Sacred Heart R.C. Primary School

‘Christ is the centre of our lives’

Hearts that believe
Hearts that achieve
Hearts that inspire

CALCULATION POLICY

JANUARY 2020

SACRED HEART PRIMARY SCHOOL

CALCULATION POLICY

FLUENCY

Fluency covers retrieval of 'facts' from memory. This includes being fluent in recalling number bonds spanning addition and subtraction with numbers to 20, multiplication up to 12x12, and associated division facts. Being fluent in basic number calculations is strongly correlated with later mathematical success. Being mathematically fluent also involves choosing methods and procedures and working flexibly. The children need to learn, practise and reason with these facts on a daily basis. The facts will be learnt systematically using our progression in fluency ladders.

Fluency ladder 1

1. Adding and subtracting 1 (e.g. 7 + 1, 1 + 7 and 8-1)
2. Doubles and halves of numbers to 5 (e.g. 4 + 4 and ½ of 4)
3. Adding and subtracting 2 (e.g. 4 + 2, 2 + 4, and 6-2)
4. Number bonds to 10 (e.g. 8 + 2 , 2 + 8, 10-2 and 10-8)
5. Adding and subtracting 10 to or from a number (e.g. 5 + 10, 10 + 5 and 15-10)
6. Adding and subtracting 0 to or from a number (e.g. 3 + 0, 0 + 3 and 3-0)
7. Near doubles (e.g. 3 + 4 *and* 4 + 3)
8. The ones without a family! 5 + 3, 3 + 5, 6 + 3, 3 + 6, 8-5, 8-3, 9-3, 9-6

Whilst learning and using these facts the children should be practising partitioning all numbers up to 10.

Fluency ladder 2

1. Doubles and halves of numbers to 10 (e.g. 7 + 7)
2. Near doubles (e.g. 5 + 6 *and* 6 +5)
3. Bridging (e.g. 8 + 4 *and* 4 + 8)
4. Compensating (e.g. add or subtract 8, 9, 11 or 12 by adding or subtracting 10 and adjusting accordingly)

Fluency ladder 3

1. Number bonds to 100 (e.g. 73+27)
2. Near doubles (within 100)
3. Bridging (within 100) (e.g. 56+27 = 56+4+23)
4. Compensating (within 100) (e.g. 64+29 = 64+30-1)
5. Bridging with larger numbers
6. Compensating with larger numbers.

ADDITION

Understanding =

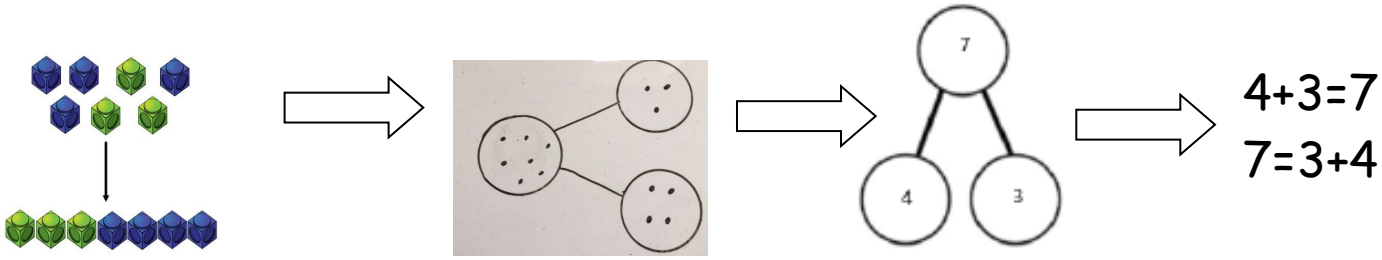
Children need to understand the concept of equality before using the '=' sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as 'the answer'.

2 = 1 + 1
2 + 3 = 4 + 1

3 = 3
2 + 2 + 2 = 4 + 2

Counting Objects

Children should have access to a wide range of counting equipment and everyday objects, as well as hoops, sorting trays, number tracks and numbered number lines.

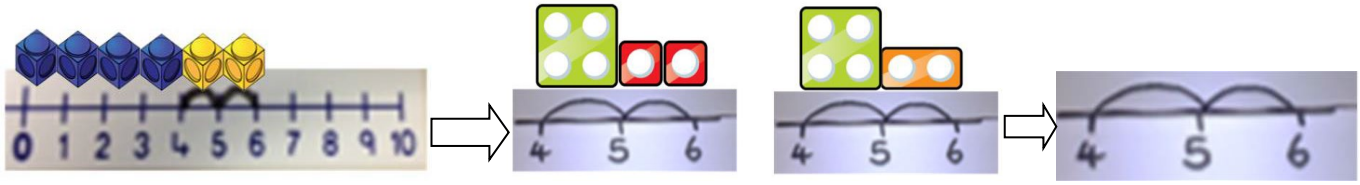


Using number bond facts

Children should learn their number bonds to 5, 10 and then to 20. They should learn these in several different forms (e.g. 9+1=10; 10-1=9; 1=10-9 then 19+1=20; 20-1=19; 1=20-19).

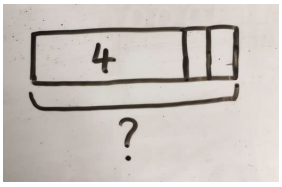
Using Number Lines to count on

The concrete number line using cubes or numicon moving into 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



Bar modelling

A bar model which encourages the children to count on, rather than count all.



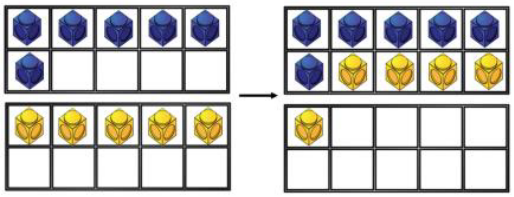
9	
5	?

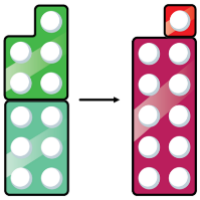
9=5+ ☐

Regrouping to make 10

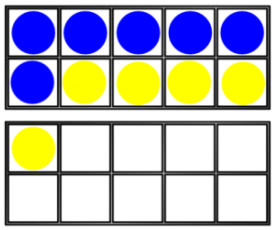
Using ten frames and use counters/cubes or using Numicon.

6+5



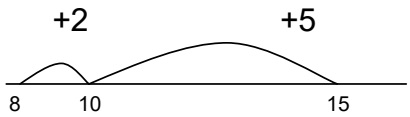


Children use the ten frame and draw their own counters/cubes.



Using Number Lines to bridge through ten.

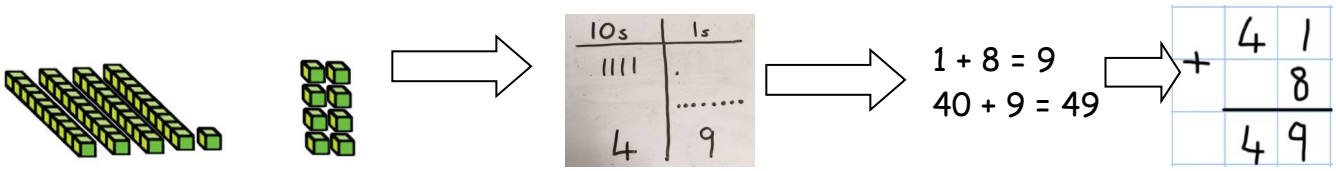
8 + 7 = 15



Partitioning and Recombining

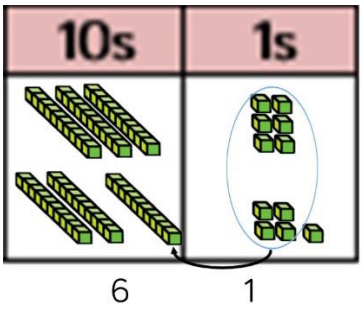
Continue to develop understanding of partitioning and place value.

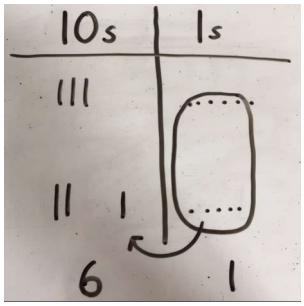
41 + 8



Column Addition

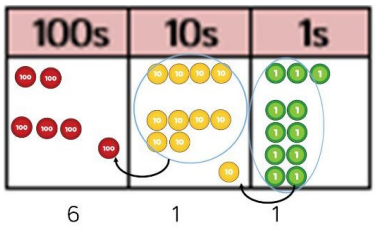
TO + TO 36 + 25

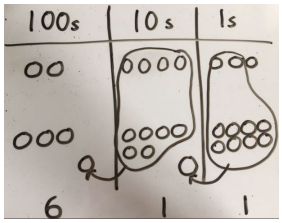




$$\begin{array}{r} 36 \\ +25 \\ \hline 61 \\ \hline 1 \end{array}$$

HTO + HTO 243+368 When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred. Children circle when they make an exchange.



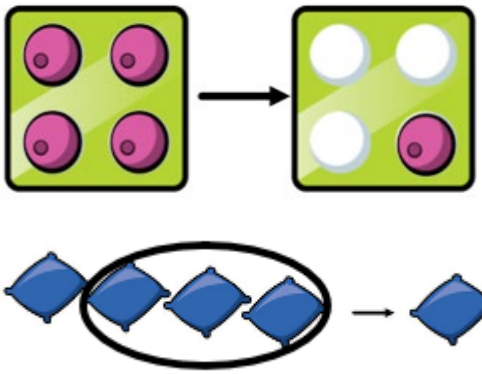


$$\begin{array}{r} 243 \\ +368 \\ \hline 611 \\ \hline 1\ 1 \end{array}$$

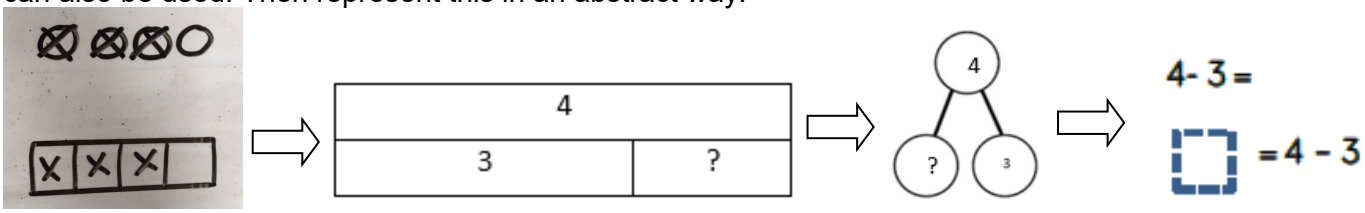
SUBTRACTION

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

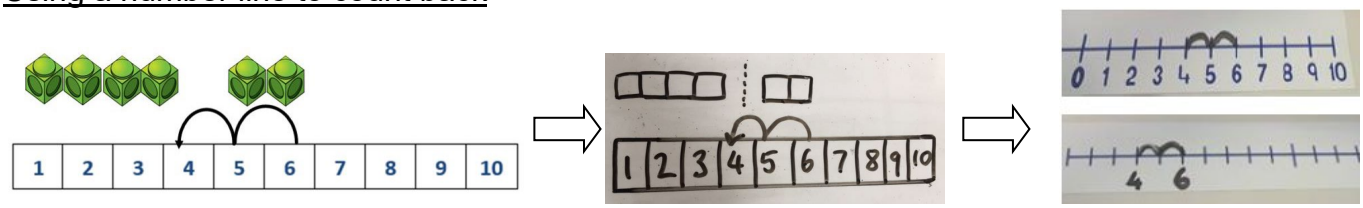
Physically taking away and removing objects from a whole



Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used. Then represent this in an abstract way.

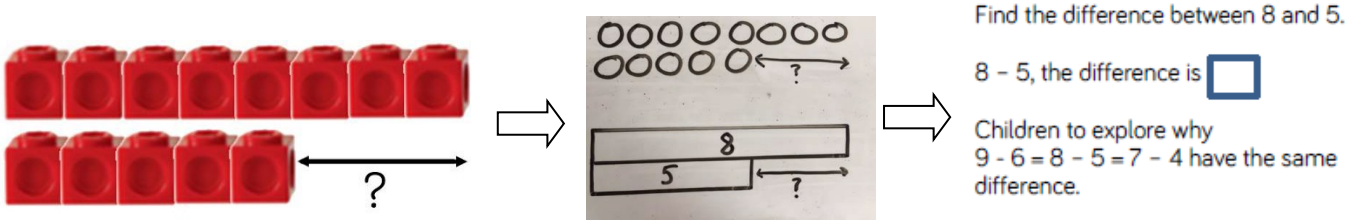


Using a number line to count back



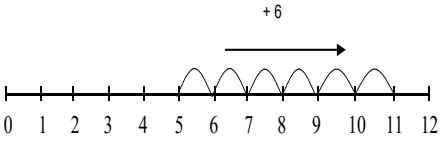
Finding the difference

Calculate the difference between 8 and 5.



Using a number line to count on

I have saved 5p. The socks that I want to buy cost 11p. How much more do I need in order to buy the socks?

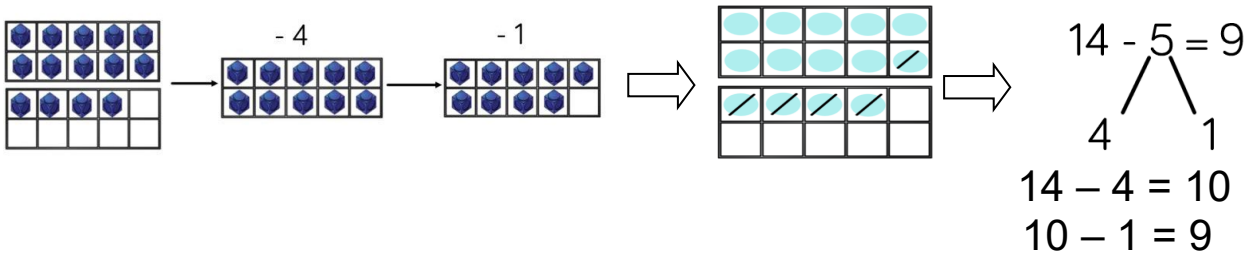


Subtraction as the inverse of addition

If 15+3=18 then 18-3 must be 15.

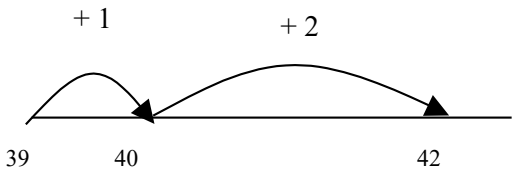
Bridging 10

14-5

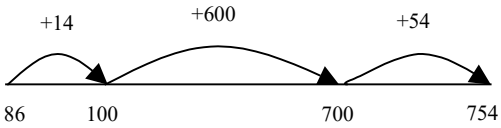


Count up to the nearest multiple of ten on a blank number line

42 – 39

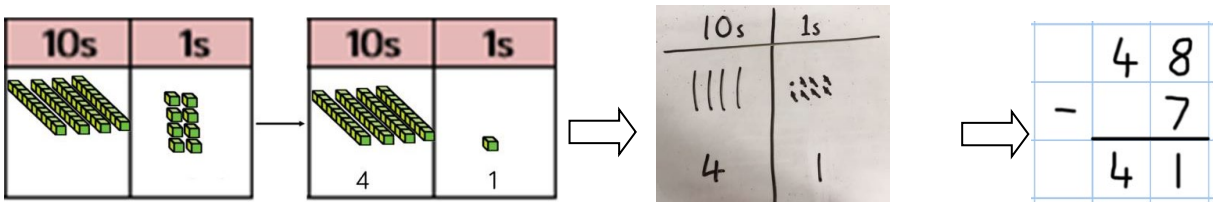


754 - 86

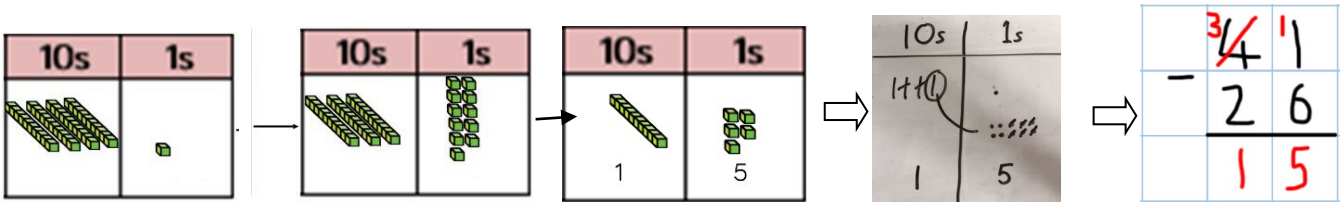


Column Subtraction

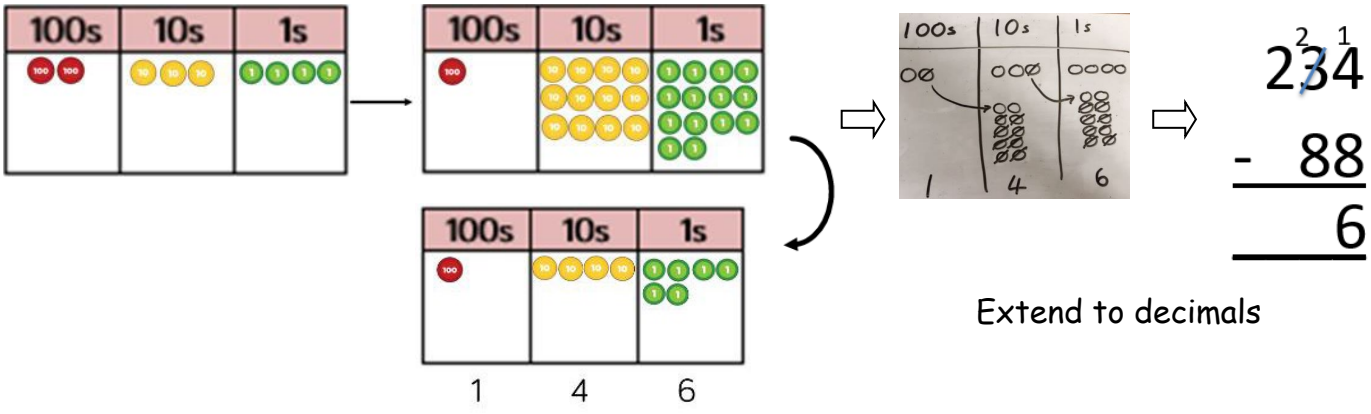
48-7



41 – 26



234 – 88

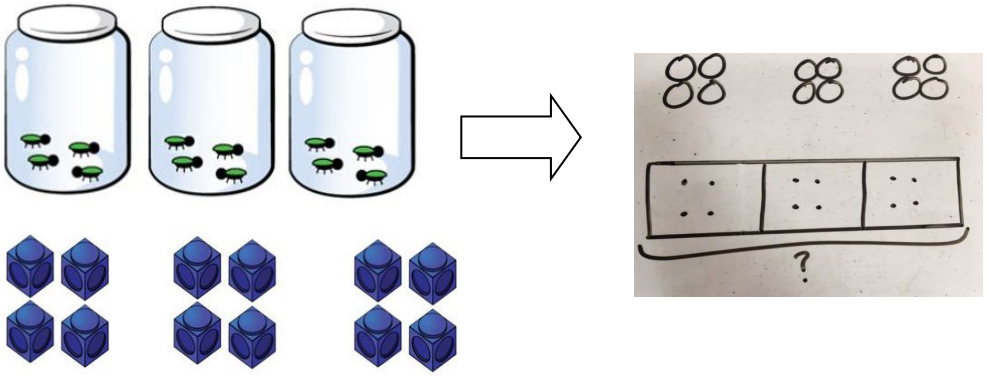


Extend to decimals

MULTIPLICATION

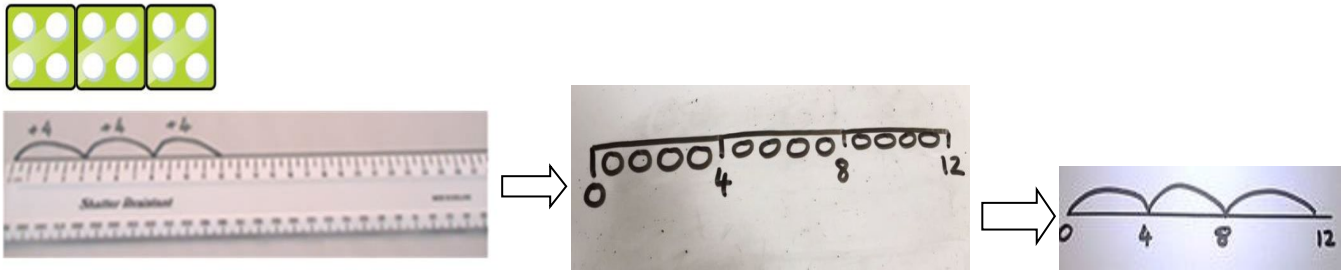
Repeated grouping/repeated addition

3 × 4
4 + 4 + 4
There are 3 equal groups, with 4 in each group.



Number lines to show repeated groups

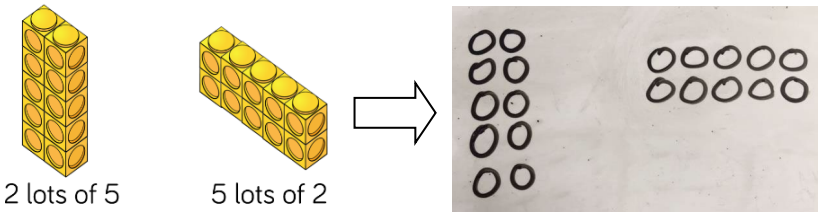
3 × 4



Arrays

Use arrays to illustrate commutativity counters and other objects can also be used.

2 × 5 = 5 × 2



10 = 2 × 5
5 × 2 = 10
2 + 2 + 2 + 2 + 2 = 10
10 = 5 + 5

Bar modelling

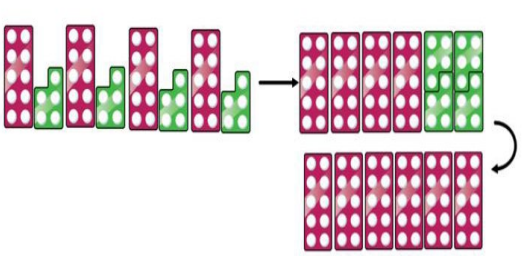
?			
5	5	5	5

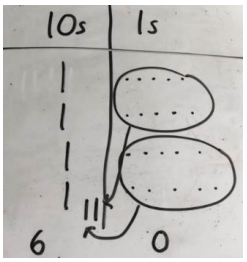
4x5=☐ 5+5+5+5=?

Partition to multiply

Use Numicon, base 10 or Cuisenaire rods.

4 × 15





Children to be encouraged to show the steps they have taken.

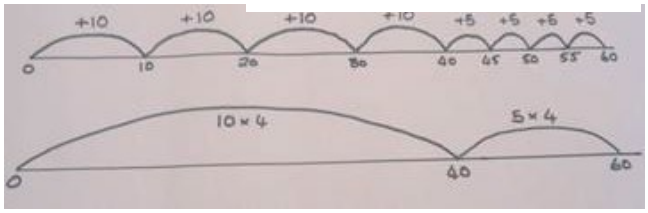
4 × 15

10 5

10 × 4 = 40

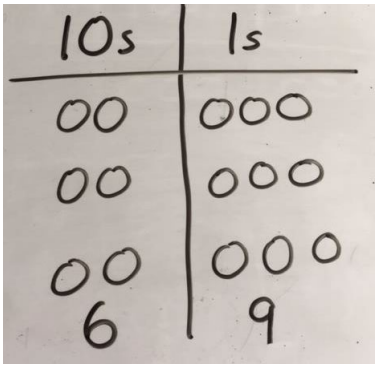
5 × 4 = 20

40 + 20 = 60



Column Multiplication

23x3



3 × 23

20 3

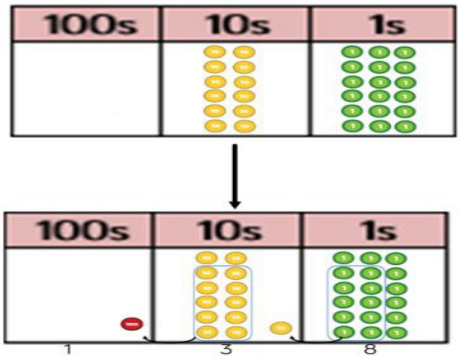
3 × 20 = 60

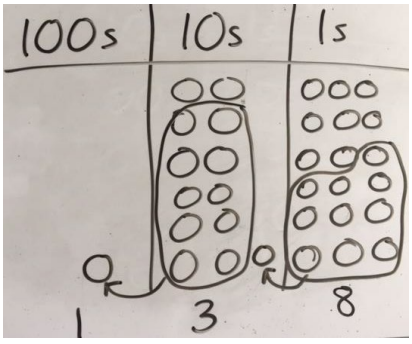
3 x 3 = 9

60 + 9 = 69

$$\begin{array}{r} 23 \\ \times\ 3 \\ \hline 69 \\ \hline \end{array}$$

6x23





6 x 23 =

$$\begin{array}{r} 23 \\ \times\ 6 \\ \hline 138 \\ \hline 1\ 1 \end{array}$$

$$\begin{array}{r} 38 \\ \times\ 7 \\ \hline 56 \\ 210 \\ \hline 266 \end{array}$$

Leading to

$$\begin{array}{r} {\scriptstyle 5} \\ 38 \\ \times\ 7 \\ \hline 266 \end{array}$$

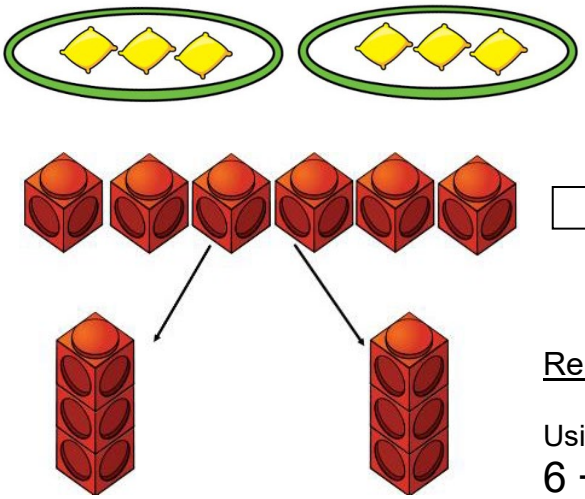
$$\begin{array}{r} {\scriptstyle 1\ 2} \\ 124 \\ \times\ 26 \\ \hline 744 \\ 2480 \\ \hline 3224 \\ {\scriptstyle 1\ 1} \end{array}$$

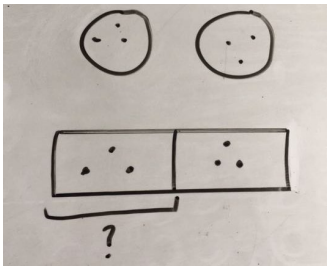
DIVISION

Children need to understand the concept of sharing and grouping using objects in hoops, purses etc.

Sharing using a range of objects.

6 ÷ 2



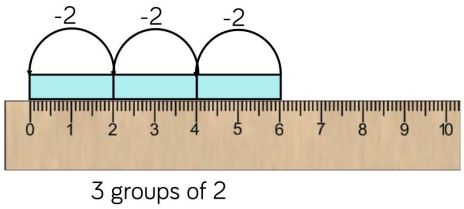


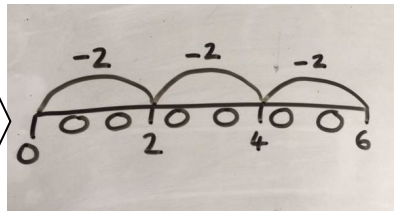
6	
3	3

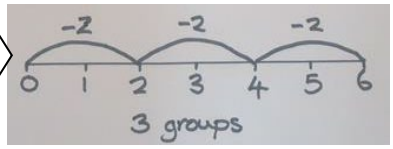
Repeated subtraction

Using Cuisenaire rods above a ruler.

6 ÷ 2







Bar modelling

20÷5= ☐

20				

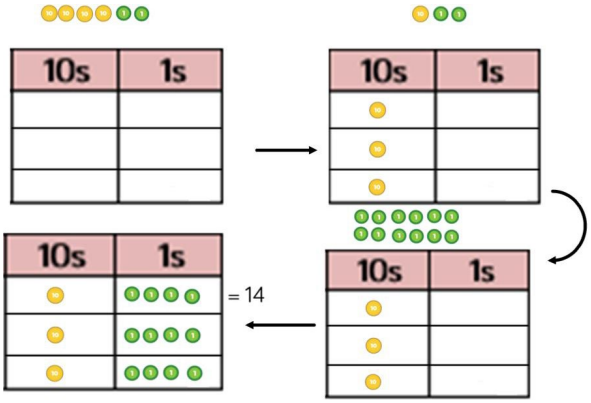
20				
4	4	4	4	4

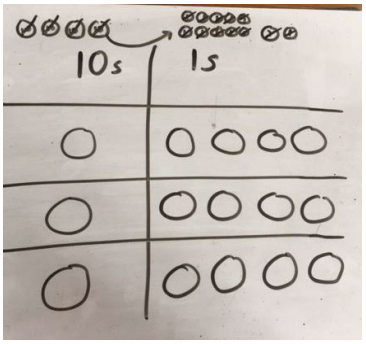
Division as the inverse to multiplication

If I know 8 x 6 = 48, then 48 ÷ 8 = 6

Sharing using place value counters.

42 ÷ 3 = 14



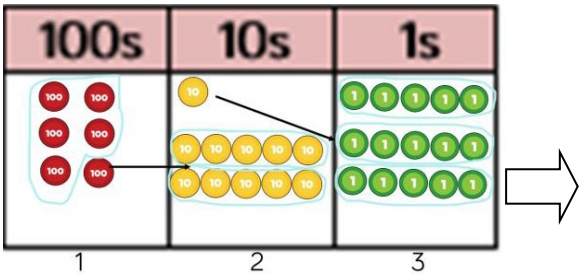


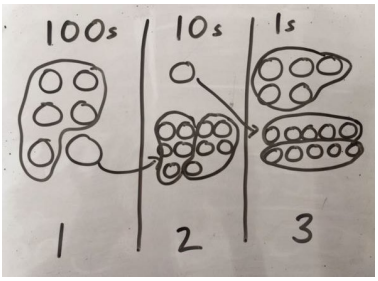
42 ÷ 3
42 = 30 + 12
30 ÷ 3 = 10
12 ÷ 3 = 4
10 + 4 = 14

Short division

Using place value counters to group.

615 ÷ 5





$$5\overline{)615} = 123$$

1. Make 615 with place value counters.
2. How many groups of 5 hundreds can you make with 6 hundred counters?
3. Exchange 1 hundred for 10 tens.
4. How many groups of 5 tens can you make with 11 ten counters?
5. Exchange 1 ten for 10 ones.
6. How many groups of 5 ones can you make with 15 ones?

Extend to remainders and decimal places

$$3\overline{)5\ ^{2}6\ ^{2}7} = 1\ 8\ 9$$

$$12\overline{)38^{2}7} = 3\ 2\ \text{r}\ 3$$

Answer 32 ¼

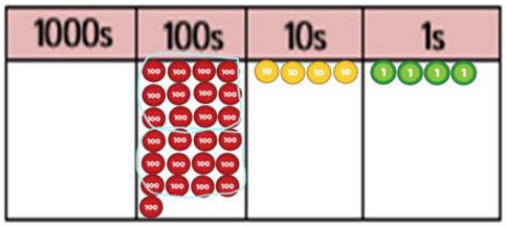
$$15\overline{)53^{8}1.^{6}0} = 3\ 5\ .\ 4$$

Long Division

Using place value counters

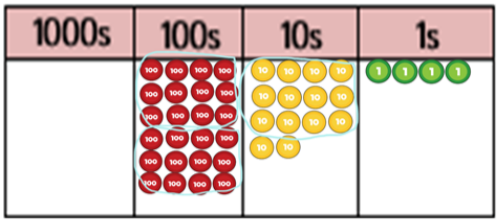
2544 12

We cannot group 2 thousands into groups of 12 so will exchange them.



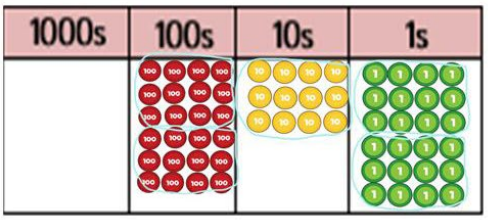
We have 25 hundreds. We can group 24 of them into 2 groups of 12, which leaves 1 hundred.

$$\begin{array}{r} 02 \\ 12\overline{)2544} \\ 24 \\ \hline 1 \end{array}$$



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

$$\begin{array}{r} 021 \\ 12\overline{)2544} \\ 24 \\ \hline 14 \\ 12 \\ \hline 2 \end{array}$$



After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 groups of 12, which leaves no remainder.

12

The ces

43

$$\begin{array}{r} 28\cdot8 \\ 15\overline{)432\cdot0} \\ 30 \\ \hline 132 \\ 120 \\ \hline 120 \\ 120 \\ \hline 0 \end{array}$$

Answer: 28·8

OVERVIEW

	Addition	Subtraction	Multiplication	Division
EYFS/ Year 1	Children need to understand the concept of equality. Combining 2 part to make a whole. Regrouping to make 10.	Taking away ones. Counting back Find the difference Part whole model Bridging 10 using the ten frame.	Repeated addition and repeated grouping. Doubling Counting in multiples.	Sharing objects into groups. Division as grouping.
Year 2	Partitioning and recombining. Adding 3 single digits. Column method (2 digit numbers)	Counting back Find the difference. Bridging 10 Use of base 10 to support column method.	Arrays - show commutative multiplication.	Division as grouping. Division within arrays (inverse of multiplication) Repeated subtraction
Year 3	Column method (3 digit numbers)	Column method (3 digit numbers)	Arrays to show commutativity. Partitioning to multiply leading to written method.	Division with a remainder. 2digit numbers divided by 1 digit numbers using base 10 and place value counters.
Year 4	Column method (4 digit numbers)	Column method (4 digit numbers)	Column multiplication (2 and 3 digit multiplied by 1 digit).	Division with a remainder. Short division (3 digit numbers by 1 digit concrete and pictorial)
Year 5	Column method (5 digit numbers and decimal numbers)	Column method (Decimal numbers)	Column multiplication (4 digit multiplied by 1 or 2 digit numbers).	Short division (4 digit numbers divided by 1 digit including remainders.)
Year 6	Column method (larger numbers decimal numbers)	Column method (differing amounts of decimal places)	Column multiplication (4 digit multiplied by 2 digit numbers).	Short division Long division with place value counters (4 digit numbers by 2 digit numbers including exchanging into tenths and hundredths column))

POLICY REVIEW

This policy was approved by governors at a meeting of the full Governing Body on the 15th January 2020 and will be reviewed every three years unless there are any changes.

Date of Review: January 2023