Clarendon Infant School

Agreed Approach to Calculation Document
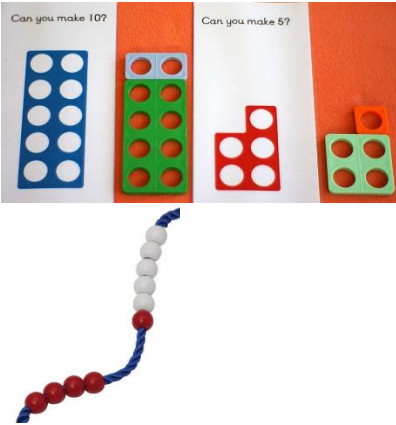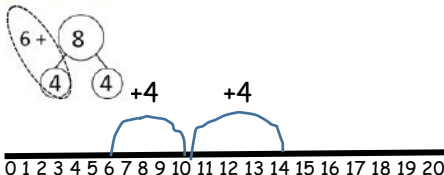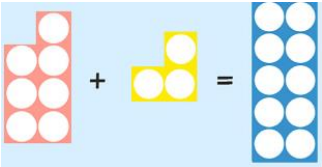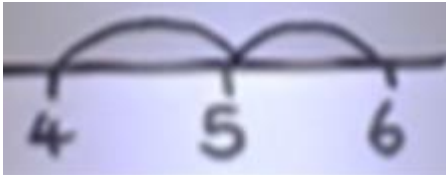
Core Manipulatives to support depth learning from Reception to Year 2.

S. Wardle 2019
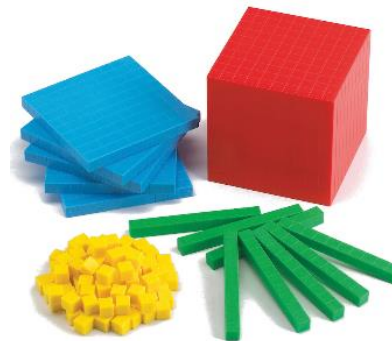
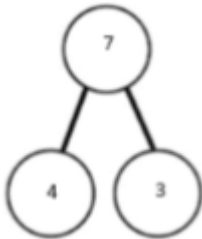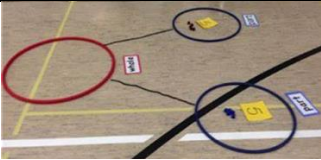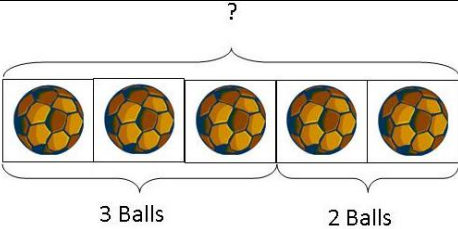| Yr	Addition Strategies	Concrete	Pictorial/Structural	Abstract
R	Finding the sum of two numbers. Combining two parts to make a whole: part part whole model. To know the pairs that total 5. ELG: To add two single digit numbers and count on to find the answer.	Use cubes, objects or Numicon to add two numbers together as a group or in a bar. 3 + 2 = 5 Part Part Whole	Use pictures to add two numbers together as a group or in a bar. 5 whole, 3 part, 2 part 4 5	Children will annotate enactive and iconic with numerals as they develop this skill. Record addition (as combining 2 or more sets) in pictures: ☺☺☺ + ☺ = 4 4 + 3 = 7 Four is a part, 3 is a part and the whole is seven. 7 / 4 3

4 + 5 =

?

3 Balls   2 Balls

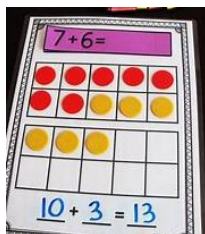| 1 | Use a range of manipulatives to add one digit and two digit numbers to 50. | Use Numicon to investigate the creation of numbers to 10 and above. First steps to bridging. | Counting on a number line.

4 + 2 = 6
13 + 6 = 19
22 = 8 + 14 (crossing tens boundary)

Start at the larger number on the number line and count on in ones or in jumps of one to find the answer.
6 + 8 =

Use pictures or a number line to regroup or partition the smaller number to make 10. | Place the larger number in your head and count on the smaller number to find the answer.

The abstract number line:
What is 2 more than 4?
What is the sum of 2 and 4?
What is the total of 4 and 2?
4 + 2

Number problems like: 4 = ___ + 2

If I am at seven, how many more do I need to make 10? How many more do I add on now?

6 and how many more make 10?
6 + ? = 10 |

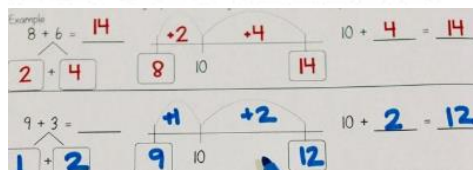Start with the bigger number and use the smaller number to make 10.

$7 + 6 =$

$10 + 3 = 13$

Adding three numbers:

$6 + 2 + 4 =$

$6 + 2 + 4 = 12$

$6 + 5$

Example

$8 + 6 = 14$ $+2$ $+4$ $10 + 4 = 14$

$2 + 4$ 8 10 14

$9 + 3 =$ $+1$ $+2$ $10 + 2 = 12$

$1 + 2$ 9 10 12
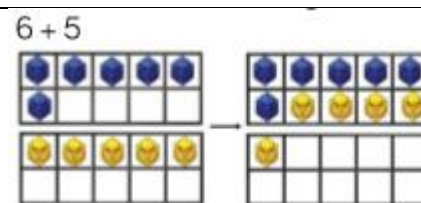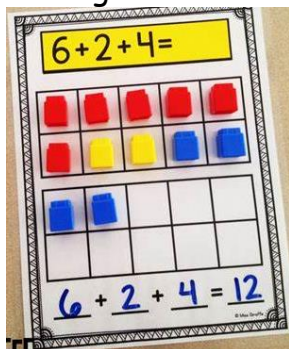
Use the bar model to represent addition:

10	
6	4
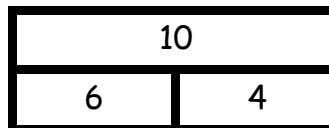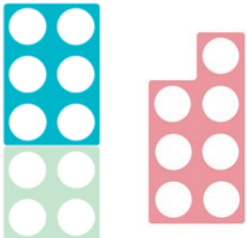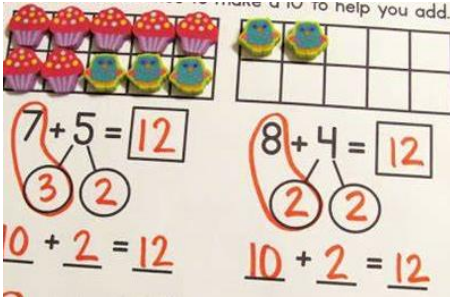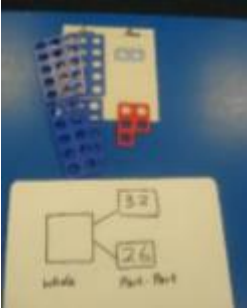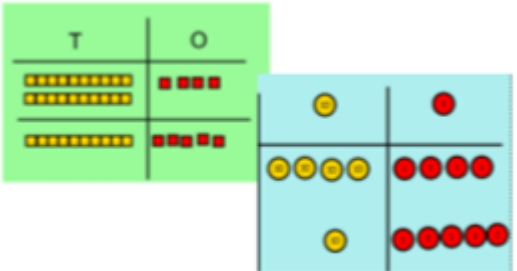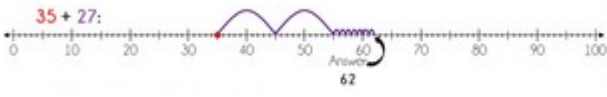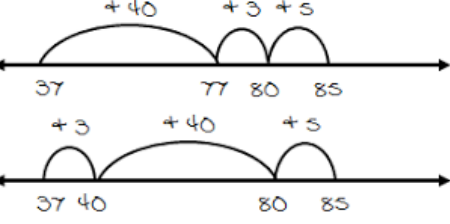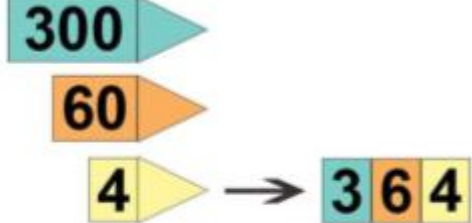
$6 + 4 = 10$
$4 + 6 = 10$
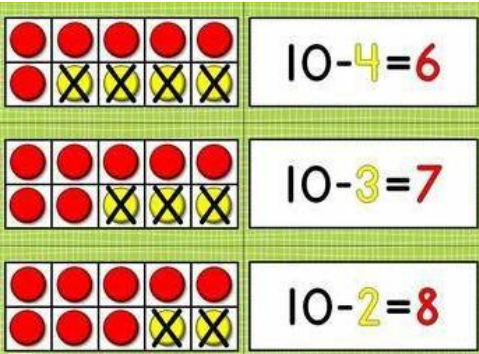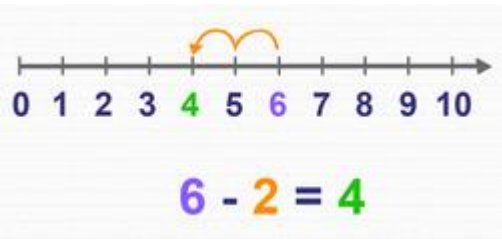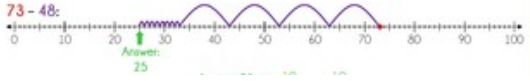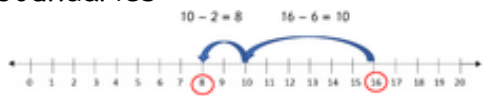
Adding three numbers:
$5 + 6 + 2 = 13$
$5 + 2 + 6 = ?$
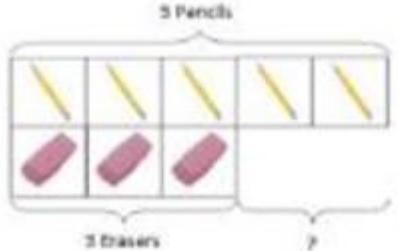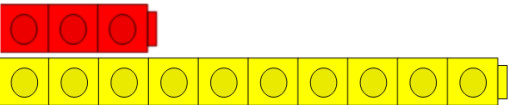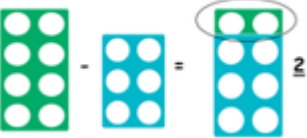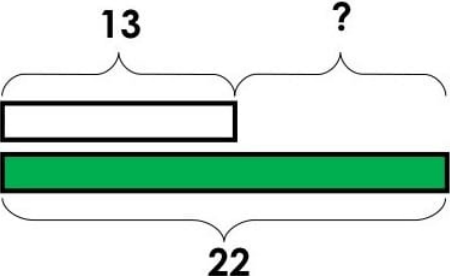
2	Adding three digits	 4 + 6 + 7 Put 4 and 6 together to make 10. Then add on 7. 	Add together three groups of objects. Draw a picture to recombine the groups to make 10. Symbols to represent missing numbers eg: ◯ + △ = 20	Combine the two numbers that make 10 and then add on the remainder.
2	Adding two 2 digit numbers up to 100	Use manipulatives to secure understanding of crossing the tens' boundaries. 24 + 15 =	Adding with dienes: Drawing ten sticks (lines) and ones (small circles). Using a number line:	Partition: 36 + 25= 30 + 20 = 50 5 + 5 = 10 50 + 10 + 1 = 61 1 5 EXAMPLE: 45+24=? 40+5 20+4 40 + 5 20 + 4 60 + 9=69 Or expanded method:

S. Wardle 2019
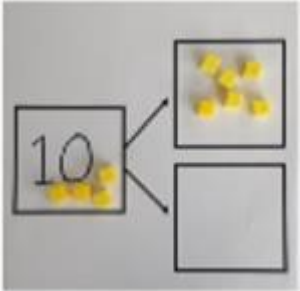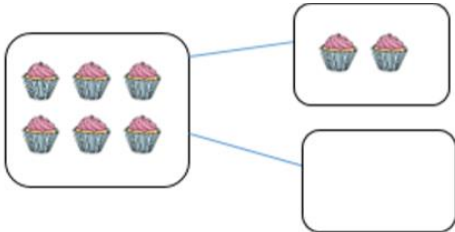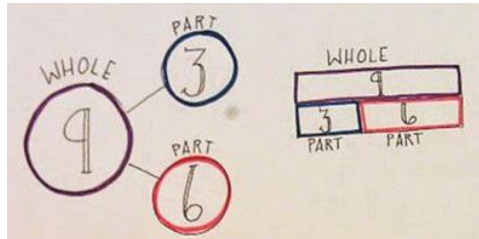
| | | Add together the ones first. Then, add the tens. Use Cuisenaire first before moving onto place value counters.

Develop to include regrouping. | 35 + 27:

Leading to:
37 + 48

+40 +3 +5

37 77 80 85

+3 +40 +5

37 40 80 85

Partitioning and recombining using arrow cards:

300
60
4 → 364 | 30 6 +
20 5
50 + 11 = 61

Calculate the value of an unknown in a number sentence:
30 - ? = 42

Partition numbers into T U, developing to H T U (support with arrow cards)
Eg:
379 = 300 + 70 + 9

Using the Expanded Method:
Adding TU + TU (including crossing ten)
HTU + U (ready to cross the tens boundary) |
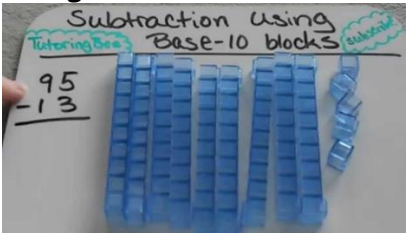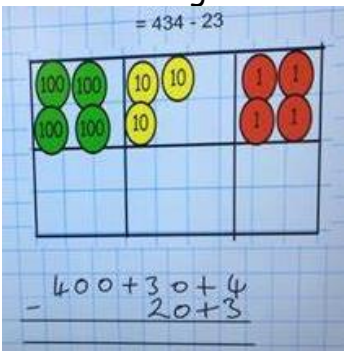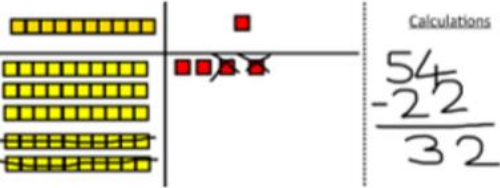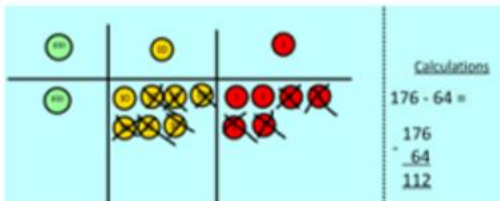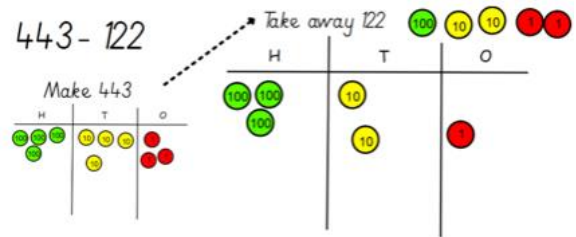
Yr	Subtraction Strategies	Concrete	Pictorial/Structural	Abstract
R/1	Taking away ones ELG: To know 1 more/1 less. Subtract 2 single digit numbers and count back to find the answer.	Use physical objects, counters, cubes etc to show how objects can be taken away. $6 - 2 = 4$ Using tens frames and counters:	Cross out drawn objects to show what has been taken away. 8 bees take away 3 bees makes 5 bees. $10 - 4 = 6$ $10 - 3 = 7$ $10 - 2 = 8$	$8 - 3 = 5$ $8 - 2 = 6$

| 1/2 | 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.

0 1 2 3 4 5 6 7 8 9 10

6 - 2 = 4

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.

73 – 48:
Answer: 25

Using partitioning to cross boundaries:
10 – 2 = 8   16 – 6 = 10

Put 13 in your head, count back 4. What number are you at? Use your fingers to help. | Subtract mentally using number bonds.

Explore empty boxes counting back:
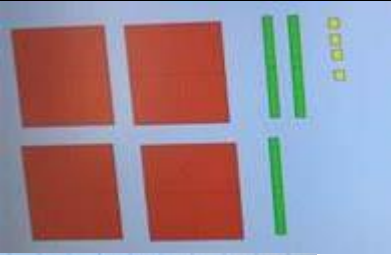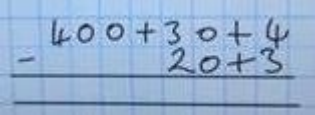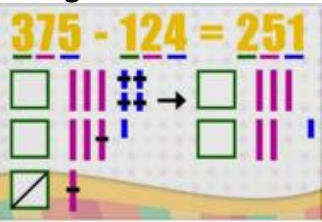
13 - ? = 9 |

| 1/2 | 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.

5 Pencils

3 Erasers ?

Use Numicon to find the difference.

 |

Use pictorial representations to find the difference.

What is the difference between 8 and 6?

Draw bars to find the difference between 2 numbers.

13   ?

22 | Solve problems involving finding the difference:

Hannah has 23 sandwiches. Helen has 15 sandwiches. Find the difference between the number of sandwiches.

Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between the sisters. |
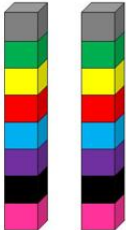
1/2	Part/Part Whole	Link to addition- use the part part whole model to help explain the inverse between addition and subtraction. If 10 is the whole and 6 is one of the parts. What is the other part? 10 – 6 =	Use pictorial representation of objects to show the part part whole model.	Move to using numbers within the part part whole model. 9 – 3 =
1/2	Making 10	14 – 9 = Make 14 on the ten frame. Take away the four first to make 10 and then take away 1 more so you have taken away 5. You are left with the answer of 9.	- 7 = Exchange ten into ones to model crossing the boundary.	16 – 8 = How many do we take off to reach the next 10? How many do we have left to take off?
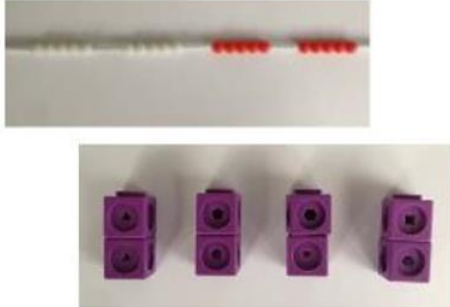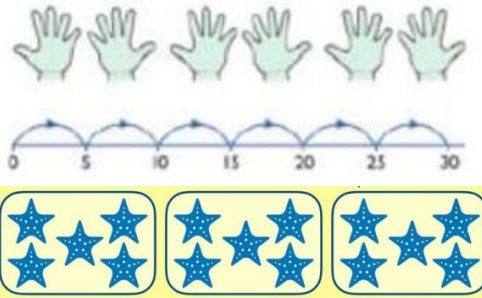
| 2/3 | Column method without grouping | Use Cuisenaire rods to make the bigger number then take the smaller number away. **Using Base 10:** Show how you partition numbers to subtract. Again make the larger number first. | Draw the Cuisenaire rods or place value counters alongside the written calculation to help to show working.   443 – 122 Make 443 400 40 3 – 100 20 2 300 20 1 = 321 **Using Base 10:** | Expanded column method to condensed. 47 – 23 = T   O   TO 40   7 -   47 - 20   3   23 20   4   24 |

400 + 30 + 4
−   20 + 3
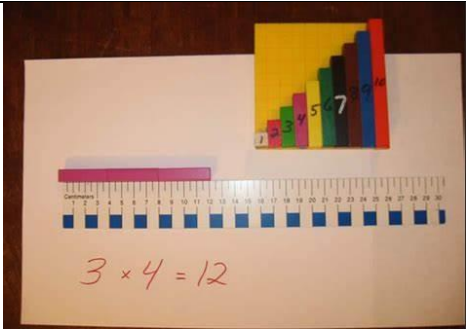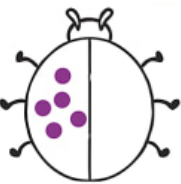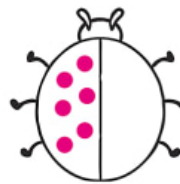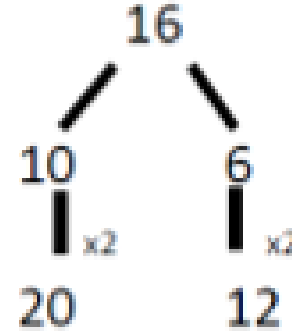
Using Place Value Blocks:

375 - 124 = 251

300 70 5 −
100 20 4
200 50 1
= 251
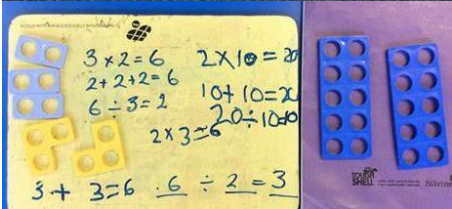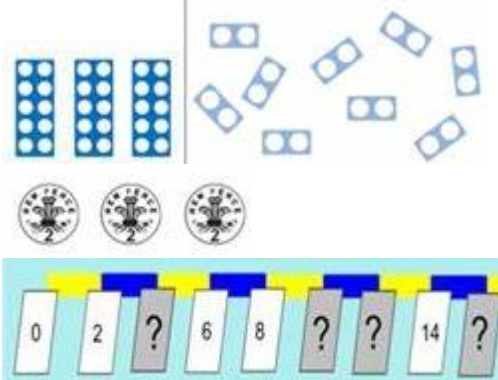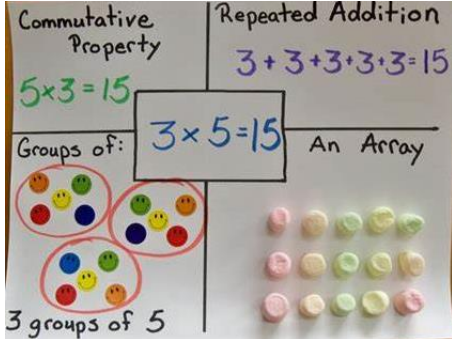
Yr	Multiplication Strategies	Concrete	Pictorial/Structural	Abstract
R	Doubling and finding lots of ELG: solve problems involving doubling and halving Tables: 2 and 10	Use practical activities to show how to double a number. Start off with a tower of 8 cubes Build a tower the same as the one you have already. How many do you have altogether now? What is double 8? Real life problems: One teddy has two buttons, how many buttons will we need for 3 teddies?	Draw pictures to show how to double a number. Double 4 is 8	Count in multiples of a number aloud using actions.

Clarendon Infant School Agreed Approach to Calculations
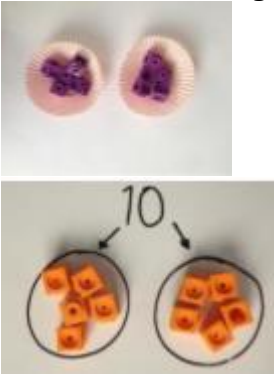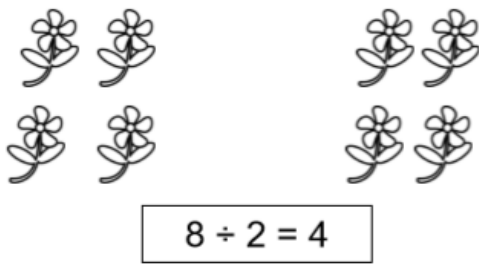
1	Counting in multiples	Count in multiples supported by concrete objects in equal groups. Adding equal groups.	Use a number line or pictures to continue to support in counting in multiples.	Write in sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 15, 30 Write addition sentences to describe objects and pictures.
				2 + 2 + 2 + 2 + 2 = 10
1	Repeated addition	Use different objects to add equal groups. 5 + 5 + 5 Using Cuisenaire, multilink, number tracks and bead strings:	Use pictures and number lines to show repeated addition: Explore the language of repeated addition: There are 5 pairs of socks on the washing line. 5 pairs of 2 = 10 5 2s = 10 2 + 2 + 2 + 2 + 2 = 10 2 x 5 = 10	Record in number sentences: 5 + 5 + 5 + 5 = 20 2 + 2 + 2 + 2 = 8

S. Wardle 2019
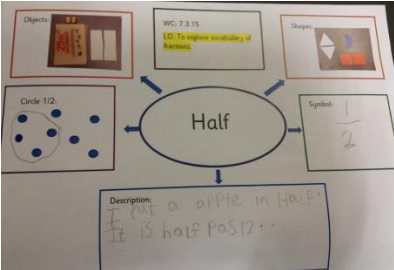
		$3 \times 4 = 12$	5 lots of 2 = 10 2 multiplied by 5 5 hops of 2 There are 10 altogether.	
1/2	Partitioning to double (pre-grid)	Use objects to model doubling ten and ones practically. $12 + 12 = 24$ double $12 = 24$	Use place value cards and Numicon to show: $10 \times 2 =$ $4 \times 2 =$ Double 5 is _____ Double 6 is _____	Partition a number and then double each part before recombining it back together.

2	Understanding multiplication	Use Numicon to model number sentences linking repeated addition and multiplication.	Use Numicon in pictorial form to model number sentences linking repeated addition and multiplication.	Link multiplication to doubling facts in numbers using equals as a balance. 4 x 5 = 10 _ 10 6 _ 5 = 15 + 15
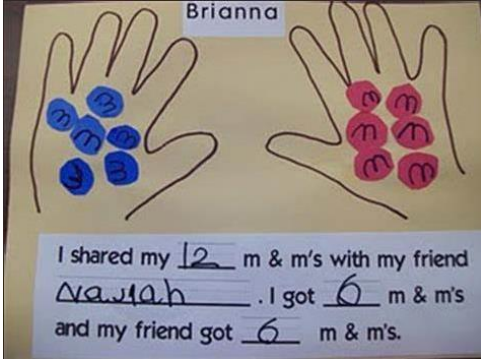
Yr	Division Strategies	Concrete	Pictorial/Structural	Abstract
R/1	Sharing objects into groups	Sharing objects equally into groups. 10 shared into 2 groups. 	Sharing pictures equally into groups. Children use pictures or shapes to share quantities. $8 \div 2 = 4$	Sharing amounts in numbers. 9 buns shared between three people: $9 \div 3 = 3$
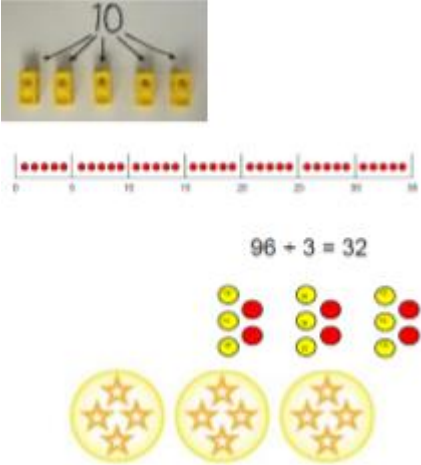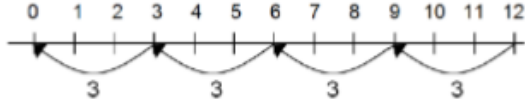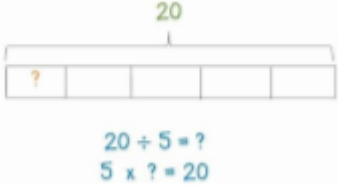
| R/1 | ELG: To solve problems using halving, doubling and sharing. | Children understand sharing and halving in <u>equal</u> groups practically.

 | Children understand sharing and halving in <u>equal</u> groups in pictures.

Half of 2 is

Half of 4 is

 | Children can record and begin to explain the link between doubling and halving facts.

8 ÷ 2 = 4
4 x 2 = 8 |
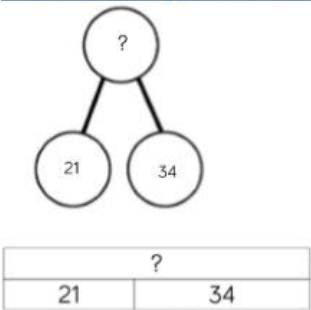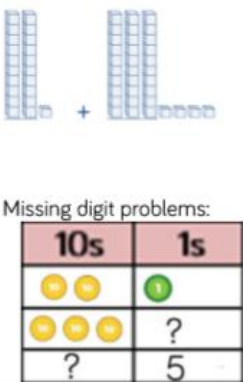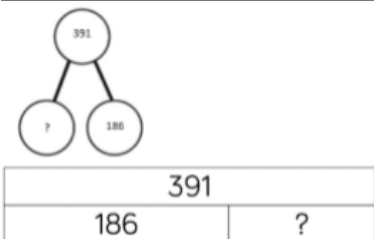
1/2	Division as sharing	Practical division (as grouping) of buttons, wheels etc. to see how many, for example cars, can be constructed. Focusing on equal groups/lots of 4 wheels per car.	Children become confident with the image of sharing:	Children explain there are 15 eggs shared with 5 people. 15 ÷ 5 = 3
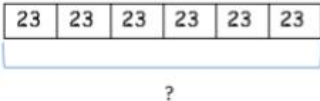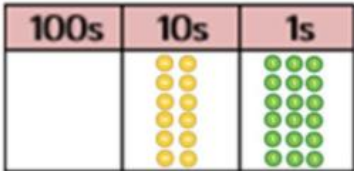
1/2	Division as grouping	Divide quantities into equal groups. Use cubes, counters, objects, Numicon, Cuisenaire, place value counters or bead strings to aid understanding. $96 \div 3 = 32$	Use a number line to show jumps in groups. The number of jumps equals the number of groups. Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group. $20 \div 5 = ?$ $5 \times ? = 20$	$28 \div 7 = 4$ Divide 28 into 7 groups. How many are in each group

Clarendon Infant School Agreed Approach to Calculations

To ensure the children gain fluency and competence with each operation, we will provide them with a wide range of procedural and conceptual variation questions that will strengthen and develop the depth of each child's understanding of each method and process.

Examples of Conceptual Variation Ideas for Each Operation:

Addition:	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 $$21 + 34 =$$ $$\boxed{} = 21 + 34$$ Calculate the sum of twenty-one and thirty-four. Missing digit problems: | 10s	1s | 21 $+34$

Subtraction:	Conceptual variation; different ways to ask children to solve 391 - 186
	Raj spent £391, Timmy spent £186. How much more did Raj spend? Calculate the difference between 391 and 186. $$\boxed{} = 391 - 186$$ $$391$$ $$-186$$ What is 186 less than 391? Missing digit calculations $$3\ 9\ \boxed{}$$ $$-\ \boxed{}\ \boxed{}\ 6$$ $$\boxed{}\ 0\ 5$$

S. Wardle 2019

Multiplication:	Conceptual variation; different ways to ask children to solve 6 × 23
	23 23 23 23 23 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 $6 \times 23 =$ $\boxed{} = 6 \times 23$ $\begin{array}{c} 6 \\ \times\ 23 \\ \hline \end{array} \quad \begin{array}{c} 23 \\ \times\ 6 \\ \hline \end{array}$
	What is the calculation? What is the product? 100s 10s 1s

Division:	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? 615 → 500, 100, 15
	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?
	$5\,\overline{)615}$ $615 \div 5 =$ $\boxed{} = 615 \div 5$
	What is the calculation? What is the answer? 100s 10s 1s