Attleborough Primary School

Calculation Policy

Date: September 2019

Review: June 2022

Attleborough Primary School
Mathematics Calculation Policy
2019

Introduction

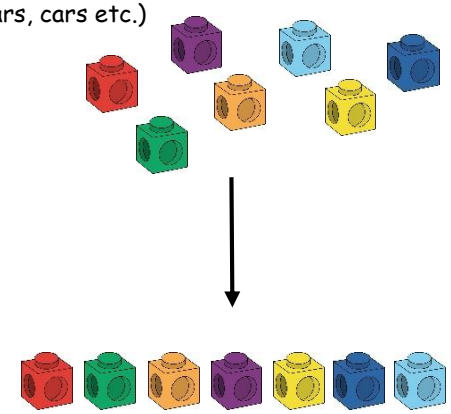
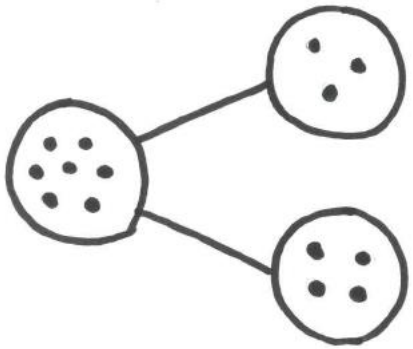
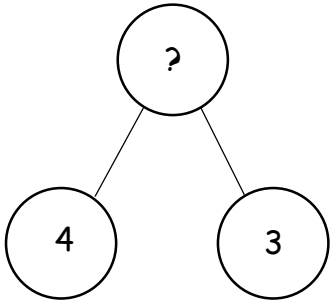
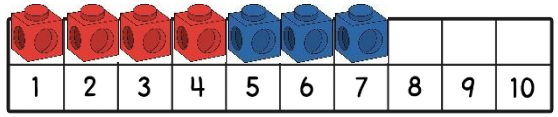
The following calculation policy has been devised to meet the requirements of the National Curriculum 2014 for the teaching and learning of mathematics. It is designed to ensure that calculation strategies are taught consistently throughout the school enabling smooth progression between informal and formal methods.

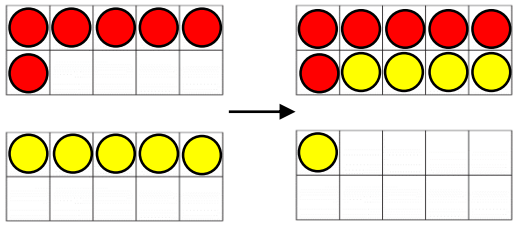
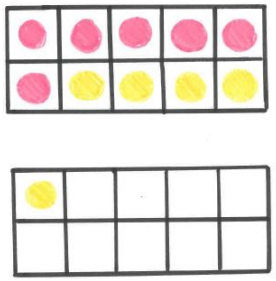
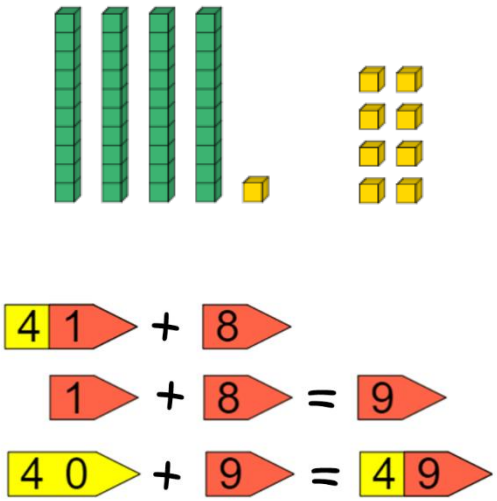
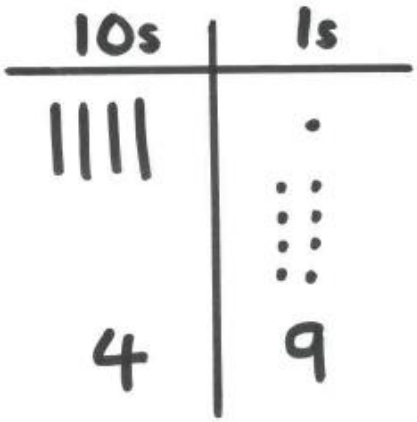
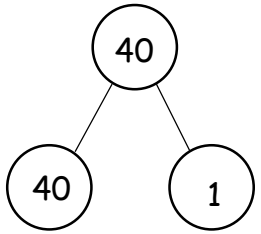
The National Curriculum 2014 sets out age-related expectations for the calculation methods which pupils should use, however at Attleborough Primary School we recognise that children do not always learn in the same way, are working at a range of attainment levels and so they are taught strategies which are appropriate to their needs. All pupils are moved on to the next stage as soon as they are ready.

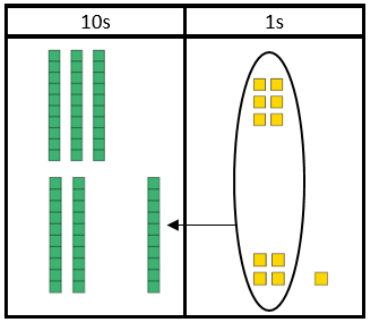
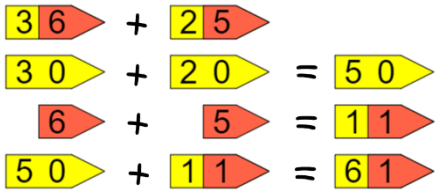
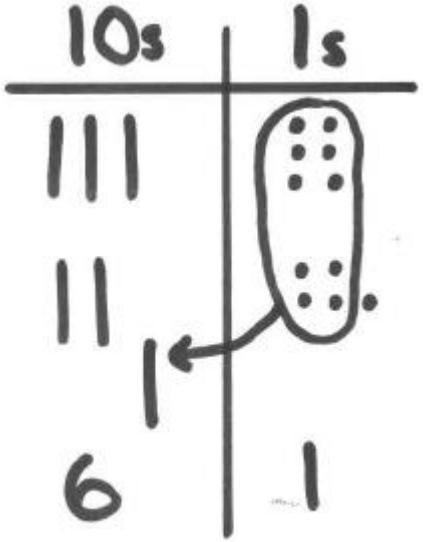
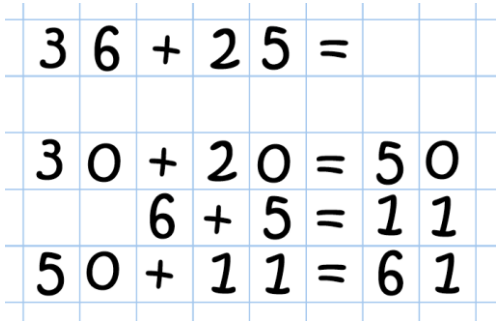
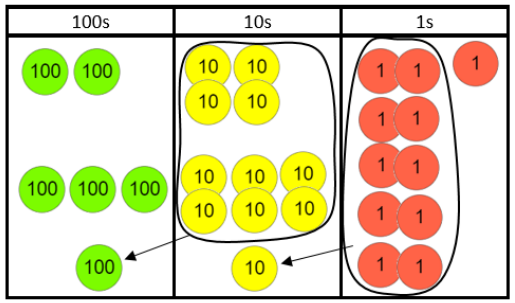
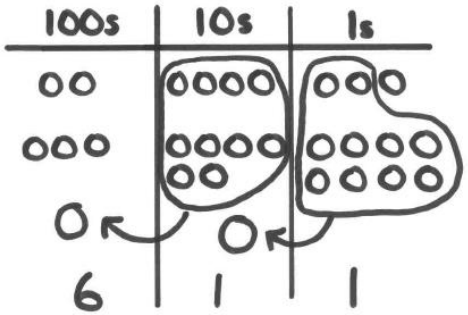
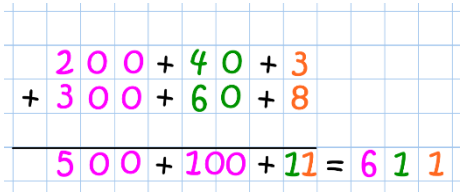
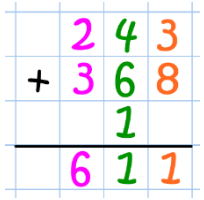
When solving puzzles or problems children use our metacognition questions to help them work through and check their answers. They are encouraged to represent calculation and problems using mathematical equipment, pictures/diagrams and as a numerical calculation. It is important that children are exposed to and can use a variety of ways to represent a calculation. We teach children how to use a range of strategies including the inverse and estimation to check their working thoroughly and to recognise when mental or written methods are most appropriate.

Calculation Policy: Addition

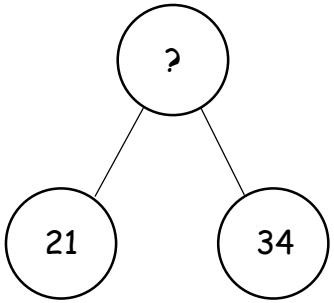
Key language: sum, total, parts and wholes, plus, add, altogether, more, 'is equal to', 'it the same as'

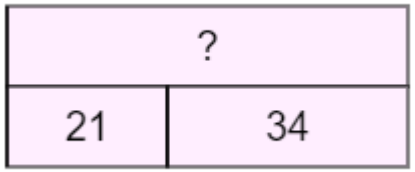
	Concrete	Pictorial	Abstract
Count All	Combining two parts to make a whole (using a range of resources too e.g. eggs, shells, teddy bears, cars etc.) 	Children represent the cubes using dots. They could put each part on a part/whole model. 	4 + 3 = 7 Four is a part, 3 is a part and whole is seven. 
Counting On	Using a labelled number line/number track, cubes or bead string. Base Ten and 100 squares could also be used with larger numbers.   	Draw representation of cubes or bead string. Introduce to the bar model. 	The abstract number line: What is 3 more than 4? What is the sum of 3 and 4? What is the total of 4 and 3? 4 + 3 

	Concrete	Pictorial	Abstract
Using Number Bonds	Regrouping to make 10 using ten frames and counters/cubes. 	Children draw on a laminated ten frame or draw their own and show counters/cubes. 	Children develop an understanding of how they can use number bonds for 10 in order to add numbers than bridge 10. 6 + 5 = 5 + 5 + 1 = 10 + 1 = 11 6 + □ = 11 6 + 5 = 5 + □ 6 + 5 = □ + 4
Partitioning – TU + U	Continue to develop understanding of partitioning and place value using Base 10.  	Draw representation of Base 10 e.g. lines for tens and dots for ones.  	41 + 8  1 + 8 = 9 40 + 9 = 49

	Concrete	Pictorial	Abstract
Partitioning – TU + TU	Continue to develop understanding of partitioning and place value using Base Ten, using arrow cards alongside.   	 	Present each partitioned calculation. 
Column Method	Use of place value counters when adding larger amounts and when introducing decimals. Arrow cards could still be used alongside.  	Children represent the counters in a place value chart, circling when they make an exchange.  	Expanded method moving into column method. Abacus using specific colours to represent place value. It may be useful to indicate this when modelling.  

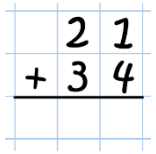
Conceptual variation; different ways to ask children to solve 21 + 34





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

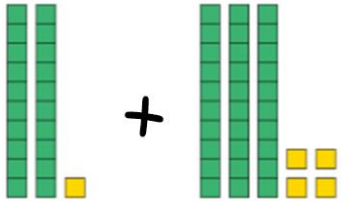
21 + 34 = 55. Prove it.

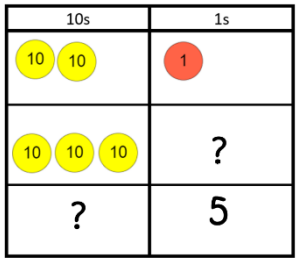


21 + 34 =

☐ = 21 + 34

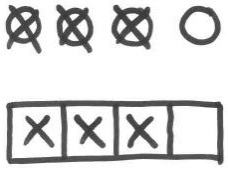
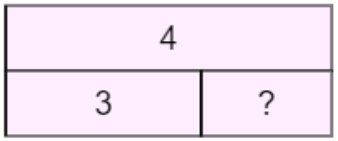
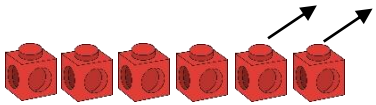
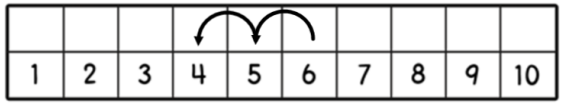
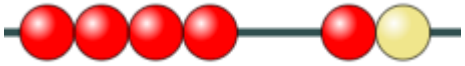
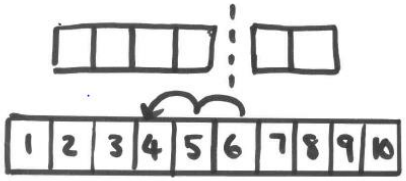
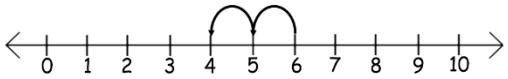
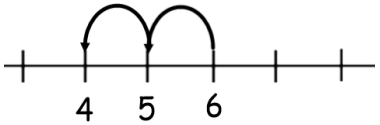
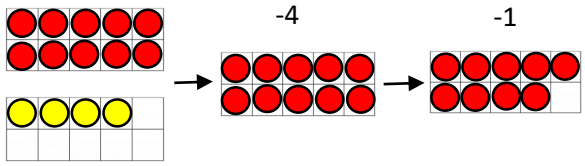
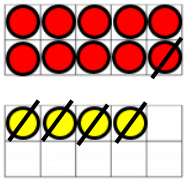
Calculate the sum of twenty-one and thirty-four.

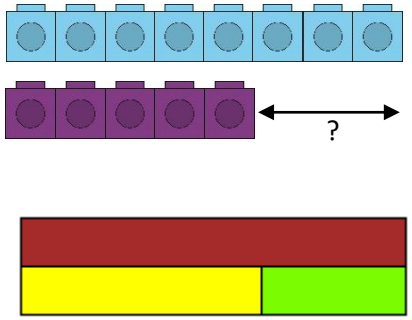
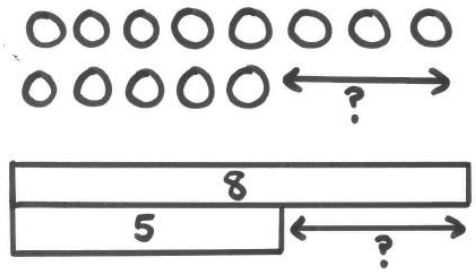
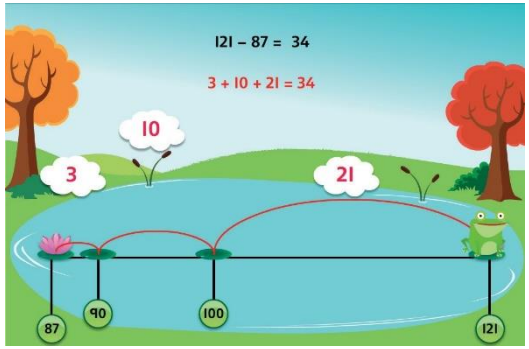
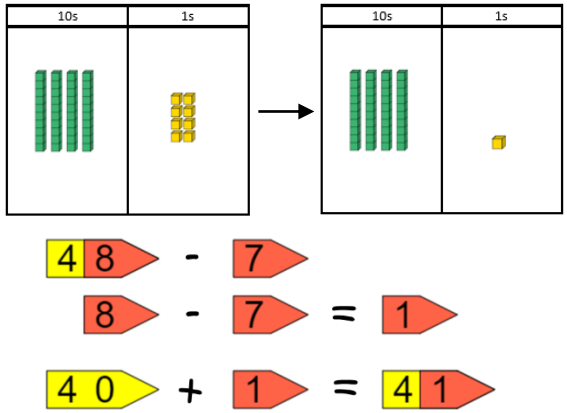
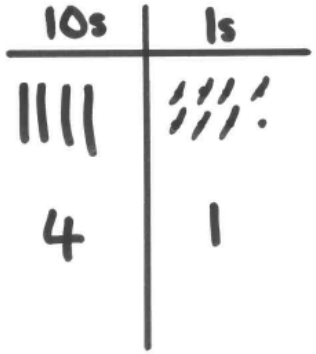


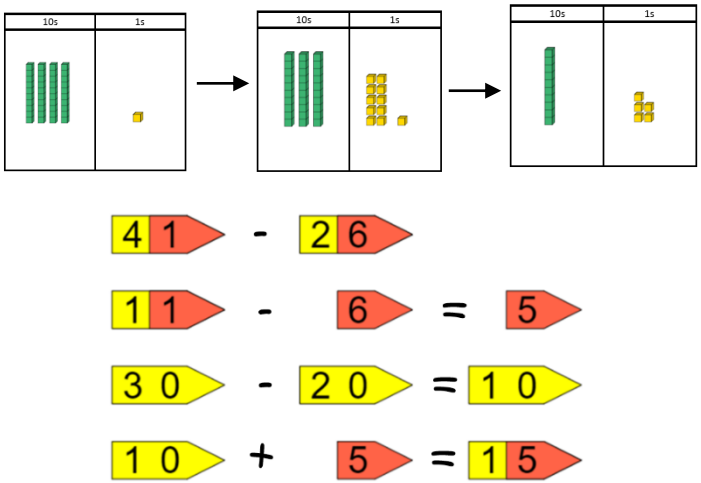
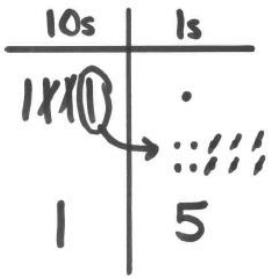
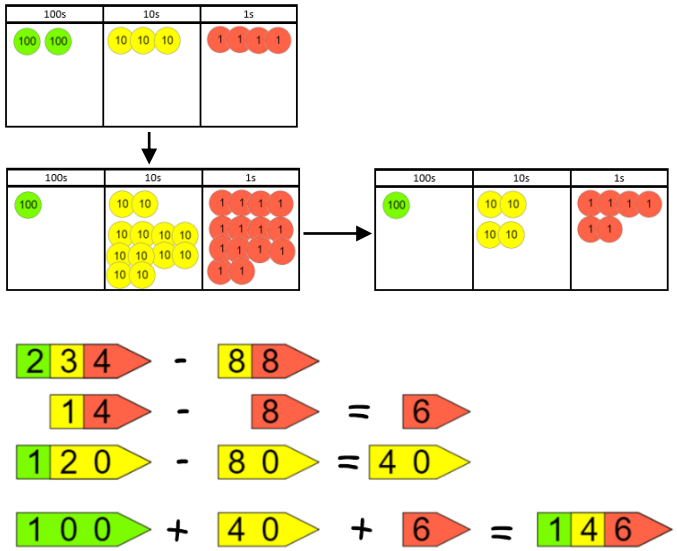
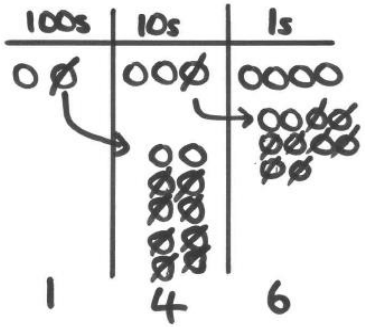
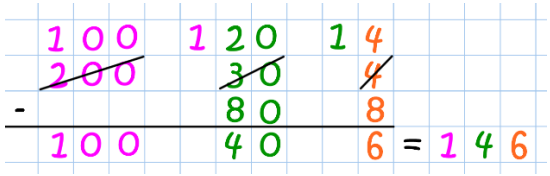
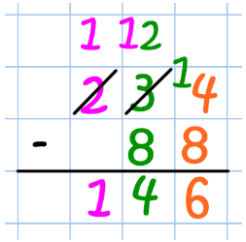


Calculation Policy: Subtraction

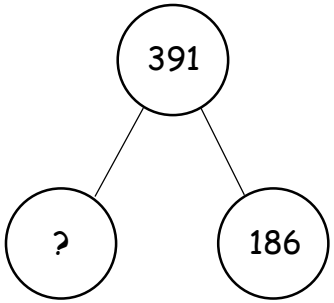
Key language: take away, less than, the difference, subtract, minus, fewer, decrease

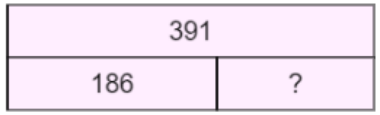
	Concrete	Pictorial	Abstract
Removing objects	Physically taking away and removing objects (cubes, counters, bears, bean bags etc.) 	Children draw the concrete resources they are using and cross out the correct amount. The bar model can also be used. 	4 – 3 = ☐ = 4 – 3 
Counting Back	Using a labelled number line/number track, children start with 6 and count back 2.  "five, four"  	Children draw what they see pictorially. 	Children represent the calculation on a number line and show their jumps. Encourage children to use an empty number line.  
Using Number Bonds	Using ten frames, begin to recognise what to subtract to make ten and use this for other calculations. 	Children to present the ten frame pictorially and discuss what they did to make 10. 	Children show they make 10 by partitioning the subtrahend. 14 – 5 = 14 – 4 = 10 10 – 1 = 9

	Concrete	Pictorial	Abstract
Find the Difference	Also known as FROG (or Counting up). Find the difference using cubes or Cuisenaire rods etc.  	Children draw the concrete resources they are using and cross out the correct amount. The bar model can also be used.  	Find the difference between 8 and 5. 8 – 5, the different is Children to explore why 9 – 6 = 8 – 5 = 7 – 4 have the same difference. 
Partitioning – TU - U	Using Base Ten and Arrow Cards.  	Children draw the Base Ten and cross out the subtrahend.  	Children partition the calculation: 48 – 7 8 – 7 = 1 40 + 1 = 41

	Concrete	Pictorial	Abstract
Partitioning – TU – TU	Using Base 10 alongside Arrow Cards and having to exchange.  	Represent the Base 10 pictorially, remembering to show the exchange.  	Show partitioned values. 41 – 26 11 – 6 = 5 30 – 20 = 10 10 + 5 = 15
Column Method	Using place value counters alongside arrow cards.  	Children represent the place value counters pictorially, remembering to show what has been exchanged.  	Expanded column method followed by compact column method. Children must understand what has happened when they have cross out digits.  

Conceptual variation; different ways to ask children to solve 391 - 186





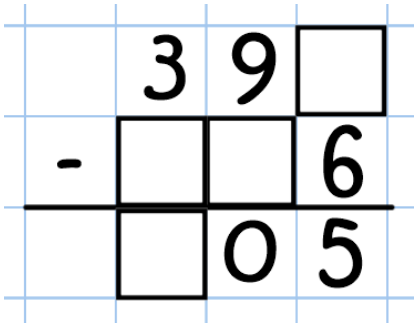
Raj spent £391, Timmy spent £186. How much more did Raj spend than Timmy?

Calculate the difference between 391 and 186.

□ = 391 - 186

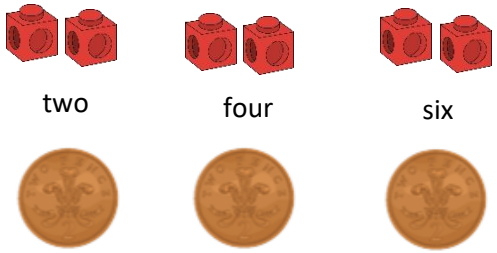
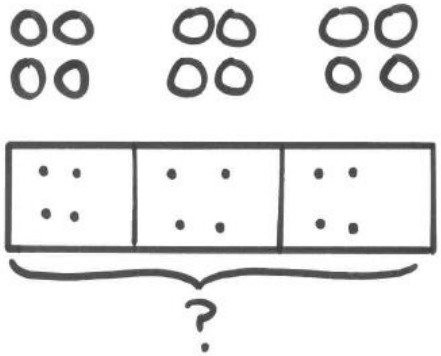
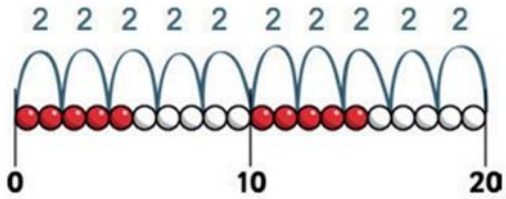
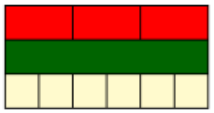
What is 186 less than 391?

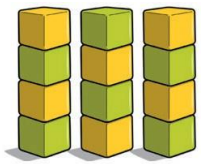
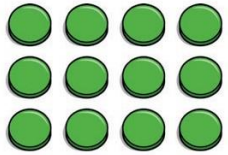
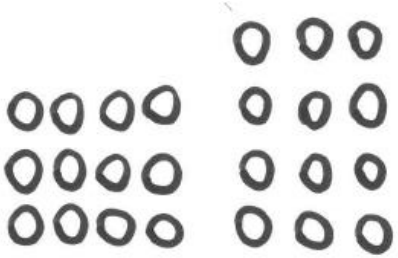
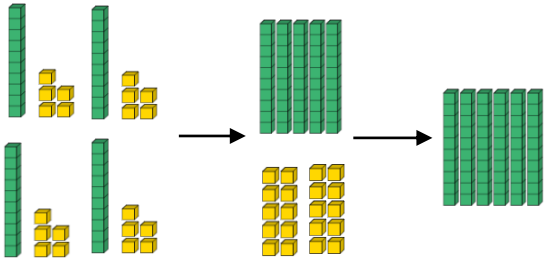
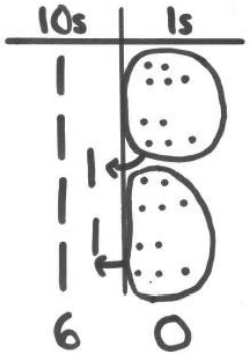
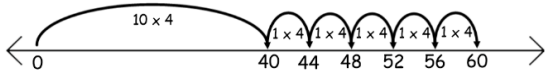
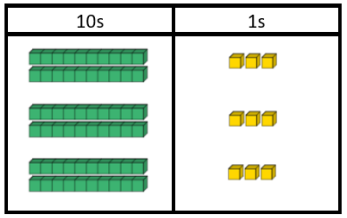
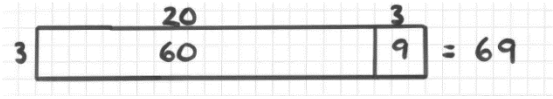
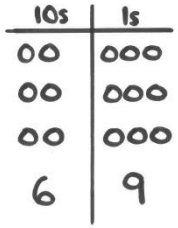
Missing digit calculations

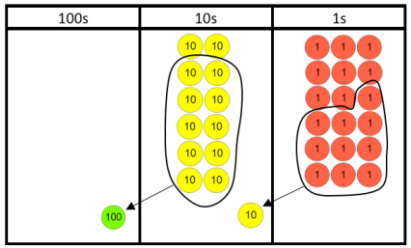
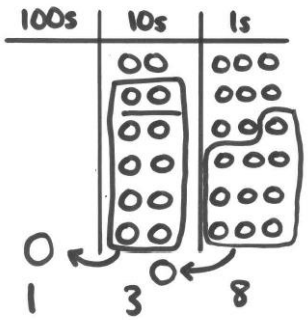
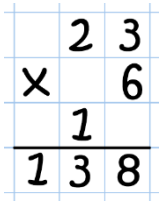


Calculation Policy: Multiplication

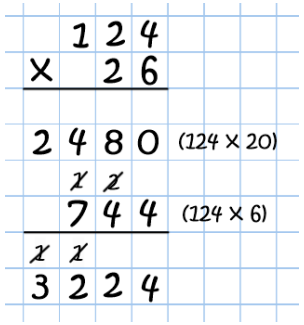
Key language: double, times, multiplied by, the product of, groups of, lots of, equal groups

	Concrete	Pictorial	Abstract
Clever Counting/Repeated Addition	Physically match counting in amounts to objects (pairs of socks, fingers, coins etc). Start with objects that show the number (i.e. 2 cubes, then move on to objects which represent the number (e.g. 2p coin).  	Children draw the concrete resources they are using and match to the numbers underneath. They can move on to using a bar model.  	2 + 2 + 2 = 6 3 x 2 = 6
Repeated Addition Number lines	Use bead strings and repeated number lines to show repeated addition.  Cuisenaire rods can also be used:  100 squares demonstrate that repeated addition continues into larger numbers.	Children draw what they see pictorially alongside a number line.  	Children represent the repeated addition using an abstract number line. 3 x 4 = 12  Moving towards known multiplication facts, appropriate to year group.

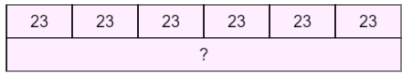
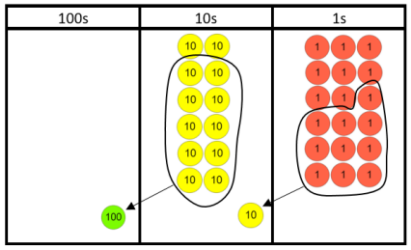
	Concrete	Pictorial	Abstract
Arrays	Use arrays to illustrate commutativity. Counters and other objects can be used to illustrate.  "3 groups of 4 is 12"  "4 groups of 3 is 12"	Children draw the concrete resources to represent the arrays pictorially. 	Children to be able to use an array to write a range of calculations. 10 = 2 x 5 5 x 2 = 10 2 + 2 + 2 + 2 + 2 = 10 10 = 5 + 5
Partitioning	Use Base 10, Cuisenaire rods or place value counters. 	Children represent the concrete manipulatives pictorially. 	Children to be encourage to show the steps they have taken. 4 x 15 4 x 10 = 40 4 x 5 = 20 40 + 20 = 60 
Grid Method	Using Base 10. 	Represent the grid proportionately.  	Draw the grid method: x | 20 | 3 3 | 60 | 9 = 69

	Concrete	Pictorial	Abstract
Short Multiplication	Using place value counters to represent larger amounts. 	Children draw the concrete resources to represent the arrays pictorially. 	Children to be able to use an array to write a range of calculations. 
Long multiplication	When children start to multiply 2d x 2d etc, they should be confidence with the abstract.		

X	100	20	4	
20	2000	400	160	= 2560
6	600	120	24	= 744
				= 3304

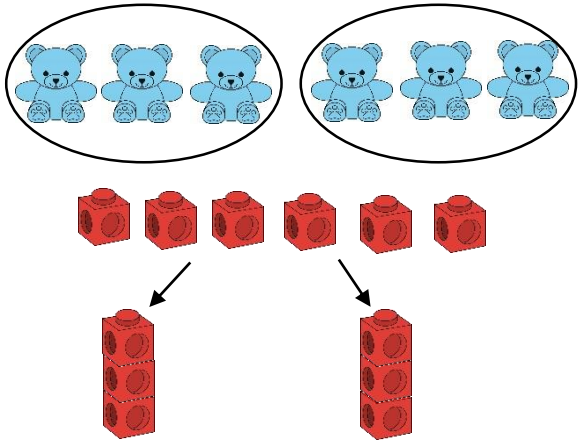
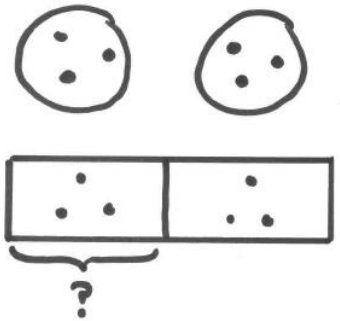
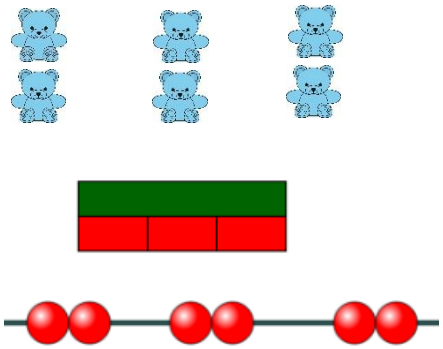
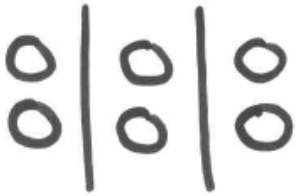


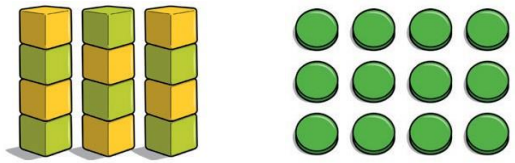
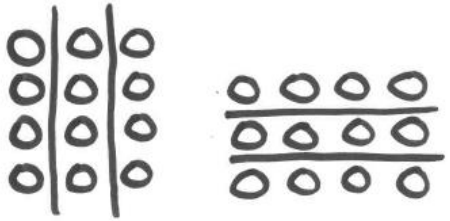
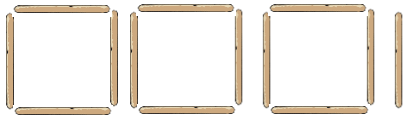
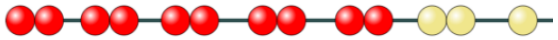
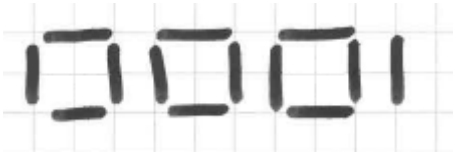
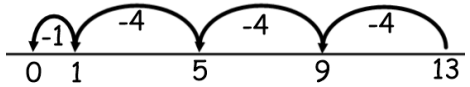
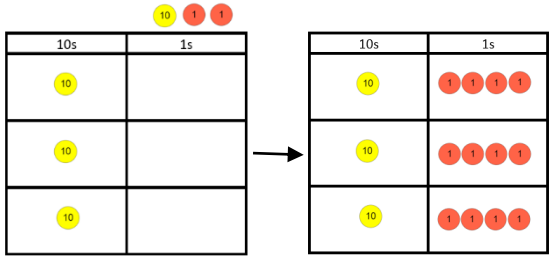
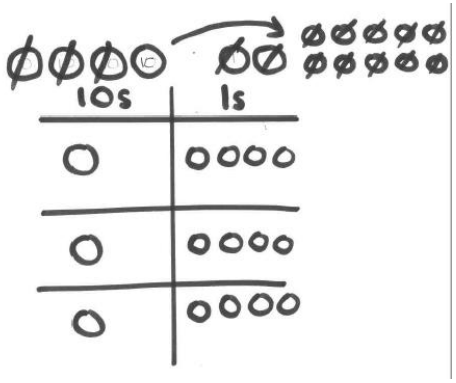
Conceptual variation; different ways to ask children to solve 6 x 23

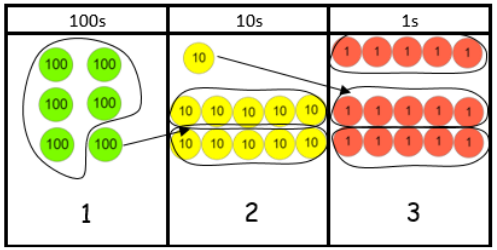
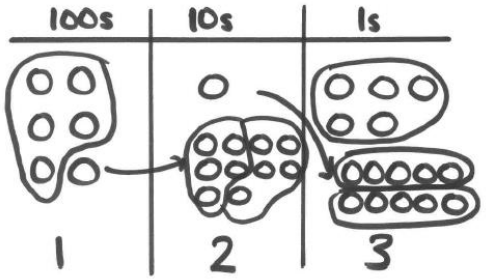
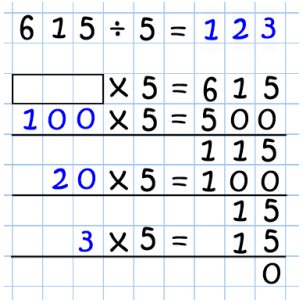
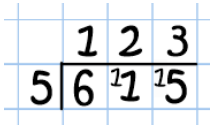
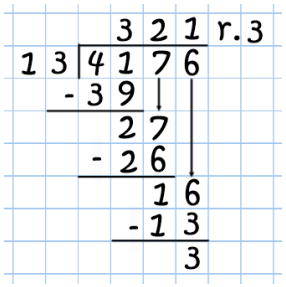
	Mai had to swim 23 lengths, six times a week. How many lengths did she swim in one week? With the place value counters, prove that 6 x 23 = 138.	Find the product of 6 and 23. 6 x 23 = ☐ = 6 x 23	What is the calculation shown? 

Calculation Policy: Division

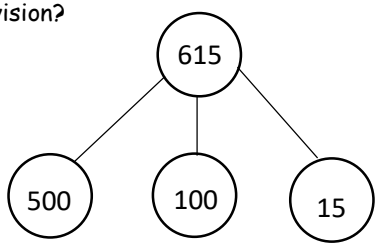
Key language: share, group, divide, divided by

	Concrete	Pictorial	Abstract
Sharing	Physically sharing a range of objects into equal amounts. 	Children represent the sharing pictorially. 	6 ÷ 2 = 3 Children should also be encouraged to use their multiplication table facts.
Grouping	Using objects, cubes, bead strings, Cuisenaire rods. 6 bears into groups of 2. 	Children represent their objects pictorially in groups. 	6 ÷ 2 = 3 Children should also be encouraged to use their 2 times table facts.

	Concrete	Pictorial	Abstract
Arrays	Use arrays to illustrate commutativity. Counters and other objects can be used to illustrate.  "12 is 3 groups of 4" "12 is 4 groups of 3"	Children represent the array pictorially. 	Children to be able to use an array to write a range of calculations and match to related multiplication facts. 10 ÷ 5 = 2 10 ÷ 2 = 5
Repeated subtraction	Using objects or bead strings. Including with remainders.  	Children represent their objects pictorially. 	Children should be encouraged to use multiplication facts. They could also represent the repeated subtraction on a number line. 
Partitioning	Using place value counters. 42 ÷ 3 	Children represent the place value counters pictorially. 	Children to be able to make snese of the place value counters and write calculations to show the process. 42 ÷ 3 42 = 30 + 12 30 ÷ 3 = 10 12 ÷ 3 = 4 10 + 4 = 14

	Concrete	Pictorial	Abstract
Short Division	Use place value counters to group. 	Children represent the place value counters pictorially. 	Children complete the calculation using the short division scaffold.  
Long Division	Children can continue to use place value counters initially. 		

Conceptual variation; different ways to ask children to solve 615 ÷ 5

Using the part whole model below, how can you divide 615 by 5 without short division? 	I have £615 and share it equally between 5 bank accounts. How much will be in each account? 615 pupils need to be put into 5 groups. How many will be in each group?	615 ÷ 5 □ = 615 ÷ 5	What is the calculation shown?