mastered' it.
- CPA approach – Standing for concrete-pictorial-abstract, this approach sees children use 'hands-on' (concrete) resources and other visual (pictorial) representations to support and deepen their conceptual understanding of all areas of maths.

While the progression of learning is separated into phases to broadly reflect the class structure of our school, this is indicative only. Each child will progress through the stages at their own pace and that is exactly how it should be. Class teachers will know where your child is at in their development, what the next step is and how they can be supported in achieving it.

Please also note that the examples given in this policy are just that – examples. They are not intended to be an exhaustive list of all of the resources that your child will use, nor one 'best' way of teaching. Your child's class teacher is best placed to know what your child needs in terms of resources, representations and language to help them develop their understanding and this guide is intended to support that knowledge, not replace it.

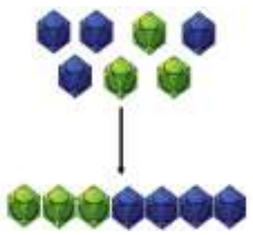
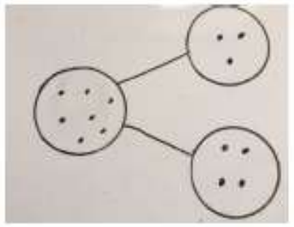
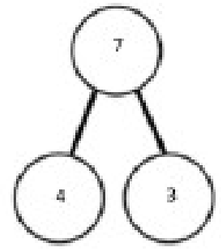
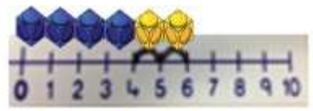
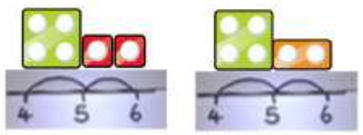
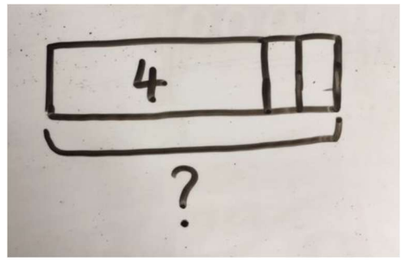
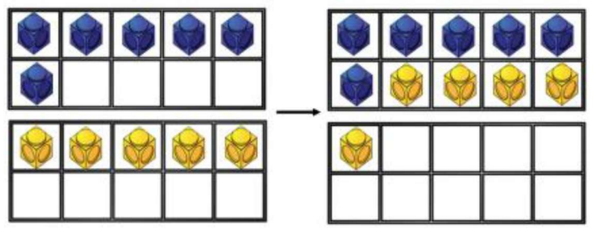
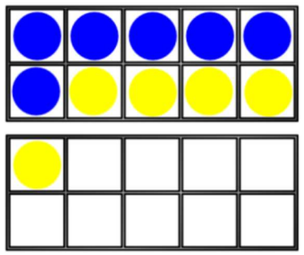
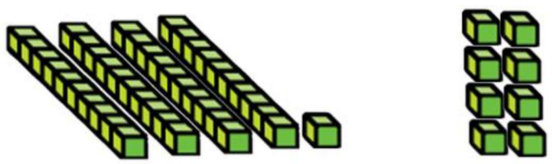
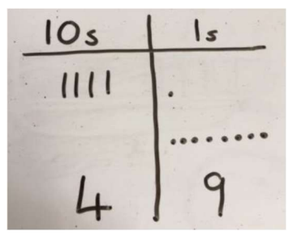
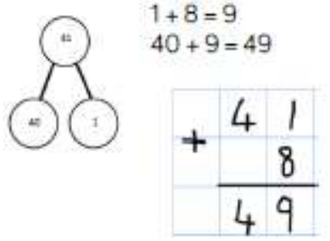
Should you have any questions about your child's learning, their class teacher remains the best point of contact. However, in general terms, the best way to help your child with their maths and their calculations in particular, is regular (ideally daily) counting and number bonds (to 10 and 20 in particular) practice with them, up and down, in 1s and in multiples. As they progress through the school, regular (ideally daily) Tackling Tables practice – this could be working together with the cards that can be sourced through school or independently using the online platform.

I hope that you find this helpful when discussing calculations with your child.

Mr Boast
Executive Deputy Headteacher

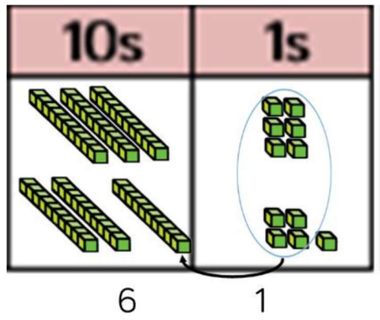
North Star Federation – Maths Calculation Policy

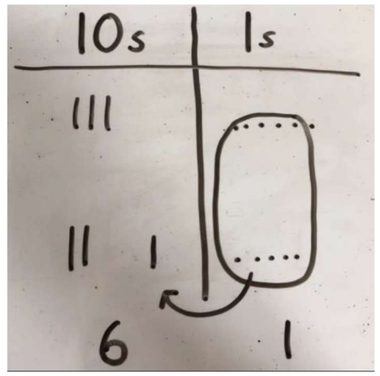
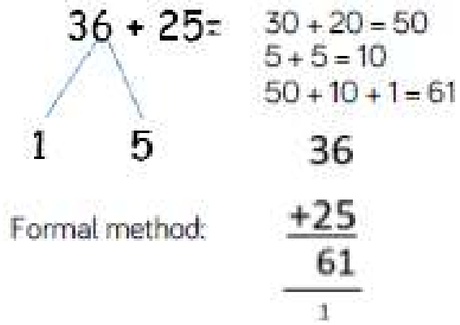
Addition – sum, total, parts and whole, plus, add, altogether, more, ‘is equal to’, ‘is the same as’

Method	Concrete	Pictorial	Abstract
EYFS / KS1 Combining two parts to make a whole e.g. 4 + 3 = 7 Use: objects, part/whole models, bar models		 Visually representing the objects with dots or crosses and can use a part/whole model	 4 is a part, 3 is a part and 7 is the whole
Starting at the bigger number and counting on e.g. 4 + 2 = 6 Use: objects, cubes, numicon, number square, number line, bar models	  	 A bar model encouraging counting on rather than counting all	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, including adding 3 single digits e.g. 6 + 5 = 11 Use: Tens frame, numicon, bar models, number lines			6 + □ = 11 6 + 5 = 5 + □ 6 + 5 = 6 + 4 + 1 = 10 + 1 Developing an understanding of equality and ‘equals’
Partitioning and combining two numbers, linking to column method without regrouping. e.g. 41 + 8 = 49 Use: Base 10, numicon, bar models, part/whole models		 Introducing the place value chart	 Important to line up place value columns

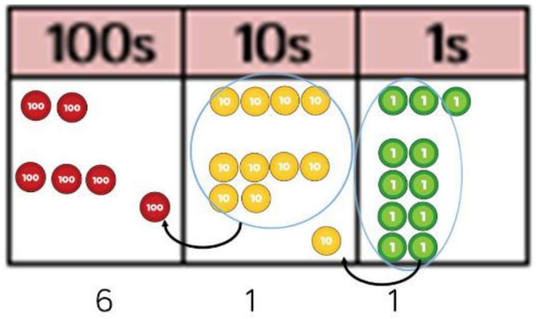
<table>
<tr>
<td rowspan="2">Lower KS2</td>
<td>Column method (up to 3 digits) with regrouping

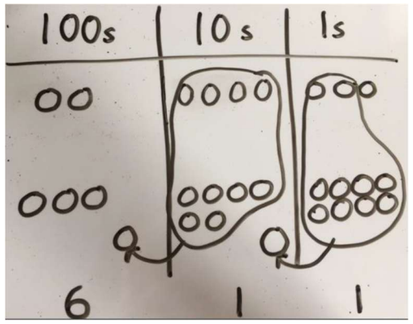
e.g. 36 + 25 = 61

Use: Base 10, place value counters</td>
<td> 

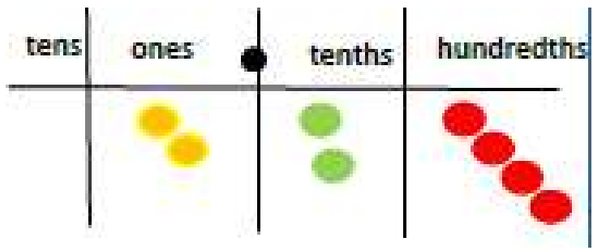
Building on partitioning and place value with regrouping.</td>
<td> 
</td>
<td>Looking for ways to make 10
Showing understanding of regrouping
 
</td>
</tr>
<tr>
<td>Column method (up to 4 digits) with regrouping

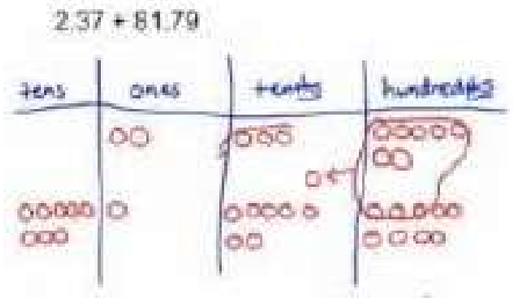
e.g. 243 + 368 = 611

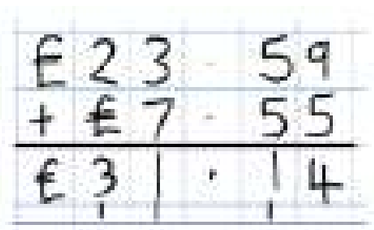
Use: Base 10, place value counters</td>
<td> 

Growing the application of the regrouping knowledge and skill</td>
<td> 

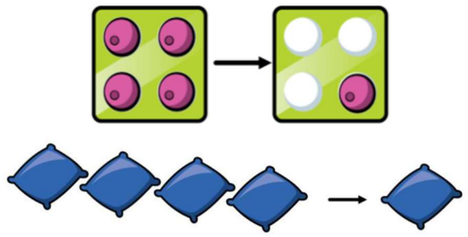
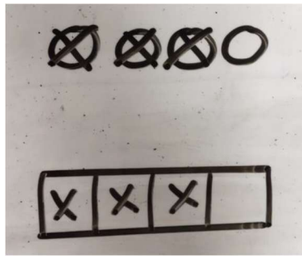
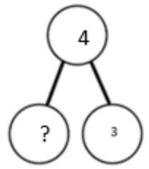
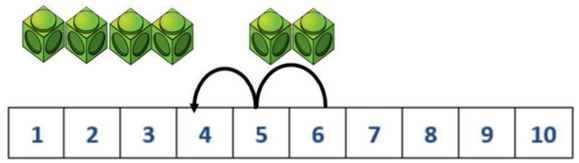
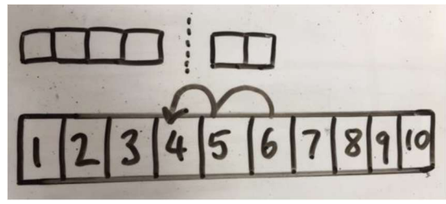
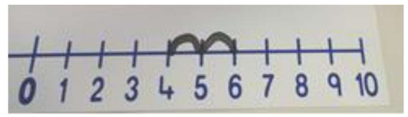
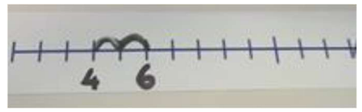
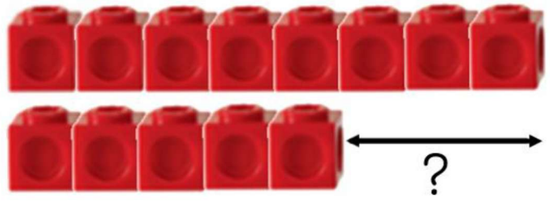
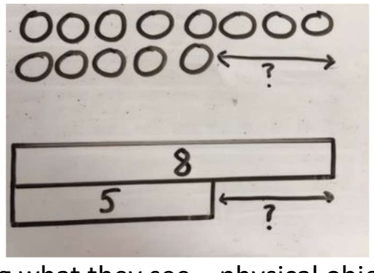
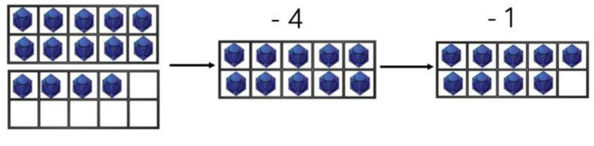
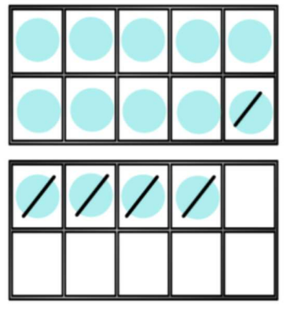
‘Circling’ to show the regrouping</td>
<td>243
+368
611
1 1</td>
</tr>
<tr>
<td>Upper KS2</td>
<td>Column method for any number, including decimals and with regrouping

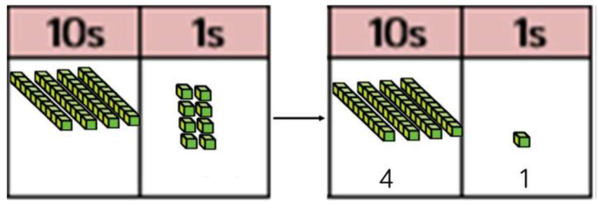
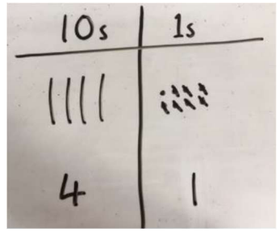
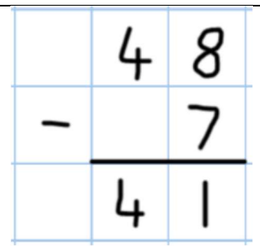
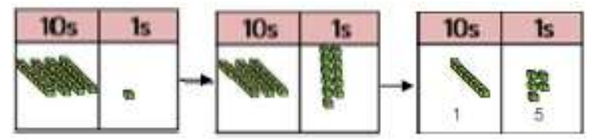
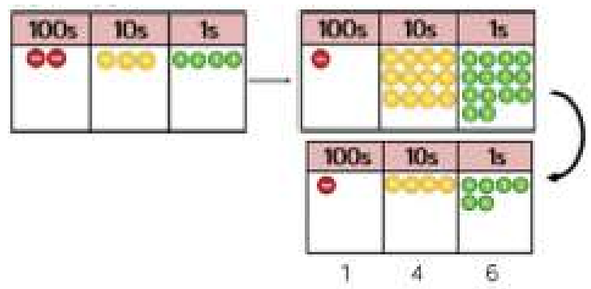
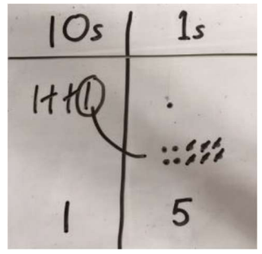
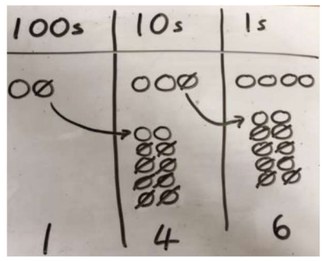
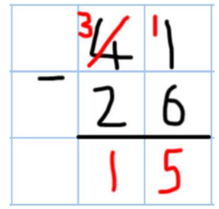
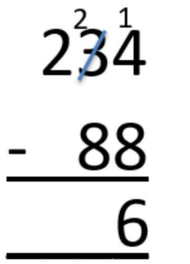
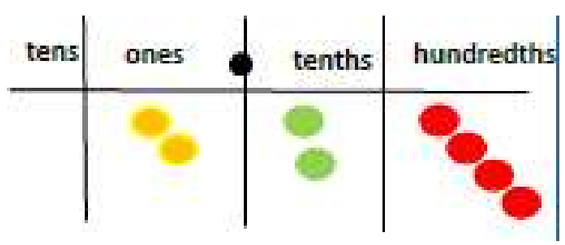
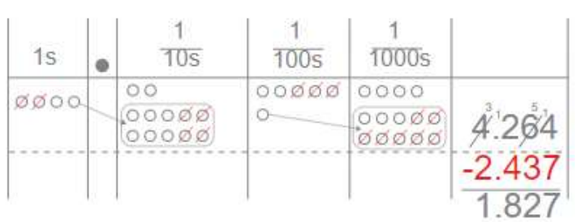
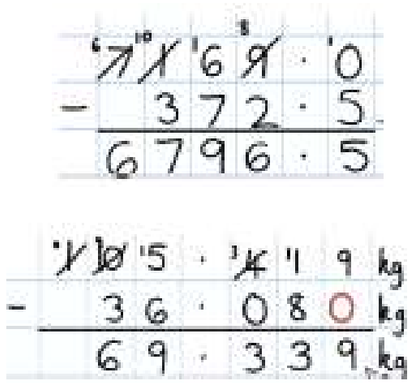
Use: place value counters</td>
<td> 

Final development in regrouping – the application to decimal numbers.</td>
<td> 

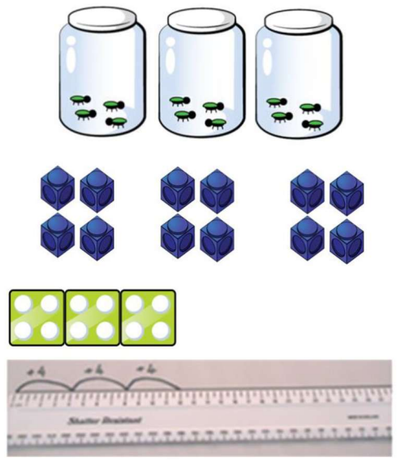
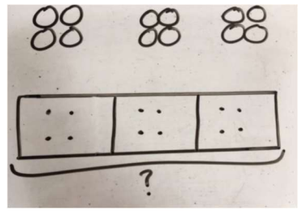
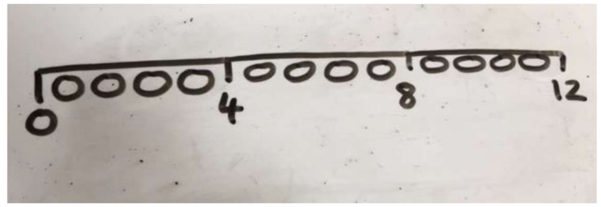
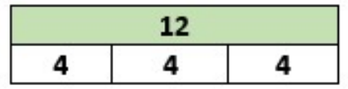
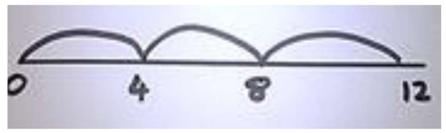
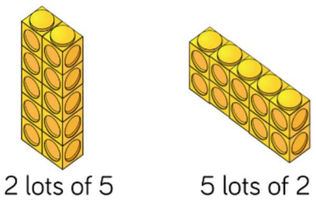
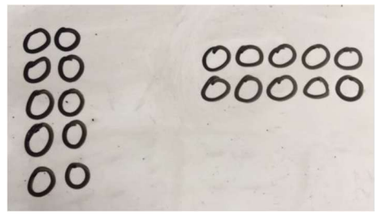
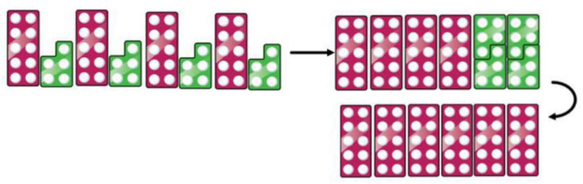
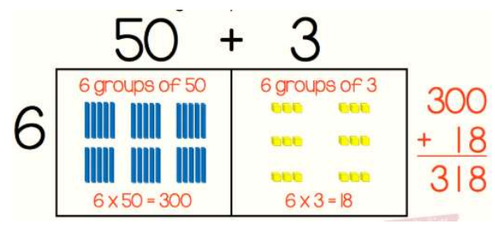
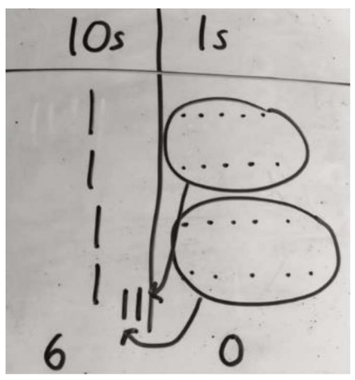
‘Circling’ remains consistent</td>
<td> 

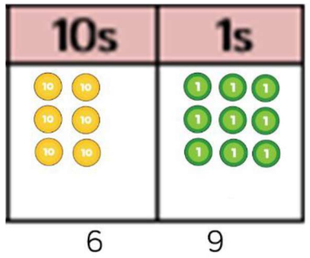
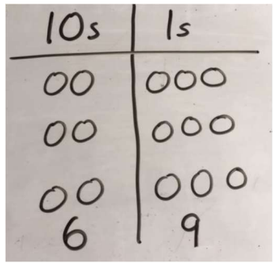
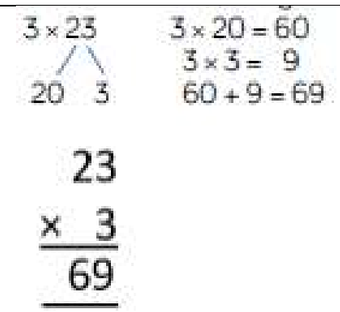
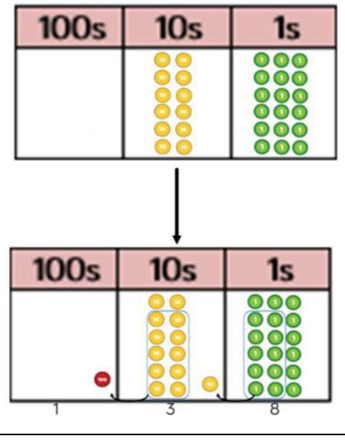
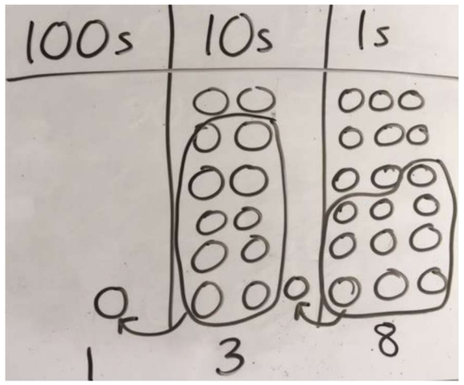
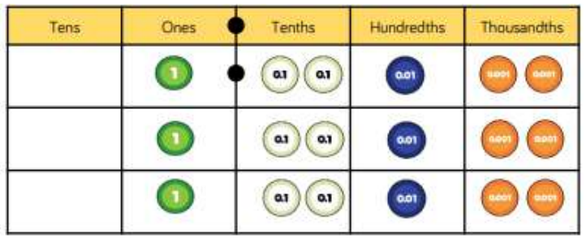
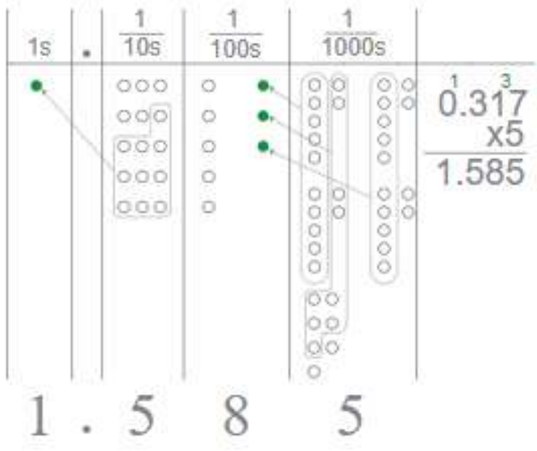
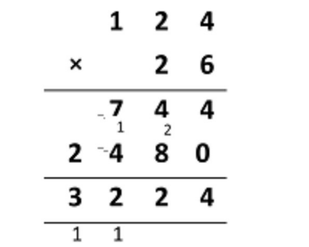
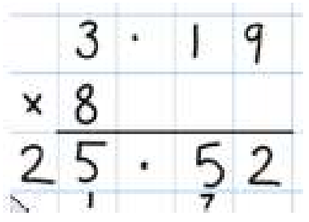
The decimal point can be used to help line up place value columns.</td>
</tr>
</table>

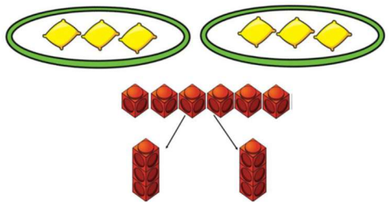
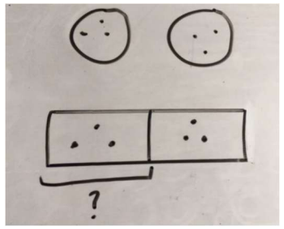
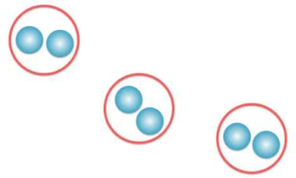
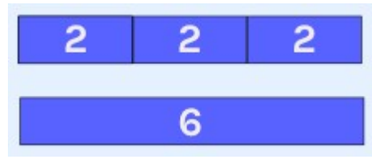
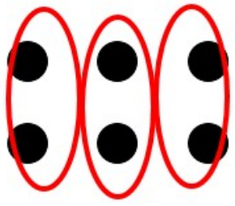
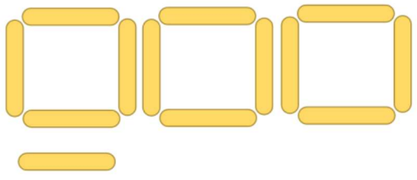
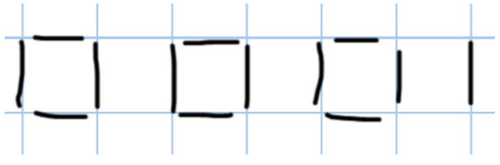
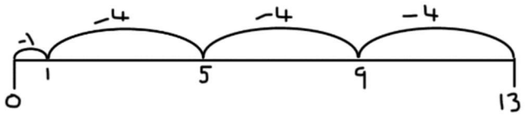
Subtraction – take away, less than, the difference, subtract, minus, fewer, decrease			
Method	**Concrete**	**Pictorial**	**Abstract**
EYFS / KS1 Taking away ones 4 – 3 = 1 Use: cubes, objects, numicon, part/whole models, bar models	 Physically removing objects to understand the mathematical concept of subtraction.	 Drawing the physical objects and crossing out. The bar model can also be used.	 4 - 3 = = 4 - 3 4 3 ?
Counting back 6 – 2 = 4 Use: cubes, objects, number lines, bar models		 Drawing what they see and do physically, including the actual cubes or objects.	  Encourage use of a blank number line to challenge and develop understanding.
Finding the difference e.g. between 8 and 5 Use: cubes, objects, bar models		 Drawing what they see – physical objects and bar model.	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 e.g. 14 – 5 = 9 Use: tens frames, numicon, bar models, number lines, base 10			14 - 5 = 9 4 1 14 - 4 = 10 10 - 1 = 9 Showing that 10 can be made by partitioning the subtrahend.

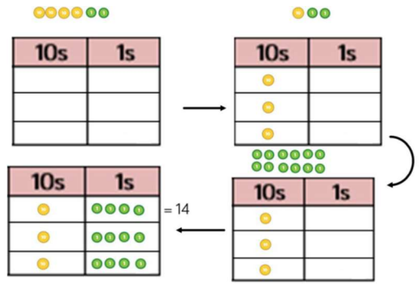
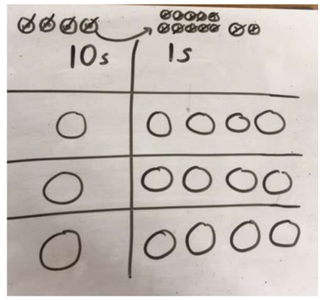
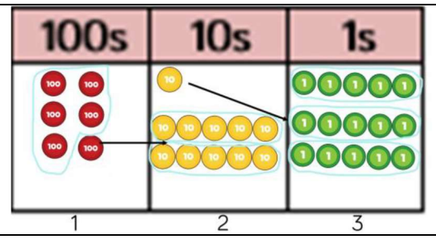
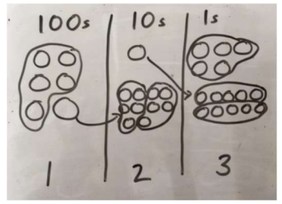
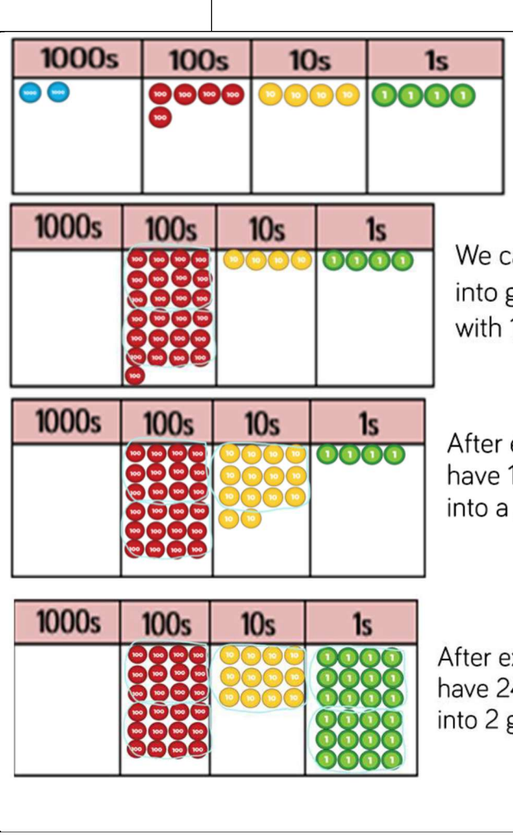
	Partitioning and subtracting two numbers, linking to column method without regrouping. e.g. 48 – 7 = 41 Use: Base 10, numicon		 Introduction of place value columns.	 Order numbers and alignment of place value columns are both important.
Lower KS2	Column method (up to 3 digits then 4 digits) with regrouping/exchanging. e.g. 41 – 26 = 15 e.g. 234 – 88 = 146 Use: Base 10, place value counters	 	  'Circling' or crossing to visually represent the physical action of regrouping.	  Children must understand that regrouping does not change the overall value and what has happened when they cross out (the exchange)
Upper KS2	Column method (any number and decimals) with regrouping/exchanging Use: Place value counters	 Final development in regrouping – the application to decimal numbers.	 'Circling' remains consistent	 The decimal point can be used to help line up place value columns.

Multiplication – double, times, multiplied by, the product of, groups of, lots of, equal groups

Method		Concrete	Pictorial	Abstract
EYFS / KS1	Recognising and making equal groups Repeated addition, doubling and counting in multiples e.g. 3 x 4 = 12 Use: cubes, numicon, objects, times table knowledge, bar models number lines	 Making 3 equal groups of 4.	  Pictures can be used to support bar model and number line drawing.	 3 × 4 = 12 4 + 4 + 4 = 12  The abstract versions are a continuation of the pictorial versions.
	Arrays (1d x 1d showing commutative multiplication) e.g. 2 x 5 = 5 x 2 = 10 Use: cubes, objects	 2 lots of 5 5 lots of 2 An alteration to the grouping/sharing structures to show commutativity.		2 x 5 = 10 5 x 2 = 10 2 x 5 = 5 x 2 = 10 5 + 5 = 10 2 + 2 + 2 + 2 + 2 = 10
Lower KS2	Partitioning and combining to multiply (2d x 1d) e.g. 15 x 4 Use: Base 10, numicon, place value counters, area model, grid method	  Resources and area models show relative value.	 Place value columns show 'lots of' or repeated addition more efficient, partitioned values	4 x 15 10 5 10 x 4 = 40 5 x 4 = 20 40 + 20 = 60 Children record the steps that they take. x | 10 | 5 4 | 4 x 10 = 40 | 4 x 5 = 20

	Column multiplication (up to 3d x 1d) e.g. 23 x 3 Use: base 10, place value counters			 The steps are shown to ensure and demonstrate understanding.
Upper KS2	Column multiplication (up to 4d x 2d) e.g. 23 x 6 Use: base 10, place value counters			6 x 23 = 23 × 6 138 1 1 Formal written method
	Column multiplication (any number, including decimals) Use: place value counters	 1.212 x 3 = 3.636		 

Division – share, group, divide, divided by, half, dividend, divisor, quotient			
Method	**Concrete**	**Pictorial**	**Abstract**
EYFS / KS1 Division as sharing e.g. 6 ÷ 2 = 3 (in each of the two equal groups) Use: cubes, objects, part/whole models, bar models, numicon			 Bar models can be used for pictorial representations Children should also be encouraged to used their knowledge of their 2x tables
Division as grouping e.g. 6 ÷ 2 = 3 (groups of two) Use: cubes, objects, part/whole models, bar models, numicon	 The grouping placement is 'random'	 6 ÷ 2 = 3	 6 seeds into pots – 2 in each pot.
Division within arrays - linking grouping with sharing and division with multiplication e.g. 6 ÷ 2 = 3 and 3 x 2 = 6 Use: cubes, objects, numicon	 Arrays build links with the inverse - multiplying	 Two groups of 3 could also be circled	6 ÷ 2 = 3 6 ÷ 3 = 2 3 x 2 = 6 2 x 3 = 6
Lower KS2 Division with a remainder - linking to times tables facts and repeated subtraction e.g. 13 ÷ 4 = 3 r1 Use: lollipop sticks, numicon, cubes, objects, number lines	 3 whole groups with 1 left over – 3 r1 Cuisenaire rods above a ruler and arrays could also be used.	 Arrays could also be drawn	 The number line links back to the Cuisenaire rod method. Use of children's times tables facts should be encouraged.

	Leading to 2d divided by 1d - using base 10 or place value counters, to help bridge to short division e.g. 42 ÷ 3 = 14 Use: place value counters	 42 is shared into 3 equal groups and the remainder exchanged/regrouped.		Children to be able to make sense of the place value counters and write calculations to show the process and their understanding. 42 ÷ 3 42 = 30 + 12 30 ÷ 3 = 10 12 ÷ 3 = 4 10 + 4 = 14
	Short division (up to 3 digits by 1 digit), including with remainders e.g. 615 ÷ 5 = 123 Use: place value counters			$\begin{array}{r} 123 \\ 5\overline{)615} \end{array}$ The concrete and pictorial work is applied, with understanding, to the formal algorithm.
	Short division (up to 4 digits by a 1 digit number including remainders)	As above	As above	As above
Upper KS2	Long division with place value counters (up to 4 digits by a 2 digit number) Children should also exchange into the tenths and hundredths column too and express remainders as decimals and fractions. e.g. 2,544 ÷ 12 = 212 Use: place value counters	 We can't group 2 thousands into groups of 12 so will exchange them. We can group 24 hundreds into groups of 12 which leaves with 1 hundred. $\begin{array}{r} 02 \\ 12\overline{)2544} \\ 24 \\ \hline 1 \end{array}$ After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens. $\begin{array}{r} 021 \\ 12\overline{)2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 2 \end{array}$ After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder. $\begin{array}{r} 0212 \\ 12\overline{)2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 24 \\ 24 \\ \hline 0 \end{array}$