THE QUEENSWELL FEDERATION

CALCULATION POLICY

Policy Written by: Spencer Clayton

Date Written: February 2021

Date for Review: 2025

Addition and Subtraction

EYFS F1	EYFS F2	Year 1	Year 2
Children have some concept of number and numerals and their relation to quantity. They explore mathematics through a range of open-ended and natural resources and use these to demonstrate their understanding of number, shape, space and measures.	Children have a secure understanding of numerals and their relation to quantity. They confidently use maths throughout their play (e.g. using money in their role play; measuring when building or counting to measure time). They are able to make use of mathematical concepts to solve problems, including during sustained shared thinking with others.	Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs Represent and use number bonds and related subtraction facts within 20 Add and subtract one-digit and two-digit numbers to 20, including zero	Solve problems with addition and subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measures Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: - a two-digit number and ones - a two-digit number and tens - two two-digit numbers - adding three one-digit numbers

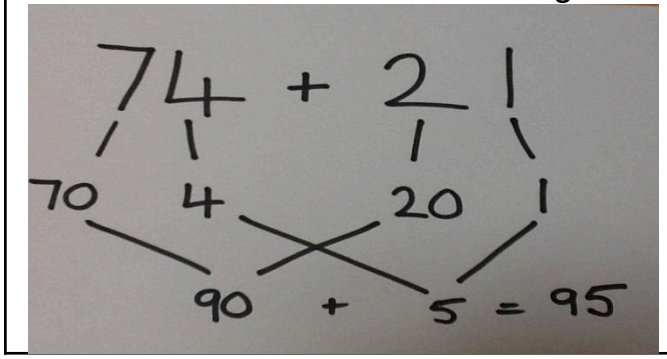
Year 3	Year 4	Year 5	Year 6
Add and subtract numbers mentally, including: a three-digit number and ones a three-digit number and tens a three-digit number and hundreds Add and subtract numbers with up to 3 digits using formal written methods of column addition and subtraction	Add and subtract numbers with up to 4 digits using the formal written methods of column addition and subtraction	Add and subtract numbers mentally with increasingly large numbers Add and subtract whole numbers with more than 4 digits, including using formal written methods Adding and subtracting decimal numbers up to three decimal places	Add and subtract whole numbers with more than 4 digits, including using formal written methods Adding and subtracting decimal numbers up to three decimal places

Addition

Key language: more, increase, jump on, count on, add, altogether, sum, total, parts and wholes**,** 'is equal to', 'is the same as,' 'is balanced', partition, exchange, commutative, inverse, estimate, formal written method

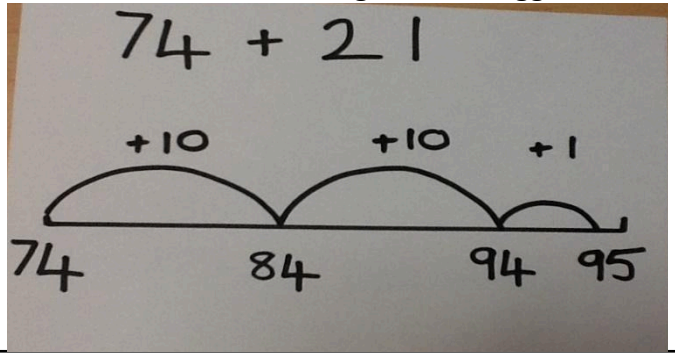
Developing mental strategies for addition: children should be taught all methods and encouraged to choose the method which is most appropriate for the calculation/ they feel most comfortable using

Partitioning



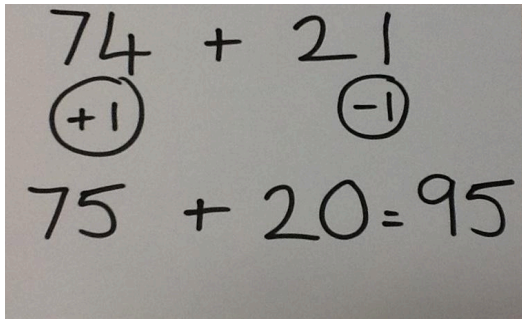
Children partition using jottings or mentally and then add ones and tens (and hundreds and thousands)

Counting on from biggest number



Children to start with biggest number and partition smallest so they can jump in multiples of 10 and then 1s

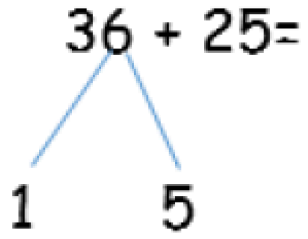
Compensating



This method is about recognising near multiples of ten and requires understanding that 2 numbers can be partitioned and added in any order

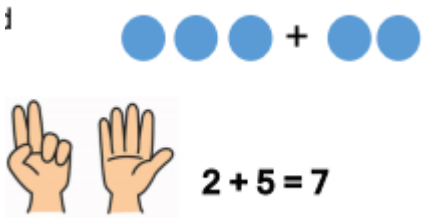
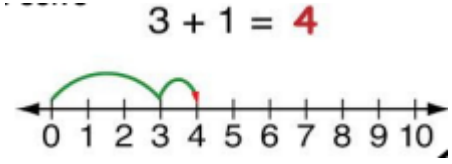
74 + 21 = 70 + 4 + 20 + 1

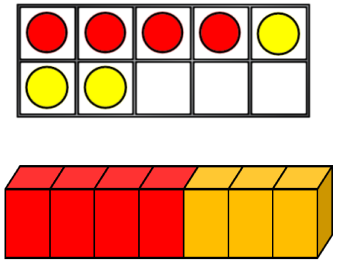
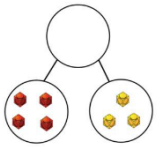
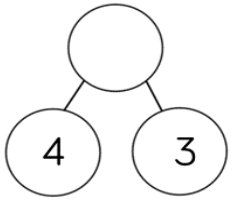
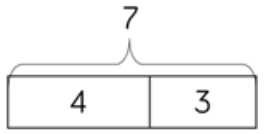
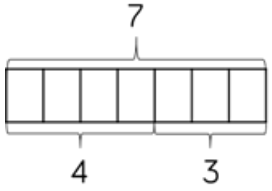
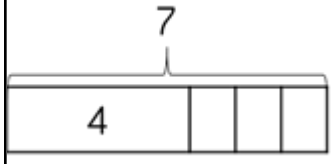
Looking for ways to make 10.

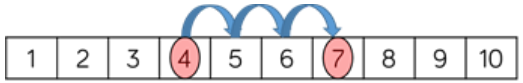
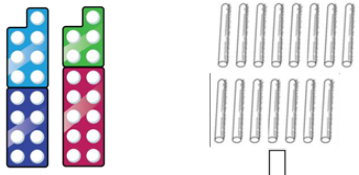
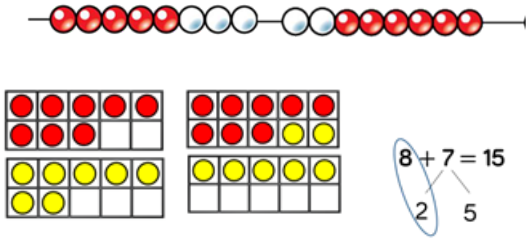
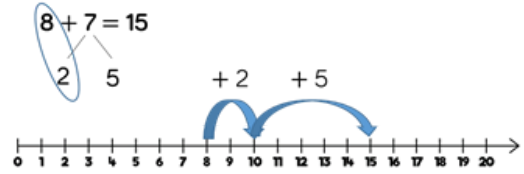
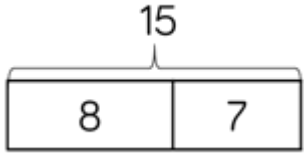


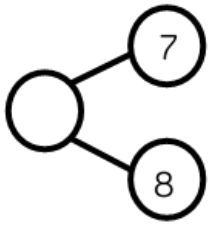
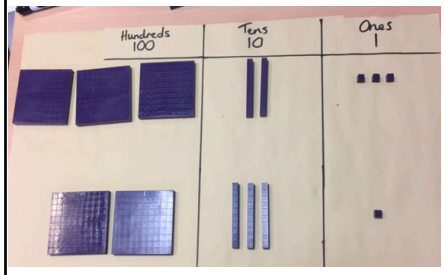
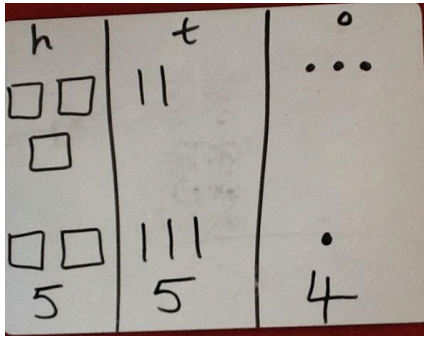
30 + 20 = 50
5 + 5 = 10
50 + 10 + 1 = 61

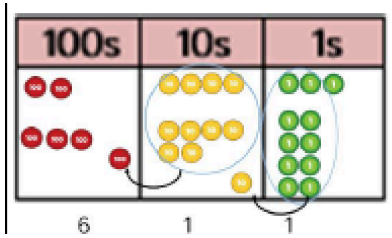
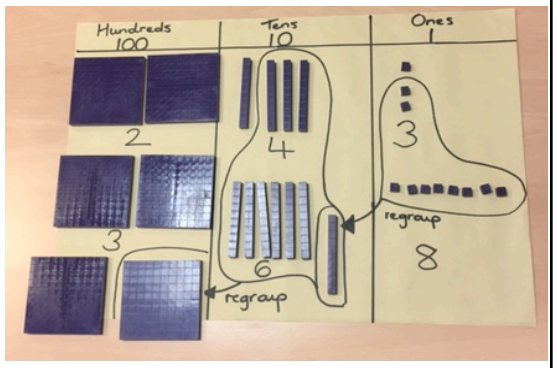
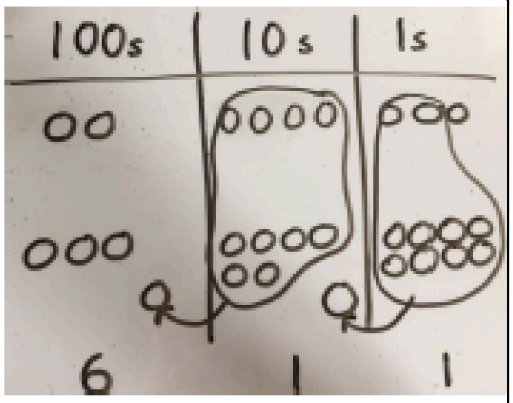
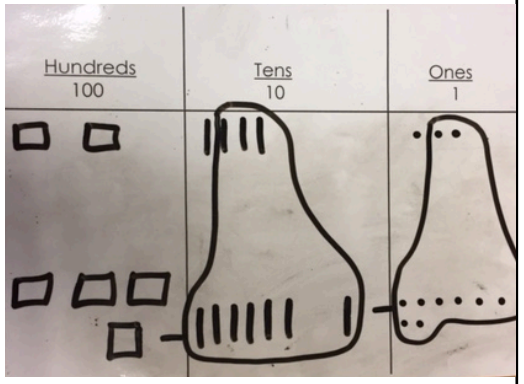
Written methods for addition:

	Concrete	Pictorial	Abstract
EYFS	 		Number lines can be used alongside practical resources to solve addition calculations. Children can 'jump' or 'count on'. 

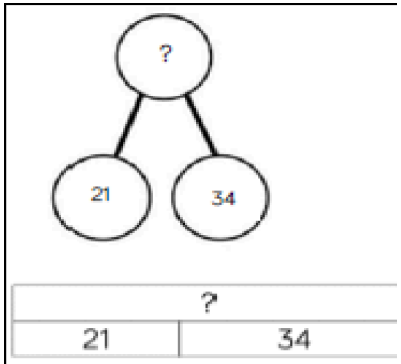
	  Children understand what 'more' means and can show one more using concrete resources. Children begin to combine groups of objects or pictures and use concrete resources.		
Adding 1 digit numbers (within 10)	  	    	4 + 3 = 7 3 + 4 = 7 Children should be able to recognise that addition is commutative and the meaning of = 7 = 3 + 4

	 When exploring adding numbers to 10 children can explore aggregation (combining 2 or more quantities) and augmentation (increasing a quantity by another quantity)	  The part – whole model, bar model, number shapes and ten frame support aggregation. The combination bar model, ten frame, bead string and number track all support augmentation.	7= 4 + 3
Adding 1 and 2 digit numbers (crossing 10)	 	Use concrete resources alongside number lines to support children in how to partition jumps.  	8 + 7 = 15 For adding 2 digit numbers in Year 2, children use partitioning into 10s and 1s rather than the formal written method. This is supported by concrete resources/ pictures. 12 + 18 =30 10 + 2 + 10 + 8 =30

	When adding one digit numbers that cross tens, it is important to highlight the importance of 10 ones equalling one ten. Different manipulatives can be used to represent this exchange.		
Formal written method without having to exchange. Year 5 and 6 use Dienes and place value counters for decimal numbers	Add together the ones first and then the tens, hundreds etc Start with Dienes, straws or place value counters 323 + 231 = 	Children to represent Dienes in a place value chart 	Children might still want to label their place value columns to help H T O 3 2 3 + 2 3 1 5 5 4

Column method – having to exchange Year 5 and 6 use Dienes and place value counters for decimal numbers	Physically exchanging ones for tens/ tens for hundreds etc 243 + 368 = Use of place value counters or Dienes to show HTO + TO and then HTO + HTO   	Children to represent numbers in a place value chart, circling when they make an exchange   	Expanded method to aid understanding. Children should be adding from the right (starting with ones) and initially writing the calculations for ones tens and hundreds alongside) 243 + 368 11 (8 + 3) 100 (60 + 40) 500 (300 + 200) 611 Regrouping recorded in the correct place value column (above the numbers) HTO 1 1 243 + 368 611

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?

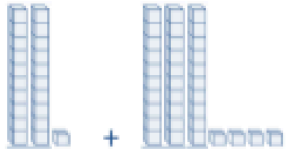
21 + 34 = 55. Prove it

21
+34
___

21 + 34 =

☐ = 21 + 34

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



Missing digit problems:

10s	1s
10 10	1
10 10 10	?
?	5

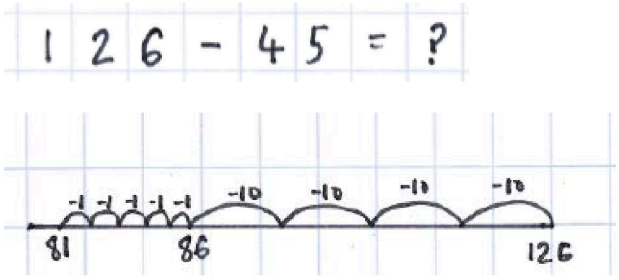
Subtraction

Key language: less, subtract, take away, fewer, difference, minus, decrease, exchange, inverse, estimate, formal written method

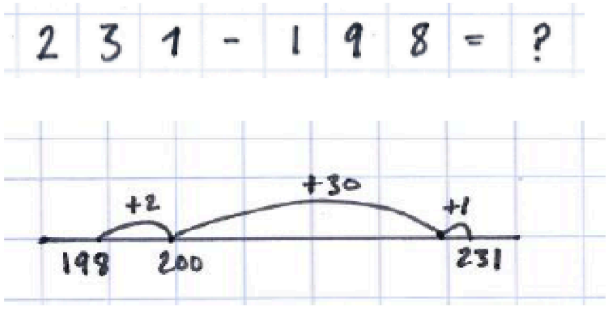
Developing mental strategies: children should be taught all methods and encouraged to choose the method which is most appropriate for the calculation/ they feel most comfortable using

Counting back from largest number on a number line

The jumps are recorded above the representation. Subtracting tens before moving onto ones.



Finding the difference (bridging through 10) by counting on from the smallest number

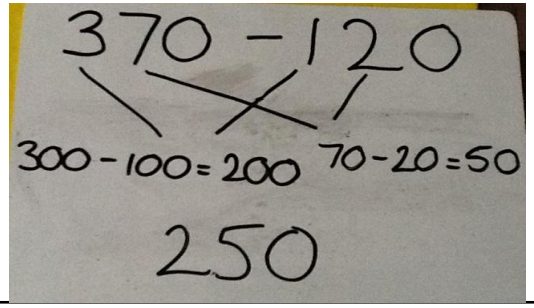


The first jump should be to the next multiple of ten followed by counting in multiples of ten before adding any remaining ones.

Another strategy would be to count in tens first and then ones.

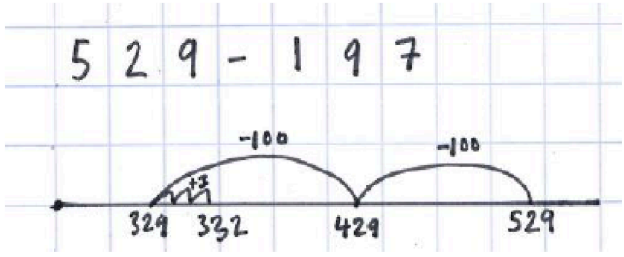
370 – 120 =

Partitioning



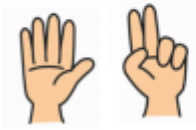
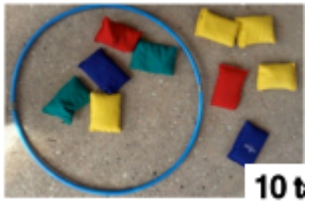
Children might recognise that numbers are near multiples of 10 or 100. They can count back and then count on the difference
529 – 197

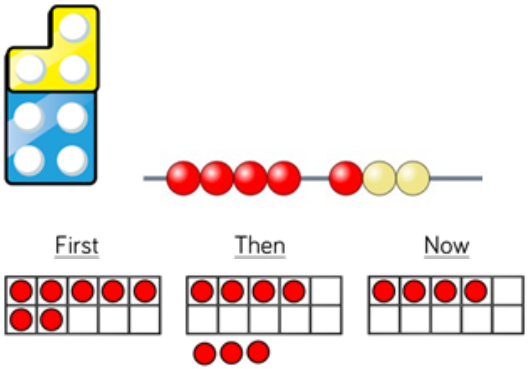
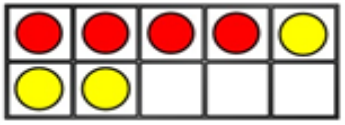
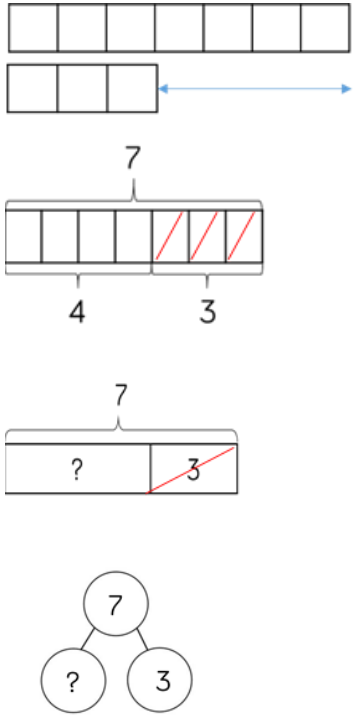
Compensating

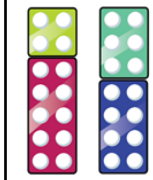
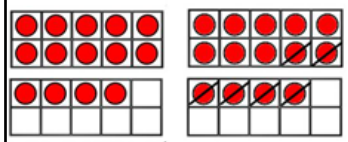
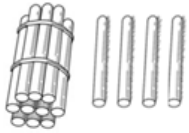
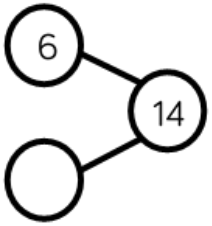
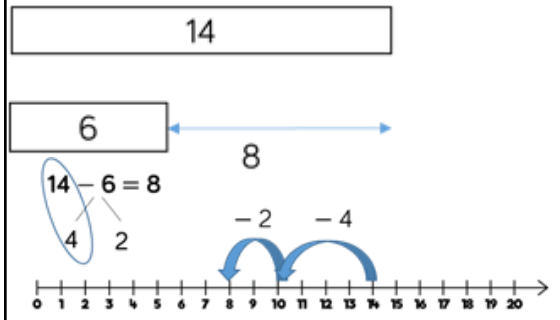


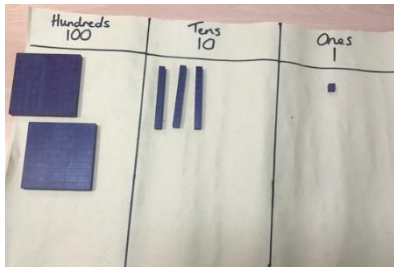
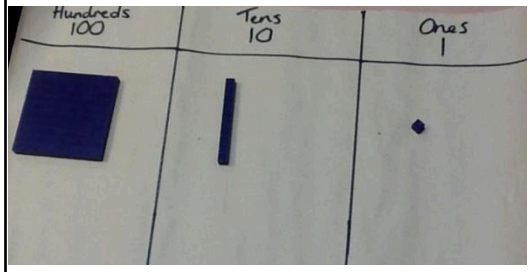
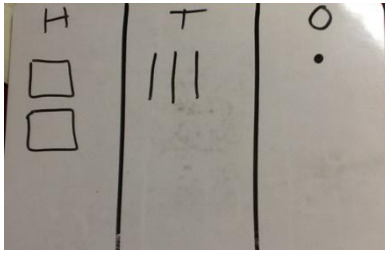
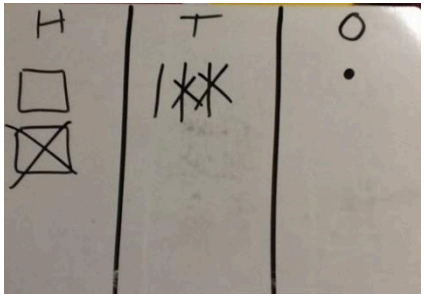
	529 – 200 (+3)

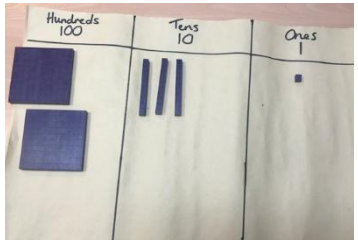
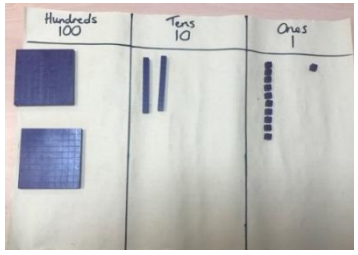
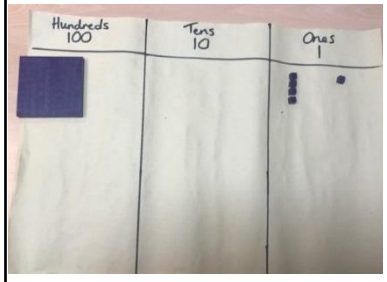
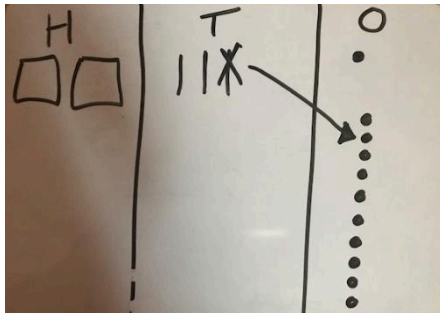
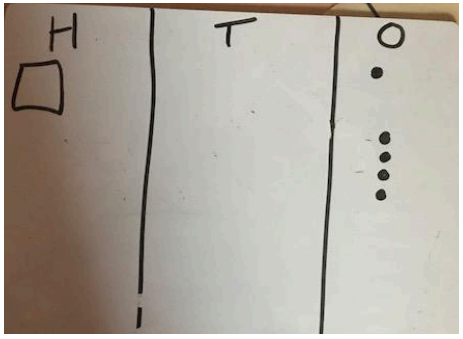
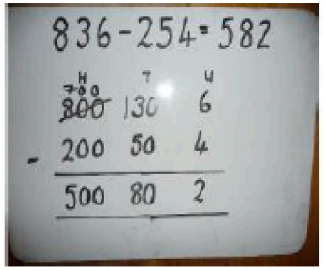
Written methods for subtraction:

	Concrete	Pictorial	Abstract
EYFS	    Children begin to use objects, pictures and concrete resources to relate subtraction to taking away and counting how many objects.		Number lines can be used alongside practical apparatus to solve calculations and 'jump back'. 

Subtract 1 digit numbers within 10	  Ten frames and number shapes support partitioning. Ten frames and bead strings support reduction. Cubes can support finding the difference.	 Part-whole models and bar models support partitioning and number tracks and number lines support reduction and finding the difference.	7 – 4 = 3 7 – 3 = 4 Children should be able to write calculations to show each part subtracted from the total. 3 = 7 – 4 4 = 7 - 3

Subtracting 1 and 2 digit numbers to 20	    When subtracting 1 digit numbers that cross 10, it is important to highlight the importance of 10 ones equally 1 ten.	   Children should be encouraged to find the number bond to 10 when partitioning the subtracted number.	14 – 6 = 8 14 – 8 = 6 Children should be able to write calculations to show each part subtracted from the total.
Formal written method for subtraction with no exchange.	Children can use Dienes to make larger number	Children represent Dienes pictorially. 231 – 120 =	Children can start column subtraction by partitioning their

Year 5 and 6 use Dienes and place value counters to represent decimal numbers.	231 – 120 =  They then physically take the smaller number away starting with the ones  	 They can cross/ rub out to take away ones first and then tens  	numbers into place value columns 200 + 30 + 1 - 100 + 20 + 0 100 + 10 + 1 = 111 Formal written method: Get children at first to clearly label tens and ones. Always start by subtracting ones. H T O 2 3 1 - 1 2 0 1 1 1

Column subtraction having to exchange	231 – 126 = Start by partitioning 231  Exchange one ten for ten ones  Subtract the ones and then the tens and hundreds by removing them  	Represent Dienes pictorially remembering to show exchange 231 – 126 =   Cross or rub out 126 starting with the ones	 Children can start their formal written method by partitioning the number into clear place value columns. Formal written method. Get children to label place value columns and make sure they cross out numbers when exchanging and write new number above H T O 2 1 2 3 1

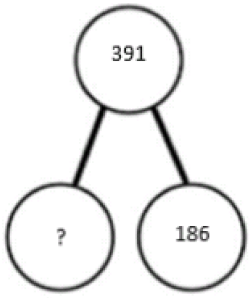
Children can start their formal written method by partitioning the number into clear place value columns.

Formal written method. Get children to label place value columns and make sure they cross out numbers when exchanging and write new number above

H T O
2 1
2 3 1

			- 1 2 6 1 0 5

Conceptual variation: different ways to ask children to solve 391 – 186

 ?	aj spent £391, Timmy spent £186. ow much more did Raj spend? alculate the difference between 391 and 86.	□ = 391 – 186 391 -186 What is 186 less than 391?	Missing digit calculations 3 9 □ - □ □ 6 □ 0 5

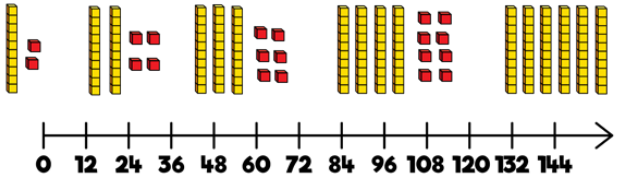
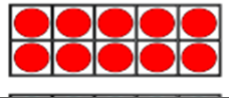
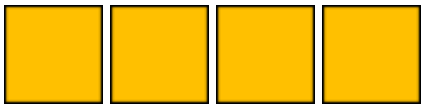
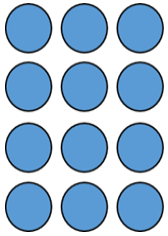
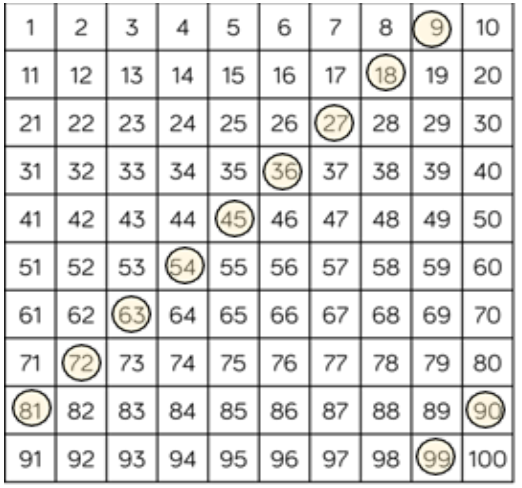
Multiplication and Division

EYFS	Year 1	Year 2
Solve multiplication problems set in a real life context and solve through counting.	Solve one-step problems involving multiplication and division, by calculating the	Recall and use multiplication and division facts for the 2,5 and 10 times tables.

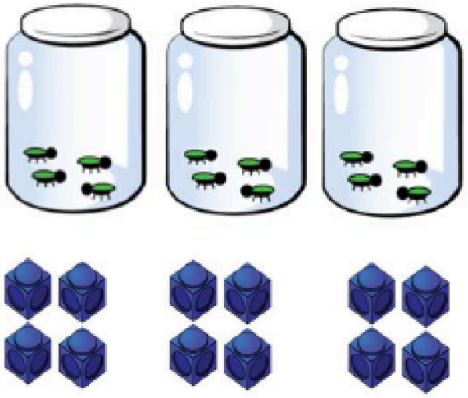
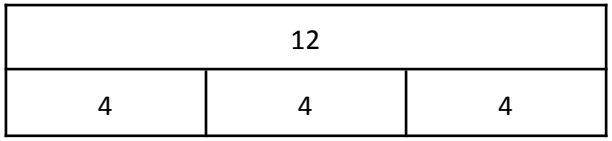
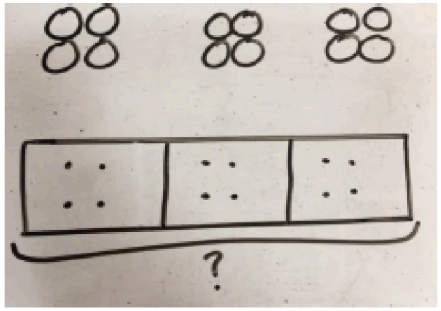
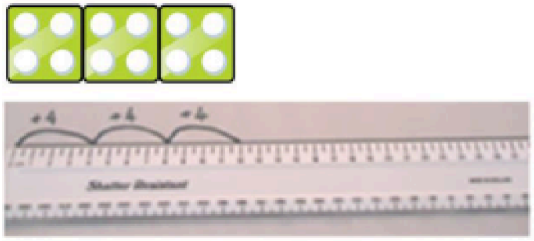
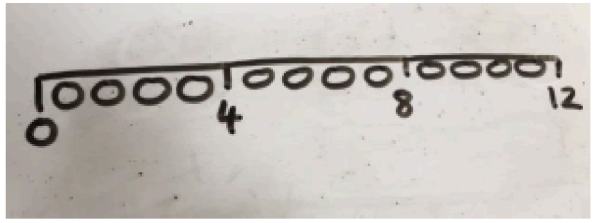
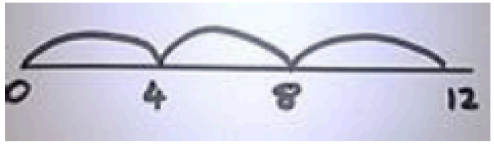
Children are introduced to doubling facts Halving by sharing into 2 groups	answer using concrete objects, pictorial representations and arrays with the support of the teacher.	Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs	
Year 3	Year 4	Year 5	Year 6
Recall and use multiplication and division facts for the 3, 4 and 8 times tables. Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods	Recall and use multiplication and division facts for the 6, 7, 9, 11 and 12 times tables. Multiply two-digit and three-digit numbers by a one-digit number using formal written layout	Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context	Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context.

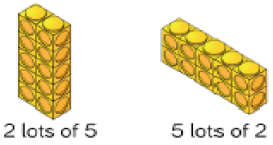
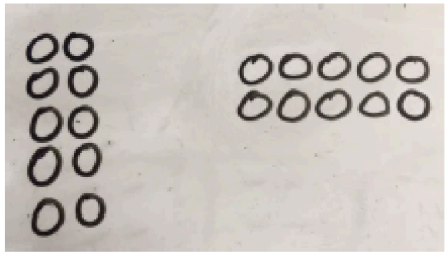
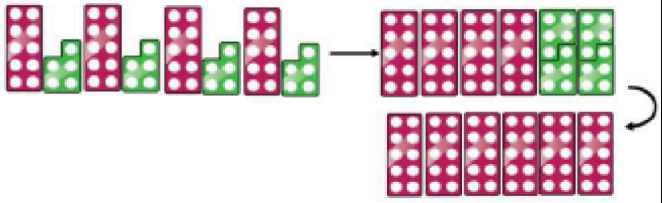
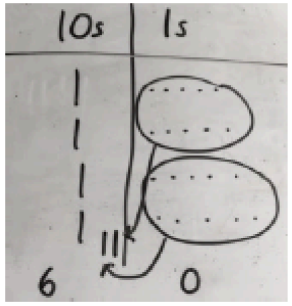
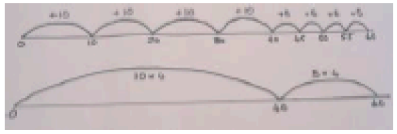
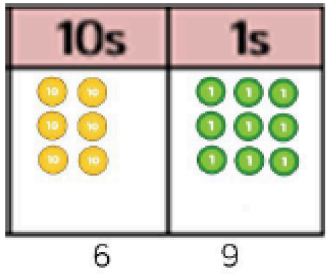
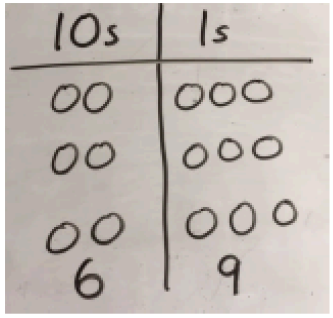
Multiplication

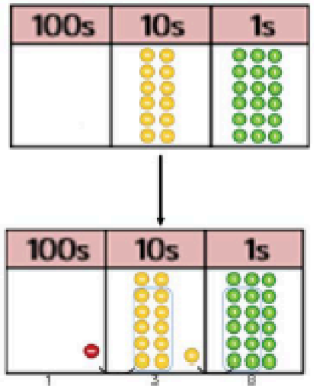
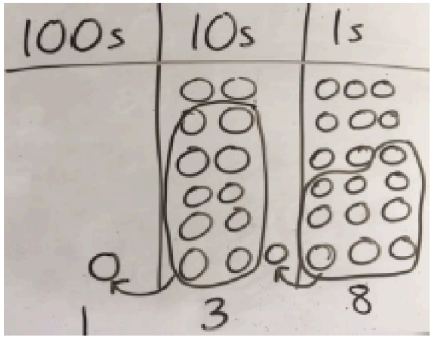
Key language: repeated addition, multiply, double, times, multiplied by, equal groups, lots of, multiple, factor, product, formal written method, array, commutative, scaling

	Concrete	Pictorial	Abstract
Times tables (Year 2 – 6)	    	   8 16 24  Use arrays to show that multiplication is commutative and the link between multiplication and division. Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line.	 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 | 6 | 12 | 18 | 24 | 30 | | 36 | 42 | 48 | 54 | 60 | | 66 | 72 | | | | Looking for patterns in multiples and making links between the different times tables.

EYFS	Children begin with mostly pictorial representations.  **How many groups of 2 are there? 3 groups of 2 = 6**  The link between addition and multiplication can be made through doubling and reinforced through repeated addition of the same number 2. Real equipment to count in repeated groups of the same size  **How many wheels are there altogether?**	

Repeated addition/ grouping	3×4 $4 + 4 + 4$ There are 3 equal groups, with 4 in each group. 	 Children to represent the practical resources in a picture and use a bar model. 	$3 \times 4 = 12$ $4 + 4 + 4 = 12$
Repeated addition on a number line	**Number lines to show repeated groups-** 3×4  Cuisenaire rods can be used too.	Represent this pictorially alongside a number line e.g.:  	Abstract number line showing three jump of four. $3 \times 4 = 12$ 

Arrays	$2 \times 5 = 5 \times 2$  Use arrays to show commutivity. Counters and other resources can also be used.	Children to represent the arrays pictorially. 	Children to be able to use an array to write range of calculations e.g. $10 = 2 \times 5$ $5 \times 2 = 10$ $2 + 2 + 2 + 2 + 2 = 10$ $10 = 5 + 5$
Partitioning	Partition to multiply using number shapes, Dienes or Cuisenaire rods 4×15 	Children to represent the concrete manipulatives pictorially.  	Children to be encouraged to show the ste they have taken. 4×15 $10 \quad 5$ $10 \times 4 = 40$ $5 \times 4 = 20$ $40 + 20 = 60$ A number line can also be used 
Column method	Use place value counters, Dienes or number shapes to show lots of in place value columsn 23 x 3 = 69  	Children to represent concrete manipulatives pictorially  	Children to record what it is they are doing to show understanding. 3×23 $20 \quad 3$ $3 \times 20 = 60$ $3 \times 3 = 9$ $60 + 9 = 69$ $23 \times 3 = 69$

<table>
<tr>
<td>Formal written method</td>
<td>Formal column method with place value counters.
6 x 23
 
</td>
<td>Children to represent the counters/base 10, pictorially e.g. the image below.
 
</td>
<td>6 x 23

2 3
X 6
1 8 (6 x 3)
1 2 0 (6 X 20)
+ 1 3 8

1
2 3
X 6
1 3 8

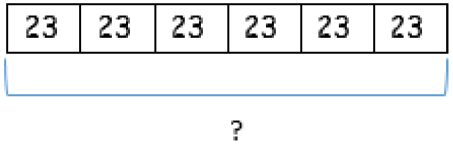
If numbers are carried over into next column then this is shown above in correct place value column.</td>
</tr>
<tr>
<td colspan="3">When children start to multiply 3 digit x 3 digit and 4 digit x 2 digit etc, they should be confident with the abstract and have clear steps to follow:

To get 744 children have solved 6 × 124.
To get 2480 they have solved 20 × 124.</td>
<td>124 x 26

~~1~~ ~~2~~
1 2 4
X 2 6
7 4 4
2 4 8 0
3 3 2 4
1 1

Children should record any exchanges above in the correct column and then when they have moved onto the next column should cross out ny numbers they no longer need.</td>
</tr>
</table>

Conceptual Variation; different ways to ask children how to solve 6 x 23

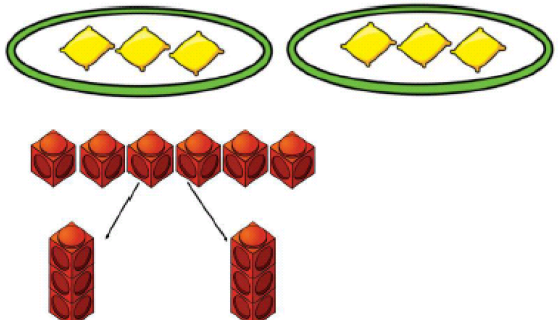
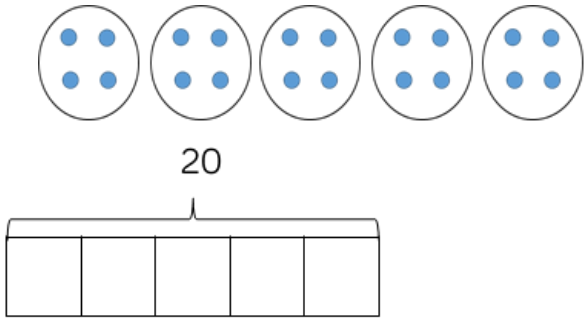
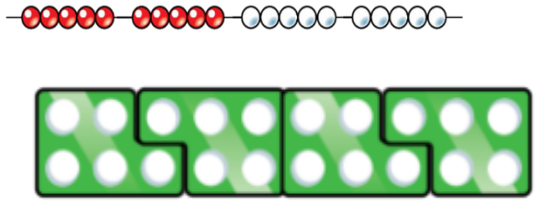
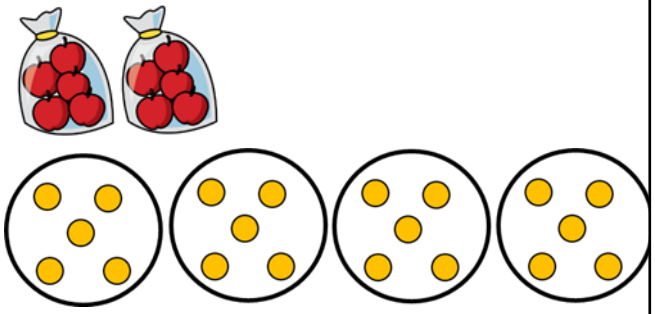
	Mai had to swim 23 lengths, 6 times a week. How many lengths did she swim in one week? With the counters, prove that 6 x 23 = 138	Find the product of 6 and 23 6 × 23 = ☐ = 6 × 23 6 × 23 = ____ 23 × 6 = ____	What is the calculation? What is the product? 

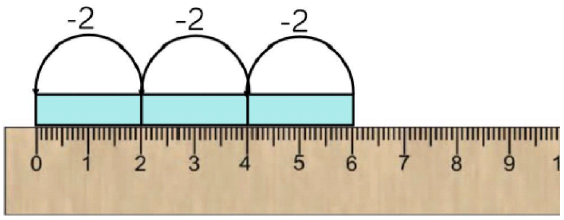
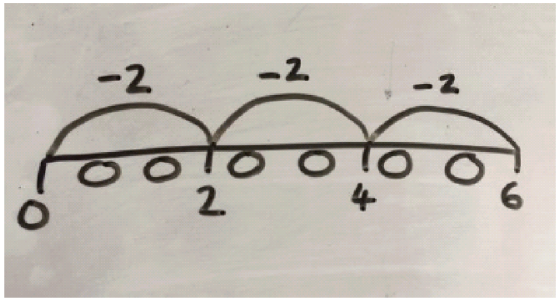
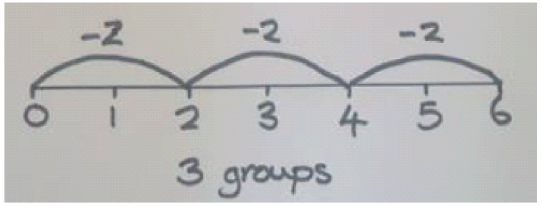
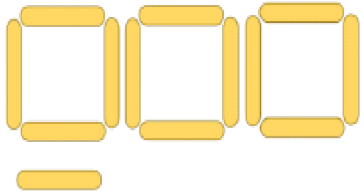
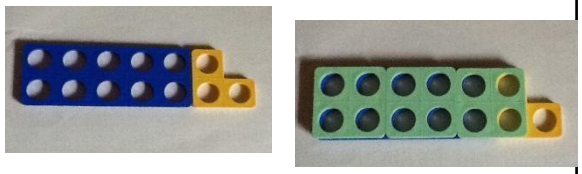
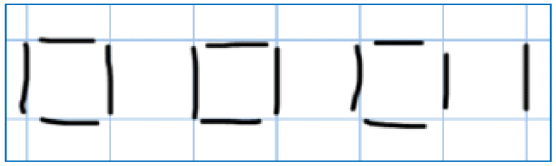
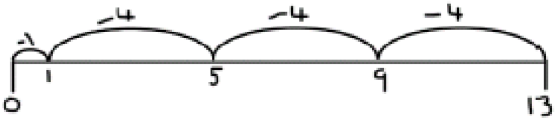
Division

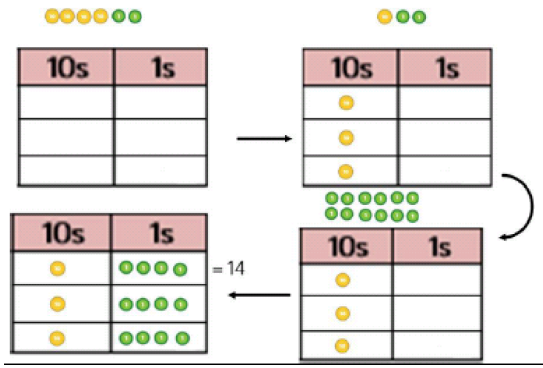
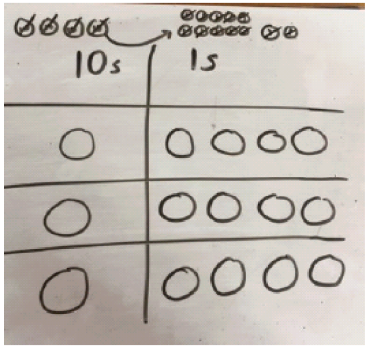
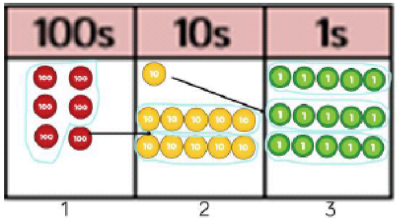
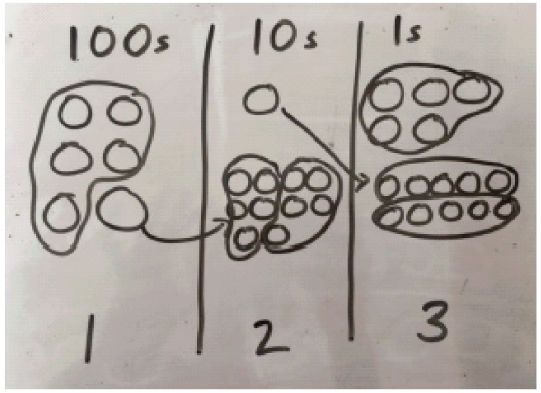
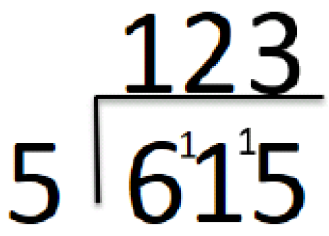
Key language: halving, sharing, equal groups, lots of, divide, divided by, dividend, divisor, quotient, remainder, inverse0049

	Concrete	Pictorial	Abstract

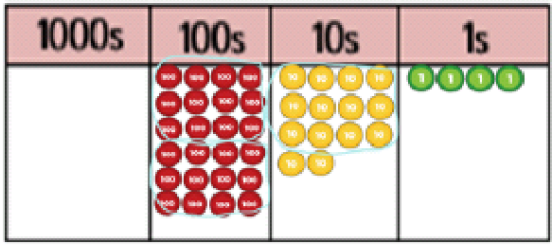
EYFS	Division can be introduced through halving or sharing an equal amount into 2 groups.  Children begin with mostly pictorial representations linked to real life contexts:  **Grouping Model** Mum has 6 socks. She grouped them into pairs. How many pairs did she make?  **Sharing Model** I have 10 sweets. I want to share them with my friend. How many will we have each? Children need to see and hear representations of division as both grouping and sharing. Children have a go at recording the calculation that has been carried out: e.g. by drawing pictures in groups or by arranging concrete apparatus into groups.  **12 shared equally by 3 is 4**	

1 step problems (sharing)	Sharing using a range of objects. 6 ÷ 2  Children solve problems by sharing amounts into equal groups.	 	6 ÷ 2 = 3 20 ÷ 5 = 4 In Year 1 children use concrete and pictorial representations to solve problems. They are not expected to record division formally. In Year 2, children are introduced to the division symbol.
1 step problems (grouping)	 Children solve problems by grouping and counting the number of groups. They can use concrete representations, such as number shapes, which helps to show the link between multiplication and division.		20 ÷ 5 = 4 10 ÷ 5 = 2

Repeated subtraction	**Repeated subtraction** using Cuisenaire rods above a ruler. 6 ÷ 2  3 groups of 2	Children to represent repeated subtraction pictorially. 	Abstract number line to represent the equal groups that have been subtracted. 
2 digit divided by one digit using known division facts (related to times tables)	13 ÷ 4 = Use of lollipop sticks to form wholes- squares are mad because we are dividing by 4.  There are 3 whole squares, with 1 left over. Using Numicon 	Children to represent the lollipop sticks pictorially.  There are 3 whole squares, with 1 left over.	13 ÷ 4 = 3 remainder 1 Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line. '3 groups of 4, with 1 left over' 

Sharing with remainders	Using place value counters or Base 10: 42 ÷ 3 = 14  	Children to represent the place value counters pictorially.  	Children to be able to make sense 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
Short division (formal written method)	Short division using place value counters to group. 615 ÷ 5  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'	Represent the place value counters pictorially.  	Children to the calculation using the short division scaffold. 
	Long division using place value counters 2544 ÷ 12  		

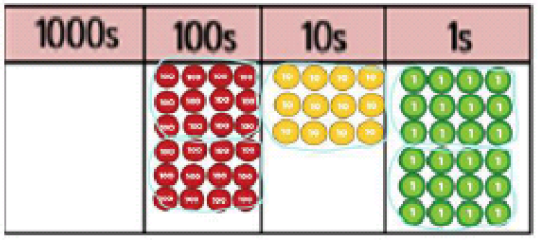
Long division (formal written method)



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

```
    021
12 | 2544
     24
     ---
     14
     12
     --
      2
```

Get children to draw an arrow to show that they are now looking at the next place value column

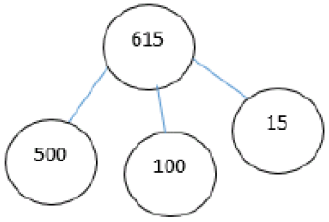


After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder.

```
    0212
12 | 2544
     24
     ---
     14
     12
     --
     24
     24
     --
      0
```

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?