Cecil Road Primary & Nursery School
Together we achieve more

Calculation Policy

September 2023

At Cecil Road Primary and Nursery School, we have developed a consistent approach to the teaching of written calculation methods in order to establish continuity and progression through the school. This policy has been adapted from the White Rose Maths Hub to be in line with our schemes of learning.

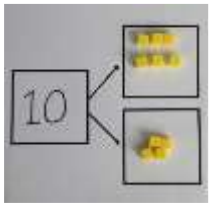
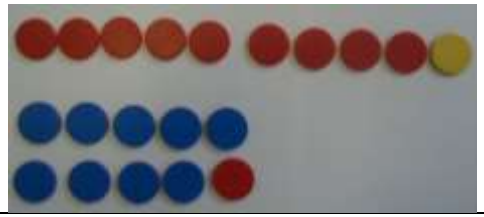
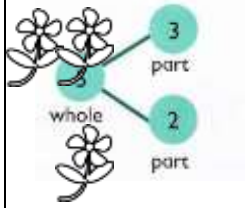
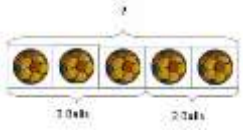
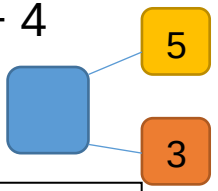
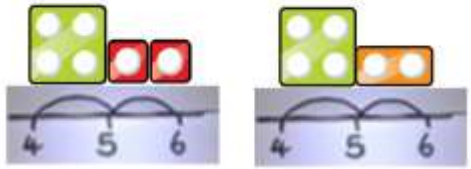
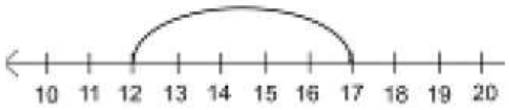
This calculation policy outlines the progression in mathematical strategies and skills from Early Years to Year 6, and the typical year group children will be in when they are first introduced to particular concepts. However, it is expected that teachers will use their professional judgement as to when consolidation of existing skills is required or if to move onto the next concept. However, the focus must always remain on breadth and depth rather than accelerating through concepts. Children should not be extended with new learning before they are ready, they should deepen their conceptual understanding by tackling challenging and varied problems.

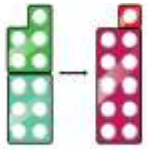
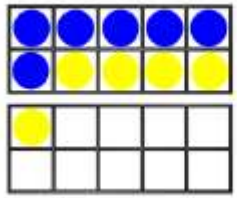
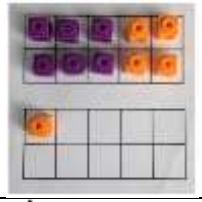
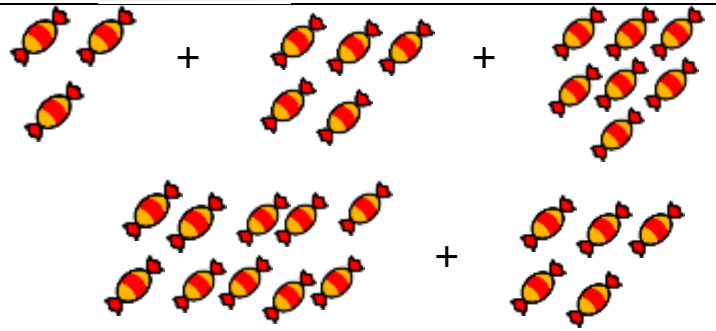
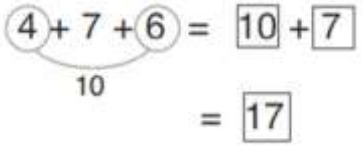
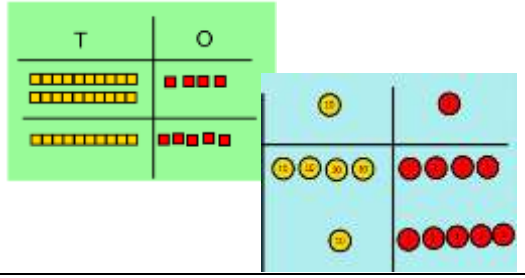
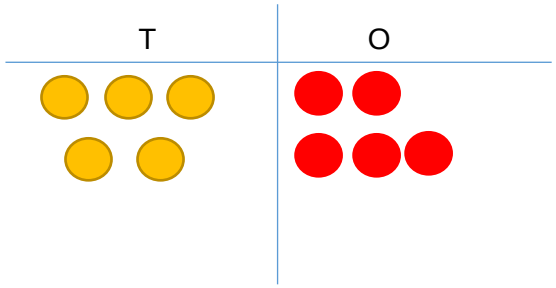
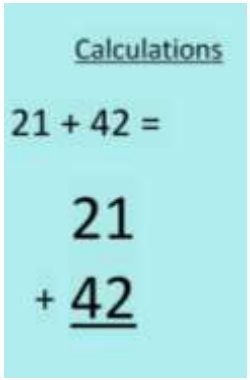
The National Curriculum is explicit in articulating the importance of children using the correct mathematical language as a central part of their learning and reasoning. It is therefore essential that teaching using the strategies outlined in this policy is accompanied by the use of appropriate and precise mathematical vocabulary. New vocabulary should be introduced in a suitable context and explained carefully using relevant objects, manipulatives, pictures or diagrams. High expectations of the mathematical language used are essential.

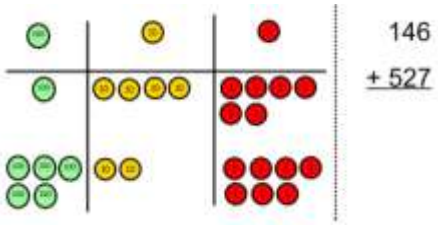
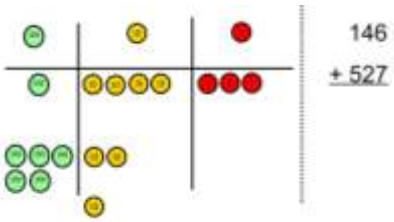
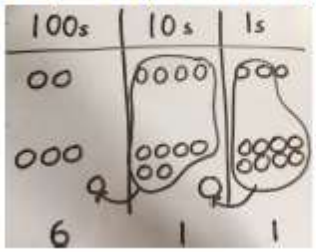
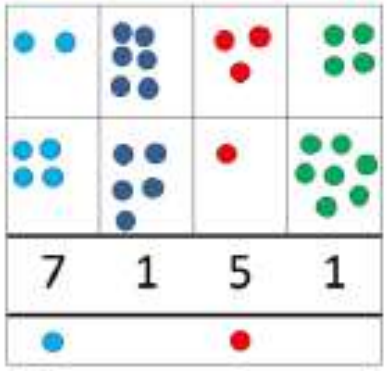
It is expected that visual images and manipulates are used alongside the teaching of each stage. Teachers can use any teaching resources that they wish to use and the policy does not recommend one set of resources over another, instead, a variety of resources are used. For each of the four operations of number, different strategies are laid out, together with examples of what concrete materials can be used and how, along with suggested pictorial representations. The principle of the concrete-pictorial-abstract (CPA) approach s for children to have a true understanding of a mathematical concept. They need to master all three phases within each year group's scheme of work.

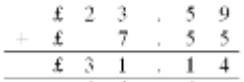
We aim for all children to be able to use a reliable and efficient written method for each operation with confidence and understanding by Upper Key Stage 2. Children will be encouraged to consider the calculation and the most efficient method to reach the answer.

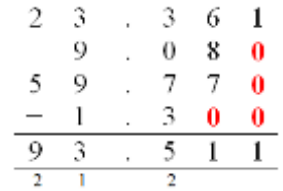
Addition

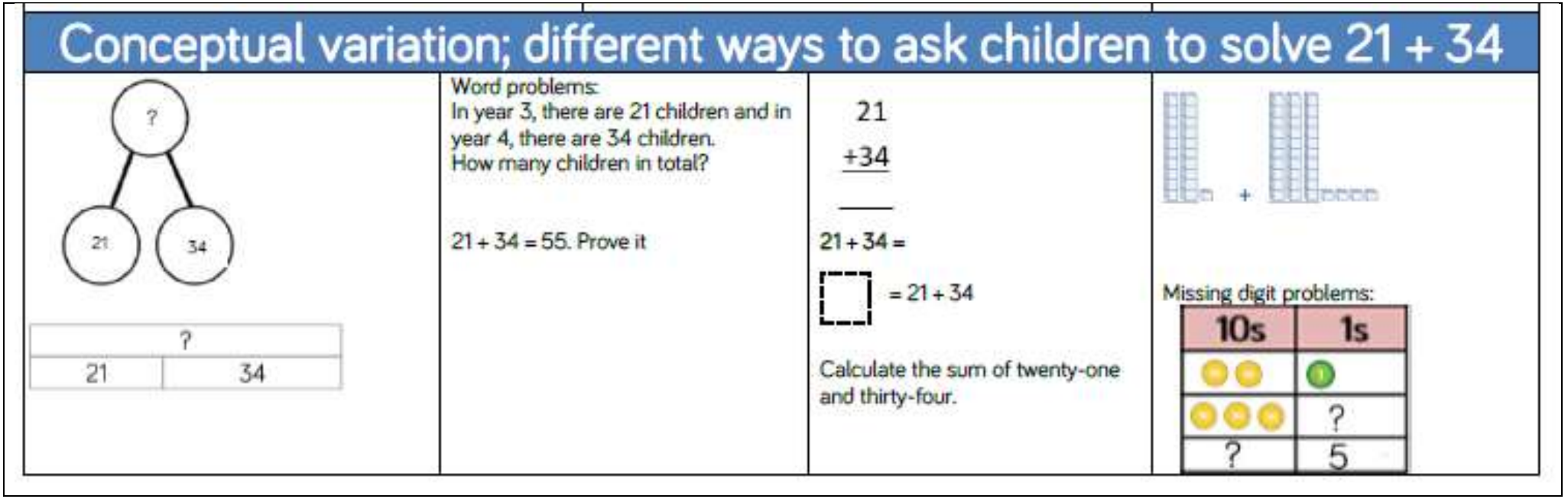
Objective and Strategies	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part-whole model	   Use objects to add two numbers together as a group or in a bar. 	  Use pictures to add two numbers together as a group or in a bar. 	4 + 3 = 7 10= 6 + 4  Use the part-part whole diagram as shown above to move into the abstract.
Starting at the bigger number and counting on	 Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer. 	12 + 5 = 17  Start at the larger number on the number line and count on in ones or in one jump to find the answer.	5 + 12 = 17 Place the larger number in your head and count on the smaller number to find your answer.

Regrouping to make 10.	6 + 5 = 11 Start with the bigger number and use the smaller number to make 10. 	Children to draw the ten frame and counters/cubes.  	Children to develop an understanding of equality e.g. $6 + \square = 11$ $6 + 5 = 5 + \square$ $6 + 5 = \square + 4$
Adding three single digits	4 + 7 + 6= 17 Put 4 and 6 together to make 10. Add on 7.  Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.	 Add together three groups of objects. Draw a picture to recombine the groups to make 10.	 Combine the two numbers that make 10 and then add on the remainder.
Column method- no regrouping	24 + 15= Add together the ones first then add the tens. Use the Base 10 blocks first before moving onto place value counters. 	After practically using the base10 blocks and place value counters, children can draw the counters to help them to solve additions. 	 Calculations 21 + 42 = 21 + 42

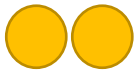
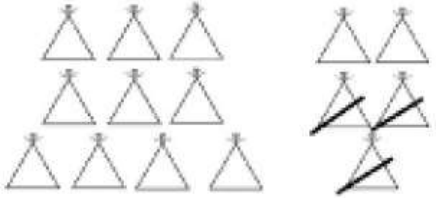
Column method- regrouping	Make both numbers on a place value grid.  Add up the units and exchange 10 ones for one 10.  Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added. This can also be done with Base 10 to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100. As children move on to decimals, money and decimal place value counters can be used to support learning.	Children can draw a pictoral representation of the columns and place value counters to further support their learning and understanding.   	243 +368 611 1 1 As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here. 72.8 + 54.6 127.4 1 1 £23.59 + £7.55 £31.14 1 1 1 23.361 9.080 59.770 − 1.300 93.511 2 1 2

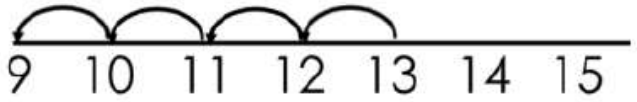
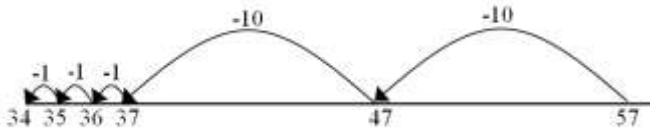
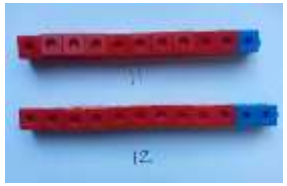
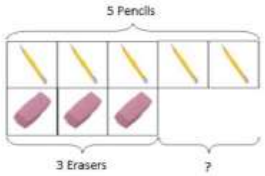
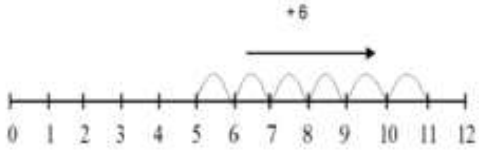
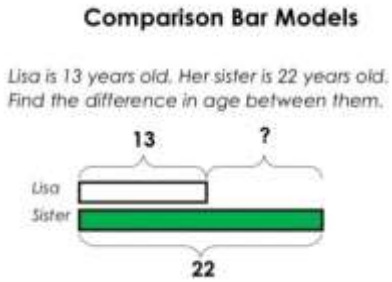


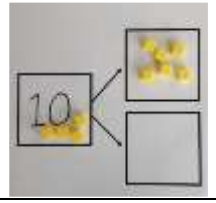
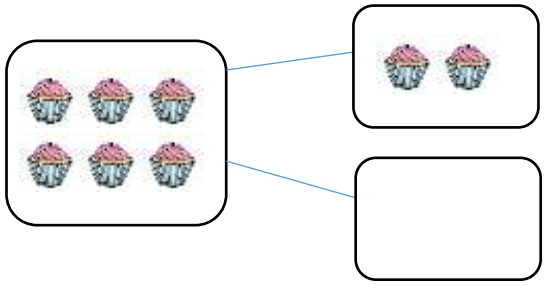
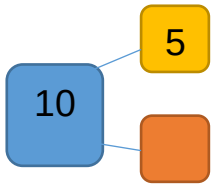
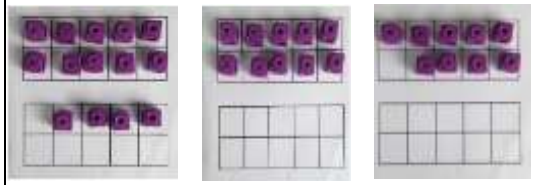
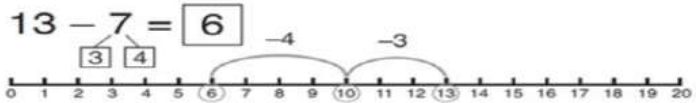
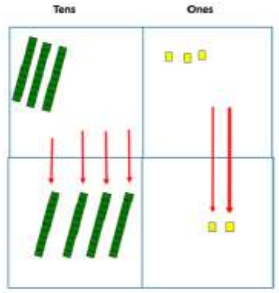
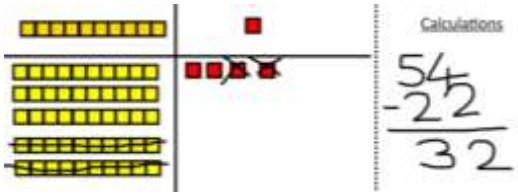
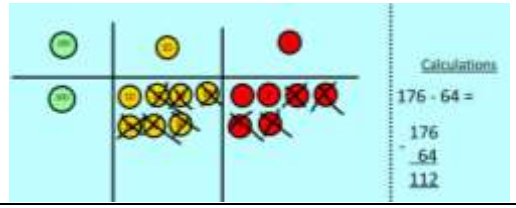
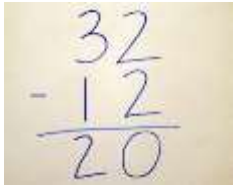
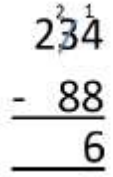


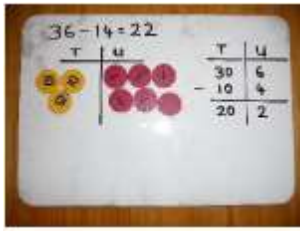
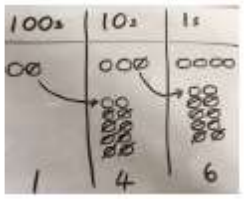
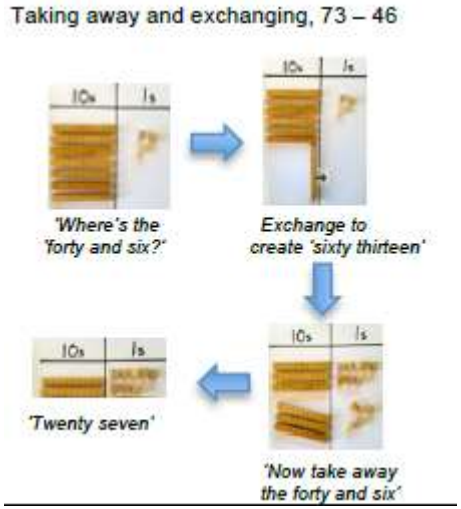
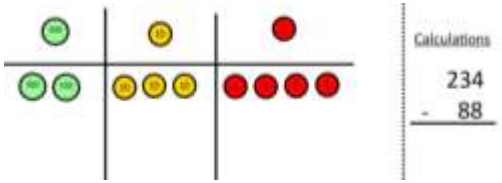
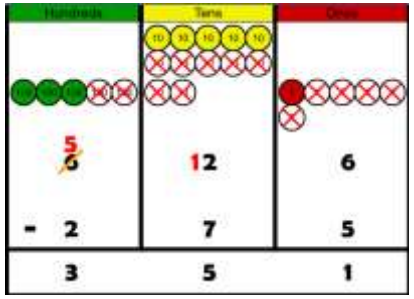
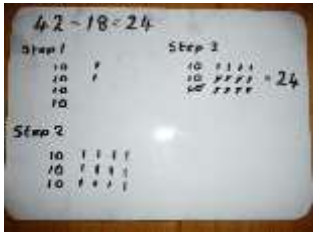
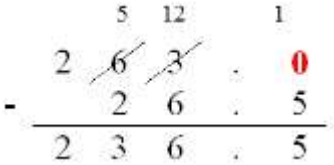


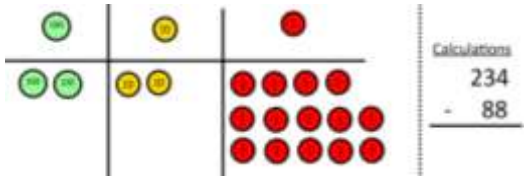
Subtraction

Objective and Strategies	Concrete	Pictorial	Abstract
Taking away ones	Use physical objects, counters, cubes etc to show how objects can be taken away.  6 – 2 = 4   	Cross out drawn objects to show what has been taken away.  15 – 3 = 12	18 – 3 = 15 8 – 2 = 6

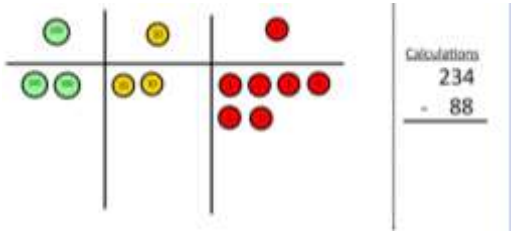
Counting back	Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.  13 – 4 Use counters and move them away from the group as you take them away counting backwards as you go. 	Count back on a number line or number track  Start at the bigger number and count back the smaller number showing the jumps on the number line.  This can progress all the way to counting back using two 2 digit numbers.	Put 13 in your head, count back 4. What number are you at? Use your fingers to help.
Find the difference	Compare amounts and objects to find the difference.  Use cubes to build towers or make bars to find the difference  Use basic bar models with items to find the difference	Count on to find the difference.  Draw bars to find the difference between 2 numbers. 	Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.

Part Part Whole Model	Link to addition- use the part whole model to help explain the inverse between addition and subtraction. If 10 is the whole and 6 is one of the parts. What is the other part? 10 - 6 =  	Use a pictorial representation of objects to show the part part whole model. 	Move to using numbers within the part whole model. 
Make 10	14 – 9 =  Make 14 on the ten frame. Take away the four first to make 10 and then takeaway one more so you have taken away 5. You are left with the answer of 9.	 Start at 13. Take away 3 to reach 10. Then take away the remaining 4 so you have taken away 7 altogether. You have reached your answer.	16 – 8= How many do we take off to reach the next 10? How many do we have left to take off?
Column method without regrouping	Use Base 10 to make the bigger number then take the smaller number away.  	Draw the Base 10 or place value counters alongside the written calculation to help to show working.   	This will lead to a clear written column subtraction.  

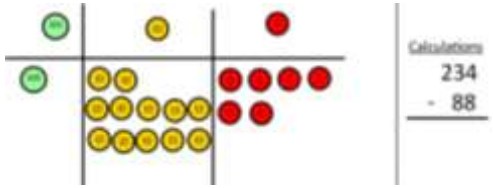
	Show how you partition numbers to subtract. Again make the larger number first. 	 	
Column method with regrouping	Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges.  Make the larger number with the place value counters  Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.	 Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make. When confident, children can find their own way to record the exchange/regrouping. Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup.  Children can start their formal written method by partitioning the number into clear place value columns and supported by the use of place value counters.	 Moving forward the children use a more compact method. This will lead to an understanding of subtracting any number including decimals. 



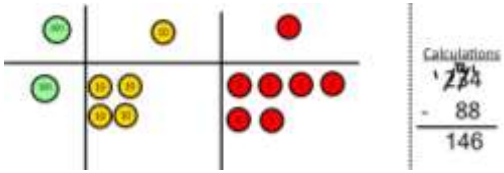
Now I can subtract my ones.



Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens.



Now I can take away eight tens and complete my subtraction

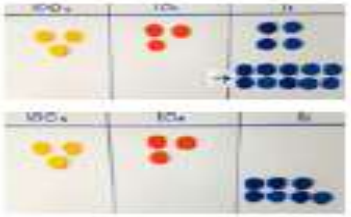


Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.

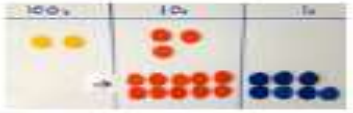
Taking away and exchanging, 344 – 187
Place value counters

'Where's the one hundred and eighty and seven?

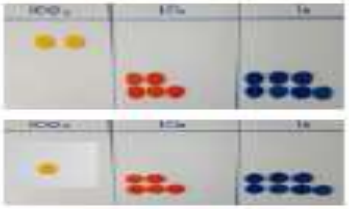
Exchange to create three hundred and thirty and fourteen. Now take away the 'seven'



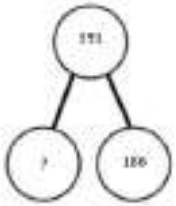
Exchange to create two hundred, thirteen tens and seven
Now take away the 'eighty'



Now take away the 'one hundred



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



391	
186	?

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

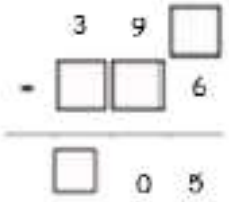
Calculate the difference between 391 and 186.

□ = 391 – 186

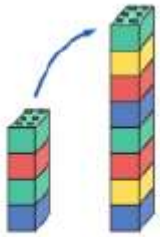
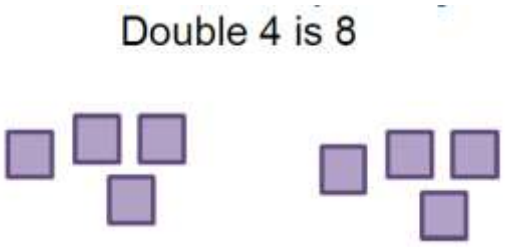
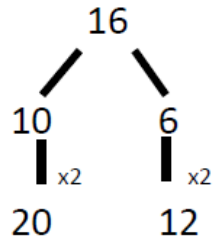
391
-186
___

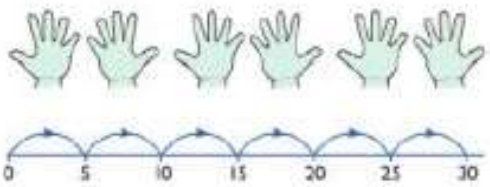
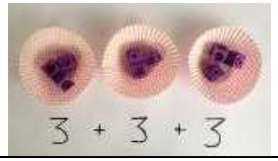
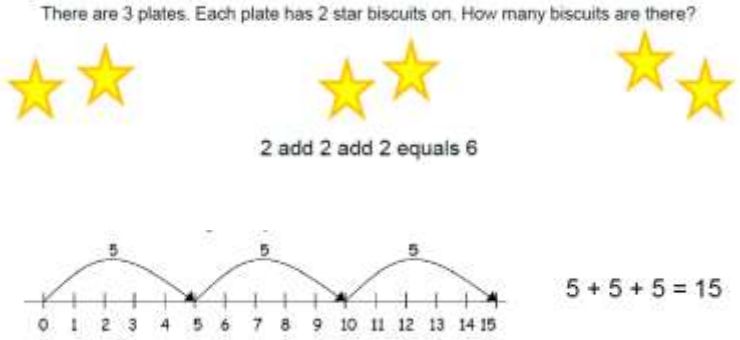
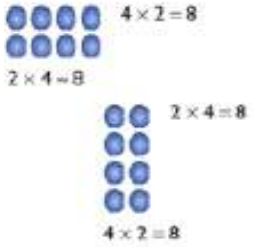
What is 186 less than 391?

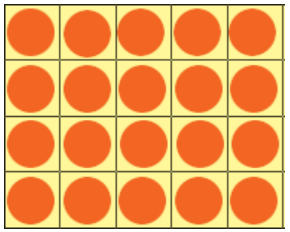
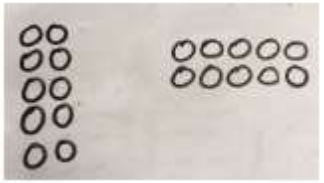
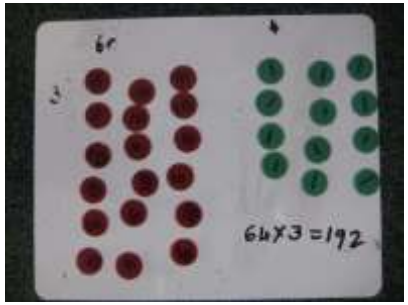
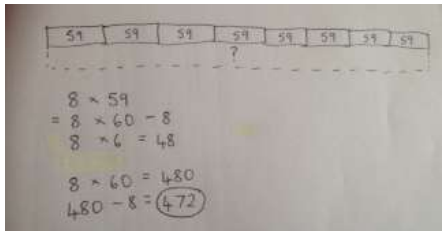
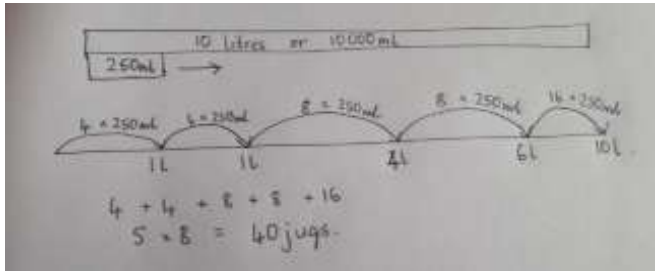
Missing digit calculations



Multiplication

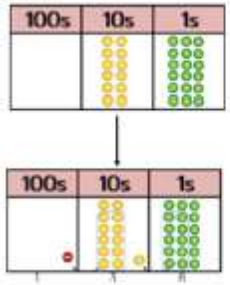
Objective and Strategies	Concrete	Pictorial	Abstract
Doubling	Use practical activities to show how to double a number.  double 4 is 8 4 × 2 = 8	Draw pictures to show how to double a number. 	 Partition a number and then double each part before recombining it back together.

Counting in multiples	  Count in multiples supported by concrete objects in equal groups.	 Use a number line or pictures to continue support in counting in multiples.	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25 , 30
Repeated addition	   Use different objects to add equal groups.	 	Write addition sentences to describe objects and pictures. 
Arrays- showing commutative multiplication	Create arrays using counters/ cubes to show multiplication sentences. 	Draw arrays in different rotations to find **commutative** multiplication sentences.  	Use an array to write multiplication sentences and reinforce repeated addition.

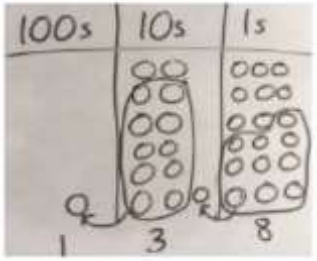
		 Link arrays to area of rectangles. These can be drawn pictorially to represent the manipulatives used. 	 5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15
Column multiplication	Children can continue to be supported by place value counters at the stage of multiplication.  It is important at this stage that they always multiply the ones first and note down their answer followed by the tens which they note below.	Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods  	Start with long multiplication, reminding the children about lining up their numbers clearly in columns. Formal written method 6 x 23 = 23 × 6 138 1 1 If it helps, children can write out what they are solving next to their answer.

Formal column method with place value counters.

6 x 23



Children to represent the counters/base 10, pictorially e.g. the image below.



32
x 24
8 (4 x 2)
120 (4 x 30)
40 (20 x 2)
600 (20 x 30)
768

This moves to the more compact method.

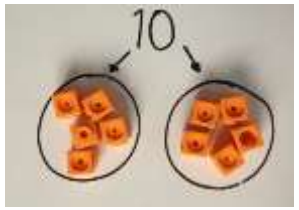
```
  74
   x 63
  ----
   12
  210
  240
+ 120 3
  ----
  4662
```

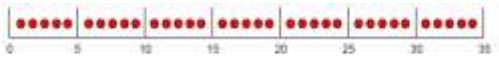
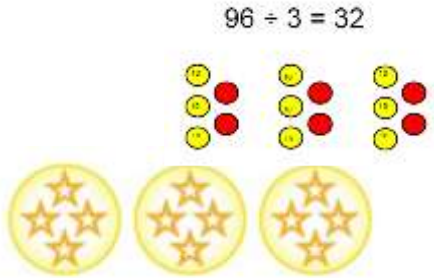
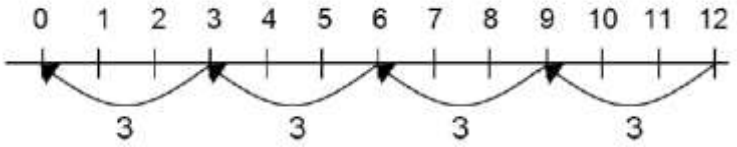
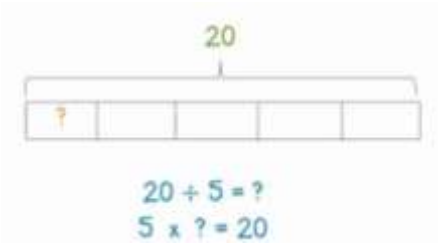
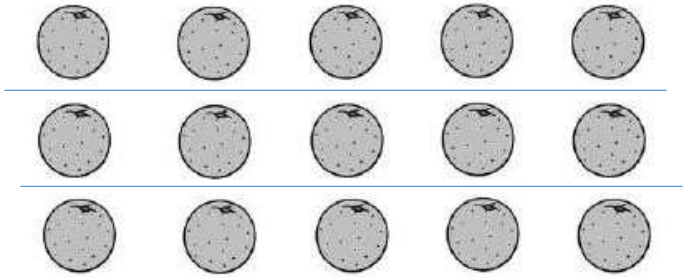
```
  231
 1342
  x 18
------
13420
10736
------
24156
  1
```

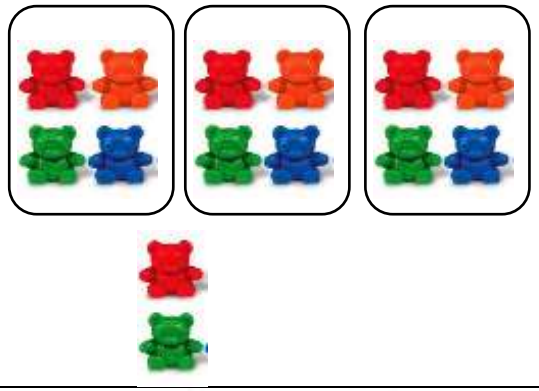
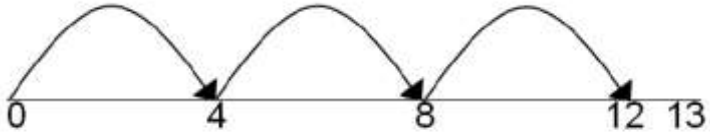
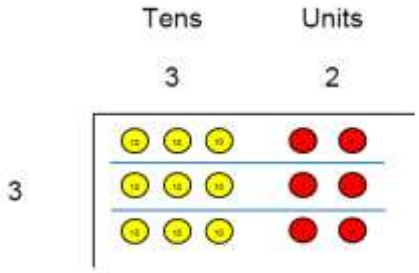
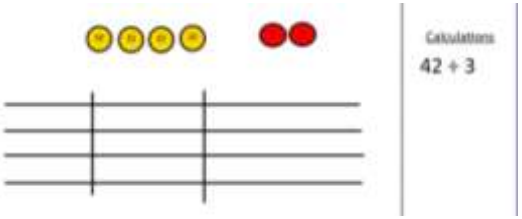
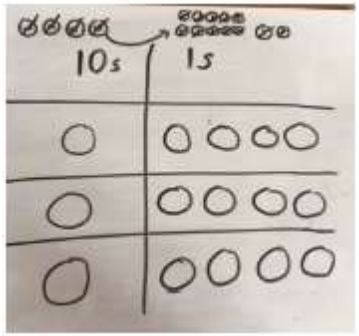
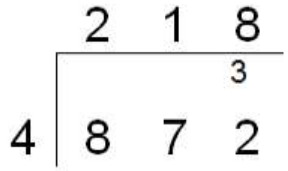
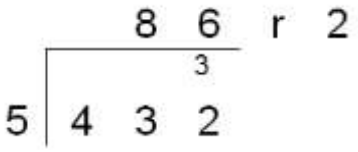
Conceptual variation; different ways to ask children to solve 6 × 23

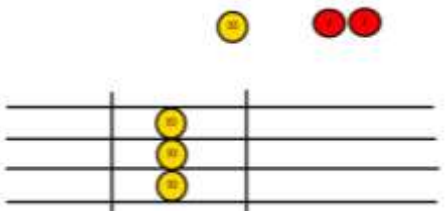
	Mai had to swim 23 lengths, 6 times a week. How many lengths did she swim in one week? With the counters, prove that 6 x 23 = 138	Find the product of 6 and 23 6 × 23 = ☐ = 6 × 23 6 × 23 = 23 × 6	What is the calculation? What is the product? 

Division

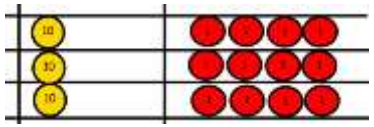
Objective and Strategies	Concrete	Pictorial	Abstract
Sharing objects into groups	 I have 10 cubes, can you share them equally in 2 groups? 	Children use pictures or shapes to share quantities.  8 ÷ 2 = 4	Share 9 buns between three people. 9 ÷ 3 = 3

Division as grouping	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.    	Use a number line to show jumps in groups. The number of jumps equals the number of groups.  Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.  	28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group?
Division within arrays	 Link division to multiplication by creating an array and thinking about the number sentences that can be created. Eg 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 sentences.	Find the inverse of multiplication and division sentences by creating four linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7

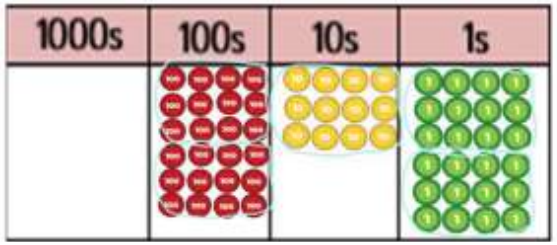
Division with a remainder	14 ÷ 3 = Divide objects between groups and see how much is left over 	Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.  Draw dots and group them to divide an amount and clearly show a remainder.  	Complete written divisions and show the remainder using r. 
Short division	 Use place value counters to divide using the bus stop method alongside  42 ÷ 3= Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.	Pupils continue to use drawn with dots or circles to help them represent the place value couters to show how to divide numbers into equal groups.  Introduce long division to show all the steps and to ensure the children understand the value of each digit. Use place value counters to support this.	Begin with divisions that divide equally with no remainder.  Move onto divisions with a remainder. 

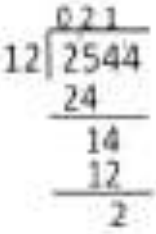


We exchange this ten for ten ones and then share the ones equally among the groups.

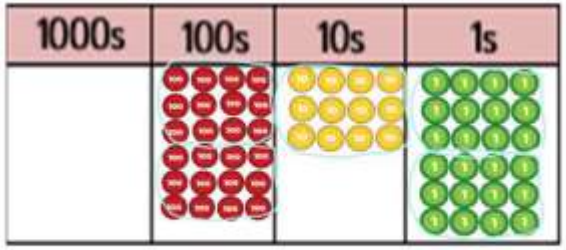


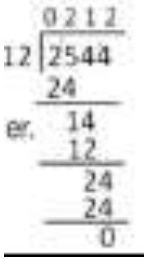
We look how much in 1 group so the answer is 14.





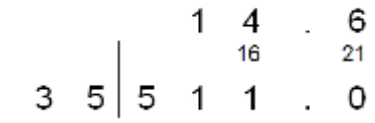
After regrouping the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens.





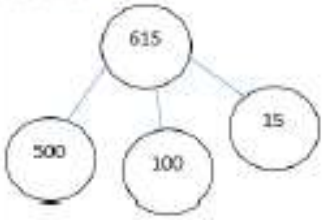
After regroupoing 2 tens, w ehave 24 ones. We group 24 ones into 2 groups of 12, which leaves no reminder.

Finally move into decimal places to divide the total accurately.



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 using 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?

$5\overline{)615}$

615 ÷ 5 =

□ = 615 ÷ 5

What is the calculation?
What is the answer?