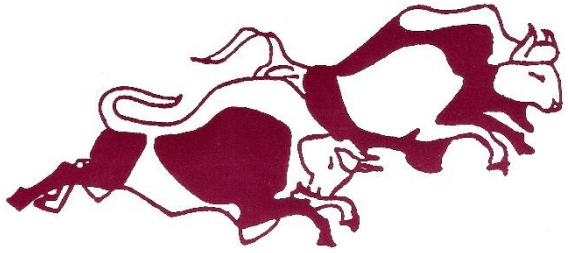


MICKLEOVER PRIMARY SCHOOL

Written Calculation Policy
2019

At Mickleover Primary, we recognise the importance of a common and progressive approach to the introduction of standard written methods, to ensure that children have secure calculation skills that are appropriate to their understanding of number. This policy outlines how written calculations are taught throughout the school based on a Mastery Approach that uses a ***concrete, pictorial and abstract*** approach to secure and deepen understanding. This approach recognises that in order for pupils to understand abstract concepts, they must first learn mathematical concepts through the use of concrete resources and pictorial representation.

Concrete is the 'doing' stage, using concrete objects to solve problems. It brings concepts to life by allowing children to handle physical objects themselves.

Pictorial is the 'seeing' stage, using representations of the objects involved in maths problems. This stage encourages children to make a mental connection between the physical object and abstract levels of understanding, by drawing or looking at pictures, circles, diagrams or models which represent the objects in the problem.

Abstract is the 'symbolic' stage, where children are able to use abstract symbols to model and solve maths problems.

As pupils progress in their maths, they become ready to handle more formal written methods that in many cases increase efficiency. However, pupils should not be moved onto these methods before their conceptual understanding of each operation is sound. Also, pupils should not be moved on automatically to the next calculation strategy – the policy should be used with professional judgement of what is appropriate for the pupils in each class. Although the focus of this policy is on pencil and paper procedures, it is important to recognise that the ability to calculate mentally lies at the heart of numeracy. Mental calculation should be seen as complementary to written recordings, as in every written method there is an element of mental processing. Supporting all calculation work should be a sound understanding of estimation and checking the reasonableness of an answer. Children should be taught to use rounding to support estimation and to check answers against the question to ensure it is reasonable and fits the real life situation (especially in the case of division and remainders).

Written ADDITION methods using a CONCRETE PICTORIAL and ABSTRACT approach.

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

Foundation 2

Concrete

Children find the total number of objects by combining two parts and counting all of them.

- Through practical activities, using fingers and through discussion they will begin to use the vocabulary involved in addition.

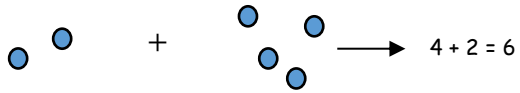
'You have five apples and I have two apples. How many apples altogether?'

- They will record pictorially then numerically

5 + 2 = 7 apples

Children add 2 single digit numbers by counting on.

- Through practical activities, children to begin counting on, starting from the highest number.



- Using a number line Or numicon counting from the biggest number.

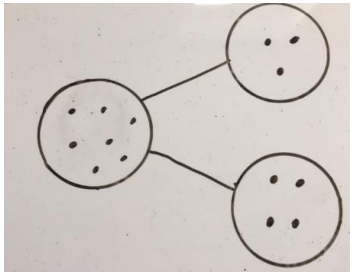
Children will find one more than a given number.

- Through songs, rhymes and practical activities children develop a sense of number.

- Children will use number line to find one more than a given number

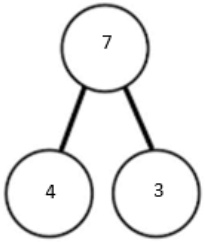
Pictorial

Children represent cubes or other objects using dots, circles crosses etc. Each part is shown on the part whole model.



Abstract

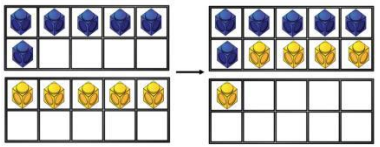
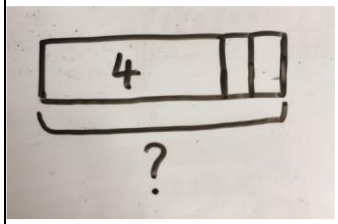
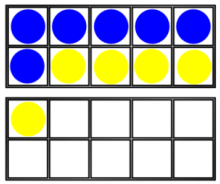
Children represent cubes or other objects using dots, circles crosses etc. Each part is shown on the part whole model.



Written ADDITION methods using a CONCRETE PICTORIAL and ABSTRACT approach.

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

Year 1

Concrete	Pictorial	Abstract
Children, read, write and interpret mathematical statements involving addition (+) and the equals (=). • Through practical activities, using rods, cubes, numicom, number beads, number lines and 100 squares .  5 + 3 =  6 + 5 makes 11	• Using a bar model or tens frame to represent the addition  4 + 2 =  6 + 5 =	• Using an abstract numberline (in head) What is 2 more than 4 What is the sum of 2 and 4 What is the total of 2 and 4  • using number bonds and related addition facts within 20 which have been learned.
Children add one-digit and two-digit numbers within 20, including zero Using practical equipment children combine groups, counting from the largest	• Using a number line to add two numbers together, encouraging children to start from the largest number.  12 + 5 = • Children solve missing number problems by counting on from the given number. eg 10 +___ = 16  • 10 + □ = 16	

Written ADDITION methods using a CONCRETE PICTORIAL and ABSTRACT approach.

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

Year 2

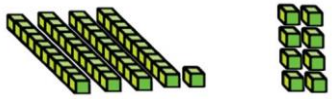
Concrete

Children solve problems with addition using concrete objects as used in foundation stage 2 and Year 1.

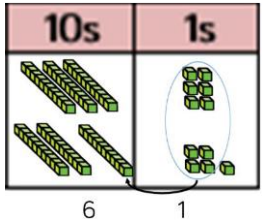
Children will learn to add -:

1. A two digit number and ones
2. A two digit number and tens
3. Two two-digit numbers
4. Three one-digit numbers

- Using Tens and Ones apparatus children add by combining groups, counting from the largest. (TO + O and TO +TO base 10 with no exchange)



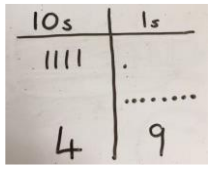
- Using Tens and Ones apparatus children add by combining groups, where 10 ones are exchanged for a Ten .

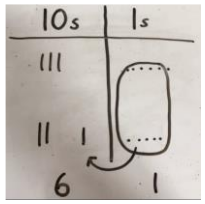


Pictorial

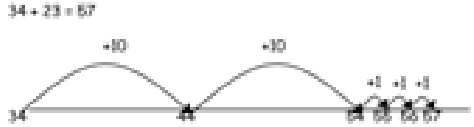
Children solve problems with addition using pictorial representations as used in foundation stage 2 and Year 1.

- Using place value knowledge children combine Tens and Ones to add.

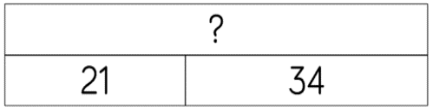




- Using an empty number line to add two-digit numbers.

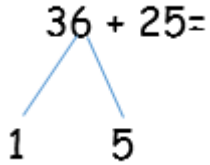


- Bar models are used to show pictorial representations



Abstract

- Using place value knowledge children combine Tens and Ones to add in head.



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

Written ADDITION methods using a CONCRETE PICTORIAL and ABSTRACT approach.

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

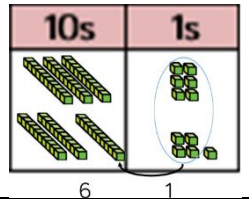
Year 3

Add numbers with up to three digits, using formal written method of columnar addition

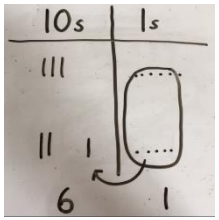
TO + TO using base 10.

Continue to develop understanding of partitioning and place value

36 + 25



Children to represent the base 10 in a place value chart.



Looking for ways to make 10.

36 + 25=

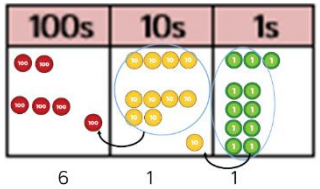
1 5

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

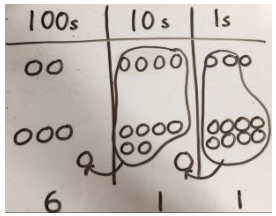
Formal method:

36
+25
61
1

Use of place value counters or Dienes to add HTO + TO, HTO + HTO etc



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



243
+368
611
1 1

YEAR 4

Add numbers with up to 4 digits using the formal written methods of columnar addition building on concrete pictorial abstract approach of year 3

	2	5	6
+	1	2	7
	3	8	3
		1	

783
+ 42
8 25
1

625
+ 48
673
1

Carry below the line and cross off when added into the calculation

Year 5/ 6

Add whole numbers with more than 4 digits, including using formal methods

	5	2	0	9
+	3	1	9	2
	8	4	0	1
		1	1	

23587
+ 1475
25062
50124
1 2 1

Begin to add two or more decimal fractions with up to three digits and the same number of decimal places; know that decimal points should line up under each other,
particularly when adding or subtracting mixed amounts, e.g. 3.2 m – 280 cm.

	3	8	.	3	6
+	2	7	.	9	5
	6	6	.	3	1
	1	1		1	

When working with decimals, always make each number have the same amount of digits to the right of the decimal point

3.7 +2.35

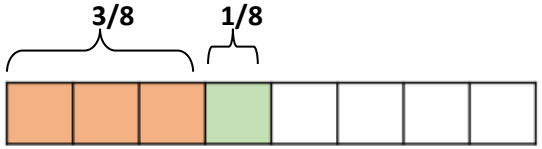
3.70
+ 2.35
6.05
1

In year 6, there is an expectation that children will continue to practise and use the formal written method for larger numbers and decimals and use these methods when solving problems, when appropriate

Addition of fractions

Year 3

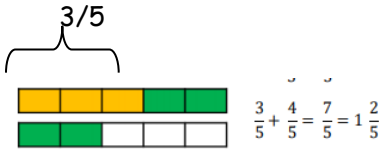
Use bar models to add fractions with the same denominator within one whole



We can use this model to calculate $\frac{3}{8}+\frac{1}{8}=\frac{4}{8}$

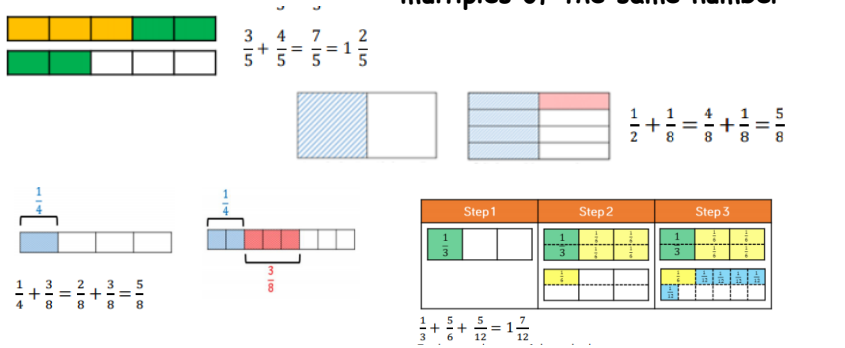
Year 4

Use bar models to add fractions of the same denominators

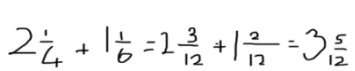


Year 5

Use bar models to add fractions with same denominators and multiples of the same number



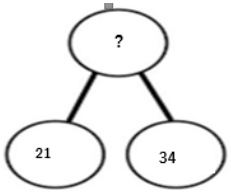
Year 6



Pupils should add fractions with different denominators and mixed numbers using the concept of equivalent fractions.

Leading to abstract method of using common denominators

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



?	
21	34

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

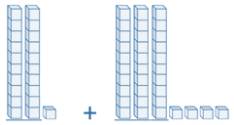
21 + 34 = 55. Prove it

21
+34
___

21 + 34 =

☐ = 21 +34

Calculate the sum of twenty-one and thirty-four



Missing digit calculations

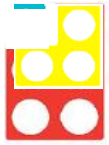
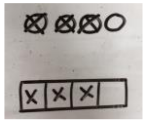
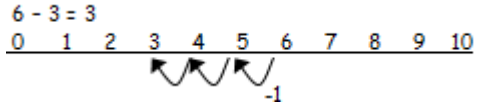
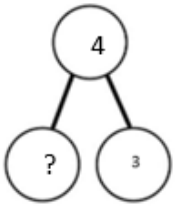
10s	1s
10 10	1
10 10 10	?
?	5

2☐ + ☐4 = 55

Written SUBTRACTION methods using a CONCRETE PICTORIAL AND ABSTRACT approach

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

Foundation 2

Concrete	Pictorial	Abstract
Children will engage in a variety of counting songs, rhymes and practical activities to develop a sense of number. **Children will find one less than a given number.** • In practical activities , using objects and fingers they will begin to use the vocabulary involved in subtraction  'You have five apples and I eat one apples. How many apples left?' • They will record pictorially then numerically 5- 1 = 4 apples		
Children subtract from 2 single digit numbers, by counting back to find the answer practically. • Using objects then pictures, children subtract a single digit number  5 subtract 3 = 2 • Using numicon children represent the subtraction by taking away covering the number. 	• Children draw the concrete resources and cross out the correct amount. Bar models are also used .  • Using a number line children count back below the line to show subtraction. 	• Part Whole models show the equation for children to find the correct answer 

Written SUBTRACTION methods using a CONCRETE PICTORIAL AND ABSTRACT approach

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

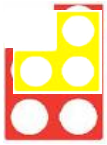
Year 1

Concrete

Children read, write & interpret mathematical statements involving subtraction (-) & equals (=).

- Through practical activities, using rods, cubes, numicom, number beads, number lines and 100 squares.

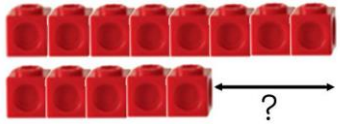
5 - 3 = 2



Children subtract one-digit & two-digit numbers to 20, including zero.

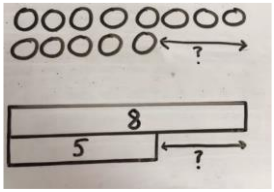
- Children find the difference using subtraction.

Calculate the difference between 8 and 5.

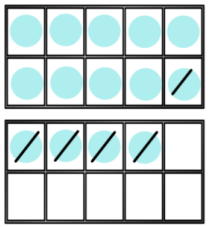


Pictorial

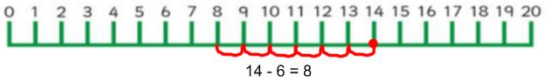
- Children draw cubes/counters and represent subtraction on bar models.



- Children present the ten frame pictorially and discuss what they did to make 10.



Children use a number line to subtract a number, counting back <u>below</u> the line.



Abstract

- Children use number bonds and related addition facts within 20 which have been learned.

Written SUBTRACTION methods using a CONCRETE PICTORIAL AND ABSTRACT approach

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

Year 2

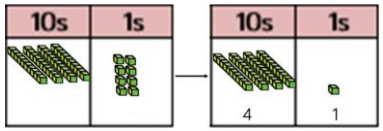
Concrete

Childen subtract numbers using concrete objects and pictorial representations as used in foundation and year 1.

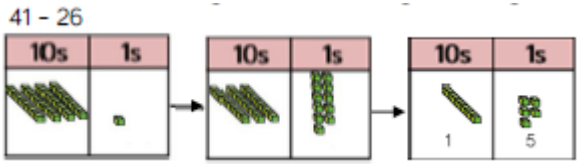
Children will learn to subtract -:

- A two digit number and ones
- A two digit number and tens
- Two two-digit numbers

- Using place value knowledge children subtract Tens and Ones. (No exchange)
  48 – 7 =

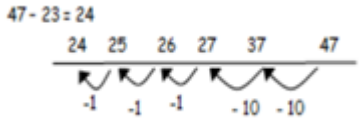


- Using Tens and Ones apparatus children subtract by exchanging ten ones for a Ten .

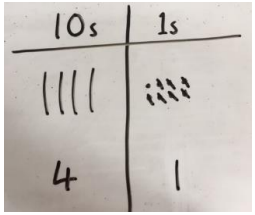


Pictorial

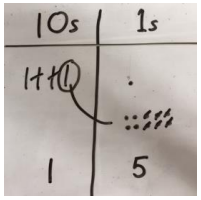
- Using place value knowledge, children subtract using a number line



- Using place value knowledge, children subtract Tens and Ones. (No exchange)
  48 – 7 =



- Using Tens and Ones apparatus children subtract by exchanging ten ones for a Ten



Abstract

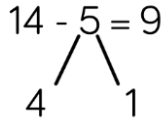
- Using knowledge of addition and subtraction families and the inverse relationship of addition and subtraction.

  3 + 2 = 5 2 + 3 = 5 Number
  5 - 2 = 3 5 – 3 = 2 families

- Using Inverse knowledge

  48 + 36 = 84 so 84 – 36 = 48

- Use partitioning of the number being subtracted before carrying outthe subtraction



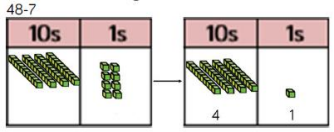
Written SUBTRACTION methods using a CONCRETE PICTORIAL AND ABSTRACT approach

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

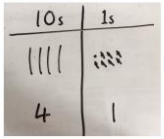
Year 3

Subtract numbers with up to three digits, using formal written method of columnar subtraction

Column method using base 10.
48-7



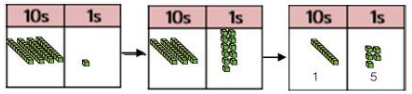
Children to represent the base 10 pictorially.

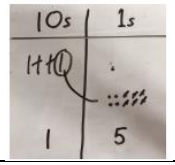


Column method or children could count back 7

	4	8
-		7
	4	1

Column method using base 10 and having to exchange.
41 – 26

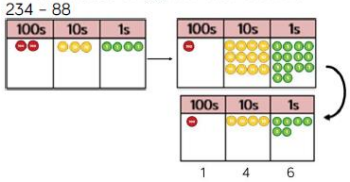




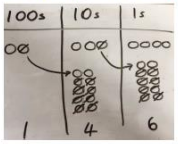
Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because 41 = 30 + 11.

	3	11
	~~4~~	1
-	2	6
	1	5

Column method using place value counters.
234 – 88



Represent the place value counters pictorially; remembering to show what has been exchanged.



Formal colum method. Children must understand what has happened when they have crossed out digits.

	2	1
	2	~~3~~4
-		88
		6

Year 4

Subtract numbers with up to 4 digits using the formal written methods of columnar subtraction where appropriate

	6	14	1
	~~7~~	~~5~~4	
-		86	
	6	6	8

		5	~~6~~^{5}	^{1}2
-	3	1	9	
	2	4	3	

NOTE: In both examples, we have '**exchanged**' one of the six tens for ten ones.

Children will also begin to find the difference between two three-digit sums of money, with or without 'adjustment' from the pence to the pounds; know that decimal points should line up under each other

£3.50- £1.67

1.67- 0.3

		1.67
-		0.30

Year 5

Subtract whole numbers with more than 4 digits, including using formal written method (columnar subtraction)

Use compact ('decomposition') method and the vocabulary 'exchange' to include decimals

	~~8~~^{7}	^{1}6	.	~~3~~^{2}	^{1}0
-	1	9	.	0	4
	6	7	.	2	6

In this example, we have 'exchanged' one of the three tenths for ten hundredths

Year 6 as per Year 5 using larger number

Subtraction of fractions

Year 3

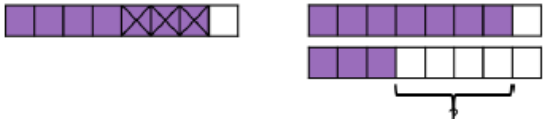
Subtract fractions with the same denominator within one whole

5/7 – 2/7 = 3/7

Year 4

Subtract fractions with the same denominator

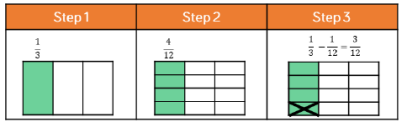
Here are two bar models to calculate $\frac{7}{8} - \frac{3}{8}$



Year 5

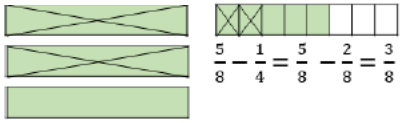
Subtract fractions with the same denominator and multiples of the same number

$\frac{1}{3} - \frac{1}{12} = \frac{3}{12}$



$1\frac{3}{4} - \frac{5}{8} = 1\frac{1}{8}$

$3\frac{5}{8} - 2\frac{1}{4} = 1\frac{3}{8}$



$\frac{5}{8} - \frac{1}{4} = \frac{5}{8} - \frac{2}{8} = \frac{3}{8}$

$3 - 2 = 1$

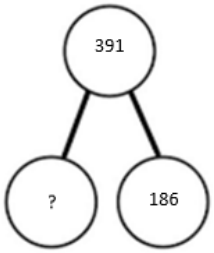
Year 6

Subtract fractions with different denominators

Building on Y5 methods to abstract methods by finding common denominator

$\frac{3}{4} - \frac{2}{3} = \frac{9}{12} - \frac{8}{12} = \frac{1}{12}$

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?

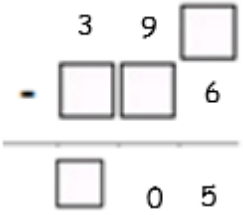
Calculate the difference between 391 and and 185

□ = 391-186

391
-186
———

What is 186 less than 391?

Missing digit calculations



Written MULTIPLICATION methods using a CONCRETE, PICTORIAL and ABSTRACT approach

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

Foundation 2

Concrete	Pictorial	Abstract
Children solve problems involving doubling. • In practical activities and through discussion children will begin to use the vocabulary of multiplication – groups, lots, double. • Through practical activities solve problems including doubling.	Children solve problems involving doubling. They will record pictorially -:  3 + 3 = 6 lollies 'You have 3 lollies and your friend gives you 3 more. How many do you have altogether?	Children solve problems involving doubling. They will record numerically -: 3 + 3 = 6 lollies Double 3 is 6

Written MULTIPLICATION methods using a CONCRETE, PICTORIAL and ABSTRACT approach

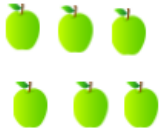
Key language: double, times, multiplied by, the product of, groups of, lots of, equal groups.

Year 1

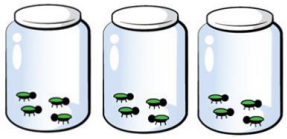
Concrete

Children solve one-step problems involving multiplication using concrete objects, pictorial representations

- Children count in 2's, 5's and 10's.
- Children continue to use the vocabulary of multiplication – groups, lots, double.
- Children recognise doubling as adding the same number again.



Children will put objects and pictures into repeated groups to count.



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

Pictorial

Children solve one-step problems involving multiplication using concrete objects, pictorial representations

- Children represent the practical resources in a picture or use a bar model

Abstract

Children solve one-step problems involving multiplication using concrete objects, pictorial representations

- Children write multiplication as a stem sentence.

3 groups of 4 = 12

Written MULTIPLICATION methods using a CONCRETE, PICTORIAL and ABSTRACT approach

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

Year 2

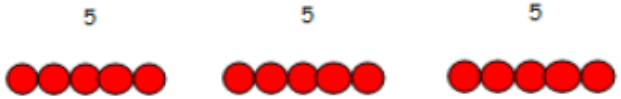
Concrete

Children solve problems with multiplication using concrete objects as used in foundation stage 2 and Year 1.

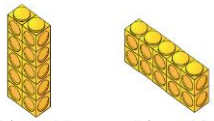
Children solve multiplication problems practically, using concrete objects and arrays

- Children solve multiplication calculations practically through repeated addition.

5 + 5 + 5
3 × 5 = 3
3 groups of 5 = 15



- Children use arrays to solve multiplication calculations and illustrate commutativity.



Pictorial

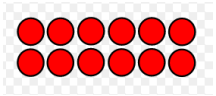
Children solve problems with multiplication using pictorial representations as used in foundation stage 2 and Year 1.

Children solve multiplication problems, pictorially using 100 squares, arrays and numberlines.

- Using a 100 square to find and discuss patterns when counting.

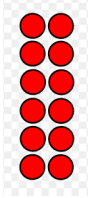
4	5	6	7	8	9	10
14	15	16	17	18	19	20

- Children draw dots to represent arrays.

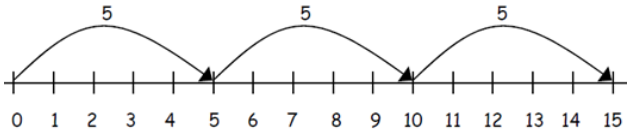


2 x 6 =

6 x 2 =



- Number lines are used to show multiplication as repeat addition.



5 x 3 = 5 + 5 + 5

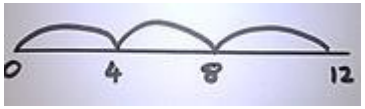
Children record calculations using x and =.

Abstract

Children solve multiplication problems, using repeated addition and multiplication and division facts.

- Children recall & use multiplication facts for 2, 5 & 10 tables, including recognising odd and even numbers.

- Children use abstract number lines to solve multiplication problems.



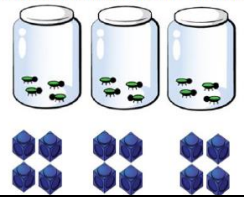
Written MULTIPLICATION methods using a CONCRETE, PICTORIAL and ABSTRACT approach

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

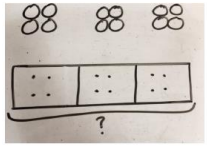
Year 3/4

Write and calculate statements for x and ÷ using tables they know, including for TU x U using mental and progressing to formal written methods.

Repeated grouping/repeated addition
3 × 4
4 + 4 + 4
There are 3 equal groups, with 4 in each group.



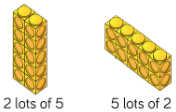
Children to represent the practical resources in a picture and use a bar model.



$3 \times 4 = 12$

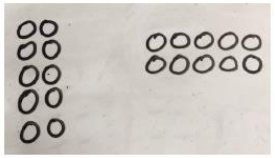
$4 + 4 + 4 = 12$

Use arrays to illustrate commutativity counters and other objects can also be used.
2 × 5 = 5 × 2



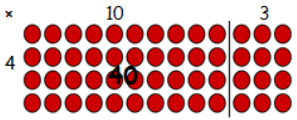
2 lots of 5 5 lots of 2

Children to represent the arrays pictorially.



Children to be able to use an array to write a range of calculations e.g.
10 = 2 × 5 2 + 2 + 2 + 2 + 2 = 10
10 = 5 + 5 5 × 2 = 10

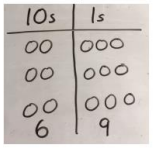
13 × 4 = (10 × 4) + (3 × 4)



Multiply TU x U

Formal column method with place value counters (base 10 can also be used.) 3 × 23

Children to represent the counters pictorially.



Children to record what it is they are doing to show understanding.

3 × 23 3 × 20 = 60
20 3 3 × 3 = 9
60 + 9 = 69

```
  23
X  3
   9
  60
  69
```

Year 5/ 6

Multiply numbers up to 4 digits by a one or two-digit number using a formal method, including long multiplication for two-digit numbers

When children start to multiply a 3dx3d and 4 x 2d, they should be confident with the abstract.

Begin with expanded if needed

		2	3
×		1	4
		9 (1)	2
	2	3	0

(23 × 4)

(23 × 10)

Leading to

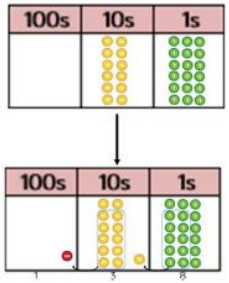
```
   1 2
   1  2  4
X        2  6
   7  4  4
2  4  8  0
3  2  2  4
 1  1
```

To get 744 children have solved 6 x124
To get 2480 children have solved 20 x 124

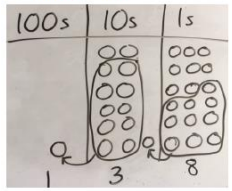
NB Carry above for x below for addition

Formal column method with place value counters.

6 x 23



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

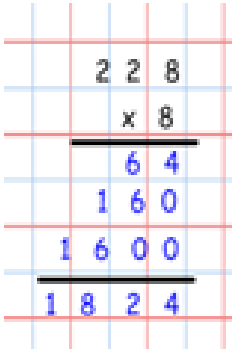


Formal written method

6 x 23 =

```
  23
X  6
  18
 120
 138
```

Multiply two-digit and three-digit numbers by a one-digit number using formal written



```
 ²2⁶28
X    8
1824
```

Carrying above to avoid confusion when multiplying 3 digit by 2 digit

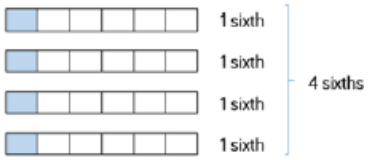
Multiplication of fractions

Year 5

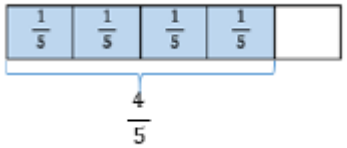
- **Multiply proper fractions by whole number,**

- Begin with repeated addition using models

$$\frac{1}{6} \times 4 = \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$$



- Using single bar model



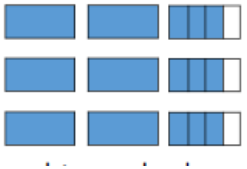
Multiply mixed umbers by whole number

$$2\frac{2}{3} \times 4$$

using repeated additon

$$2\frac{2}{3} \times 4 = 2\frac{2}{3} + 2\frac{2}{3} + 2\frac{2}{3} + 2\frac{2}{3} = 8\frac{8}{3} = 10\frac{2}{3}$$

- By partitioning



$$2 \times 3 = 6$$
$$\frac{3}{4} \times 3 = \frac{9}{4} = 2\frac{1}{4}$$
$$6 + 2\frac{1}{4} = 8\frac{1}{4}$$

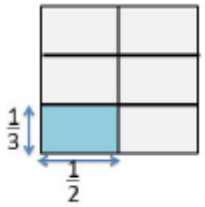
- By converting to an improper fraction

$$1\frac{5}{6} \times 3 = \frac{11}{6} \times 3 = \frac{33}{6} = 5\frac{3}{6} = 5\frac{1}{2}$$

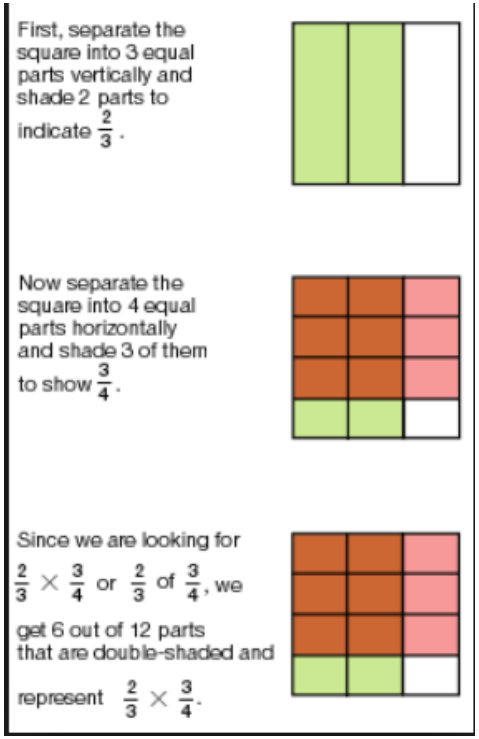
Year 6

- **Multiply simple pairs of proper fractions, writing the answer in its simplest form [for example 1/4 x 1/2 = 1/8]**

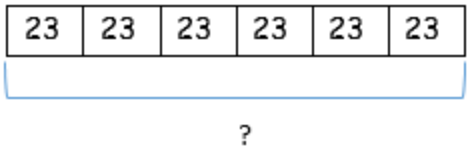
$$\frac{1}{3} \times \frac{1}{2}$$



2/3 x 3/4



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?

With counters, prove that 6 x 23 =138

Find the product of 6 and 23

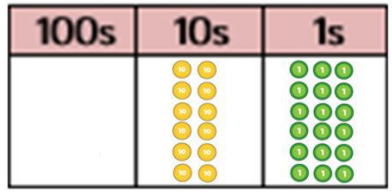
6 × 23 =

= 6 × 23

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

What is the calculation?

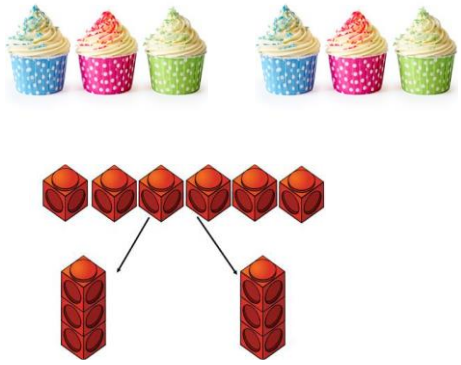
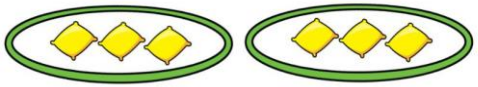
What is the product?



Written Division methods using a CONCRETE, PICTORIAL and ABSTRACT approach

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

Foundation 2

Concrete	Pictorial	Abstract
Children solve problems involving simple halving and sharing • In practical activities, using objects they will begin to use division vocabulary – groups, sharing. 'You have 6 buns and give your friend half. How many do you each have?' They will record pictorially. 	Children solve problems involving simple halving and sharing • Using pictures and through discussion they will begin to use division vocabulary – groups, sharing. 	Children solve problems involving simple halving and sharing • Through discussion they will begin to use division vocabulary – groups, sharing. .

Written DIVISION methods using a CONCRETE, PICTORIAL and ABSTRACT approach

Key language: share, group, divide, divided by, half.

Year 1

Concrete

Children solve problems with division using concrete objects as used in foundation stage 2.

Children solve problems involving division using concrete objects.

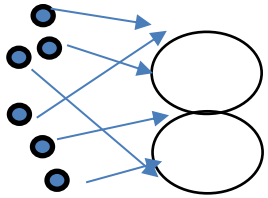
- Through practical activities children will find half and then a quarter by sharing.

4 cakes shared between 2 people. How many do they get each?

Children use objects to group and share amounts to develop an understanding of division in a practical sense.

- Sharing – Children will have practical opportunities to share out by giving one to each plate.
-

E.g. 6 sweets are shared between 2 people.
How many do they have each?

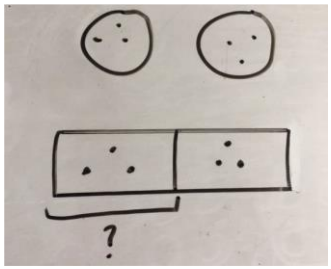


- Grouping – Children will have practical opportunities to put objects into groups of a specific number.

Pictorial

Children solve problems with addition using pictorial representations as used in foundation stage 2.

Children solve problems involving division using pictorial representations.

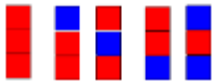


Children will use jottings to record both sharing equally and grouping. Then they begin to use the ÷ sign to record their division problems.

6 ÷ 2 = 3

Abstract

Children count on and back from different numbers in 1s and then in multiples of 2, 5 and 10.

E.g. There are 6 sweets. How many people can have 2 sweets each?  If you have 15 cubes. How many towers of 3 cubes can you make?' 1 2 3 4 5 		

Written DIVISION methods using a CONCRETE, PICTORIAL and ABSTRACT approach

Key language: share, group, divide, divided by, half.

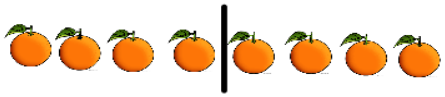
Year 2

Concrete

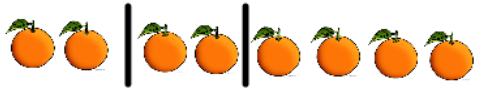
Children solve problems with division using concrete objects as used in foundation stage 2 and Year 1.

Children find a half, a quarter, a third and three quarters of shapes, objects and numbers.

- Using and sharing objects



1/2 1/2



$\frac{1}{4}$ $\frac{1}{4}$ 2 Quarter 2/4 = $\frac{1}{2}$

Children continue to use grouping and sharing for division using practical apparatus.

- Division facts - Children count regularly, on and back, in steps of 2, 5 and 10 using concrete objects.

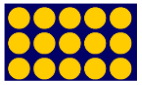
2 4 6 8 10 12

Pictorial

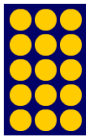
Children solve problems with addition using pictorial representations as used odd **in foundation stage 2 and Year 1.**

- Arrays - Children will be introduced to arrays as a pictorial representation to show division.

15 ÷ 3 = 5



There are 5 groups of 3.

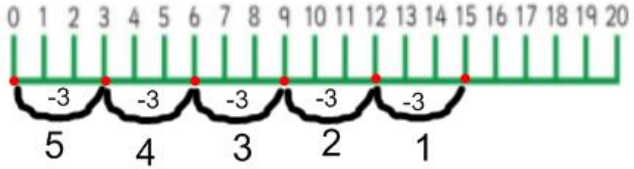


15 ÷ 5 = 3

There are 3 groups of 5

E.g. 15 pencils shared between 3 pots, how many in each pot?

- Repeat subtraction - Children recognise division as repeat subtraction. Using a numberline children start with the total amount to be divided (the first number). They then jump back in steps of the divisor (the second number) until they reach 0. By counting the number of steps taken we find the answer.



15 ÷ 3 = 5

NB. We always count backwards below the line for subtraction.

Abstract

Children recognise odd and even numbers and recall division facts for the 2, 5 and 10 multiplication tables.

E.g. Sort these numbers into and even
15, 27,34, 75, 82

- Mental methods, and division facts - Children count regularly, on and back, in steps of 2, 5 and 10.

Children calculate mathematical statements for division within the multiplication tables 0f 2, 5 and 10 and write them using division (÷) and equals (=) signs.

20 ÷ 5 =

Children partition tens and ones with larger numbers to find half, a quarter and three quarters

Find half of 48 48 = 40 + 8
Half of 40 = 20
Half of 8 = 4
Half of 48 = 20 + 4 = 24

Written DIVISION methods using a CONCRETE, PICTORIAL and ABSTRACT approach

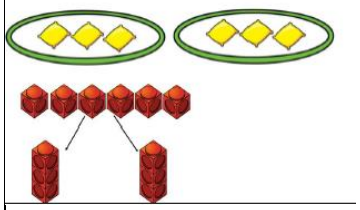
Key language: share, group, divide, divided by, half.

Year 3/ Year 4

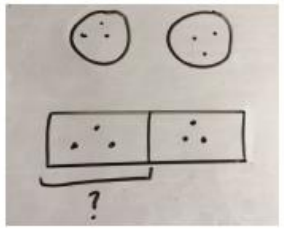
Division with a remainder-using lollipop sticks, times tables facts and repeated subtraction.

2d divided by 1d using base 10 or place value counters

Sharing using a range of objects.
6 ÷ 2



Represent the sharing pictorially.



6 ÷ 2 = 3

3	3

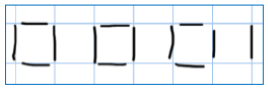
Children should also be encouraged to use their 2 times tables facts.

2d ÷ 1d with remainders using lollipop sticks. Cuisenaire rods, above a ruer can also be used.
13 ÷ 4

Use of lollipop sticks to form wholes- squares are made because we are dividing by 4.

There are 3 whole squares, with 1 left over.

Children to represent the lollipop sticks pictorially.



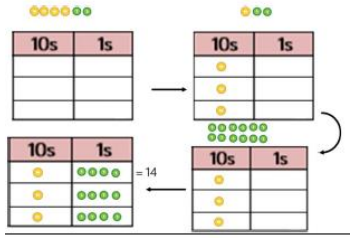
There are 3 whole squares, with 1 left over.

13 ÷ 4 = 3 remainder 1

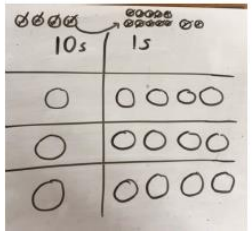
Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.

'3 groups of 4, with 1 left over'

Sharing using place value counters.
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.

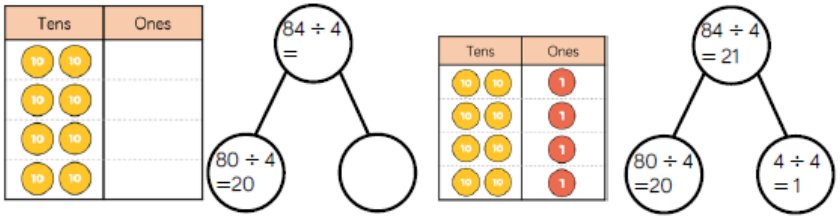
42 ÷ 3
42 = 30 + 12
30 ÷ 3 = 10
12 ÷ 3 = 4
10 + 4 = 14

Division with one digit to include remainders

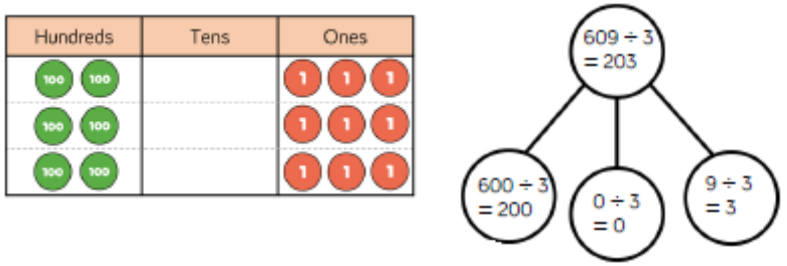
84÷4

First divide the tens

Then divide the ones



603 ÷ 3

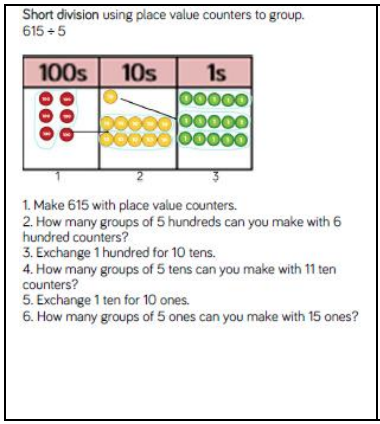


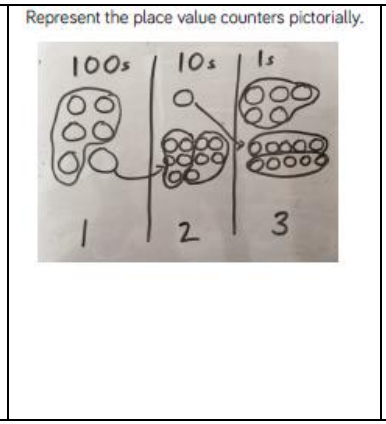
Short division (up to 3 digits by 1 digit- concrete and pictorial) See Y5 starting with 2 digit numbers beyond table facts

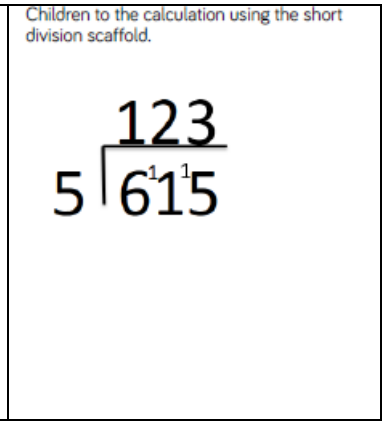
Year 5

Short division

(up to 4 digits by a 1 digit number including remainders)







6096÷ 8= 762

	0	7	6	2
8	~~6~~	$^{6}0$	$^{4}9$	$^{1}6$

R2 or

3018÷8= 377 R 2 or 377 R 2/8

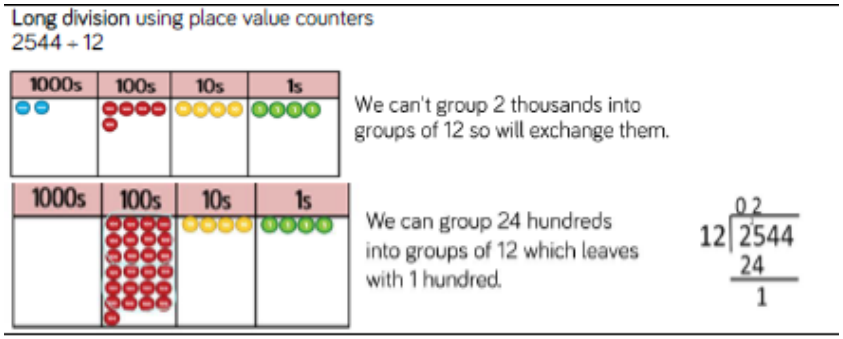
	0	3	7	7
8	~~3~~	$^{3}0$	$^{6}1$	$^{5}8$

Leading to remainder with decimals

	0	3	7	7	.	2	5
8	~~3~~	$^{3}0$	$^{6}1$	$^{5}8$	.	$^{2}0$	$^{4}0$

Year 6

Divide numbers up to four-digit by two-digit number using the short ('bus stop') method

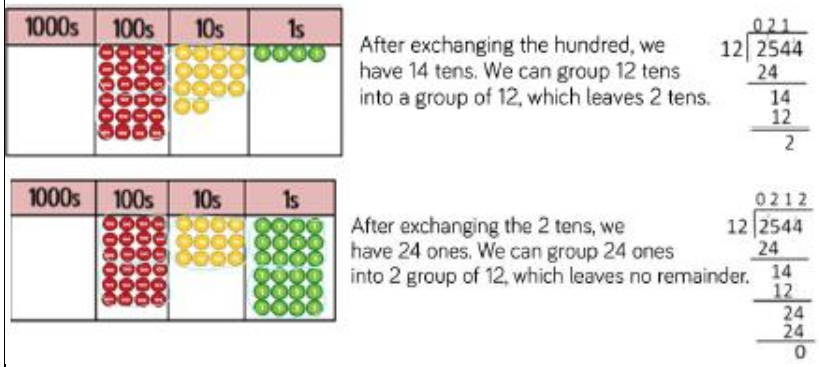


Long division for 2 digit numbers

List multiples 1st= 18

```
  343
18)6174
  54
  ---
   77
   72
   ---
    54
```

5th=90

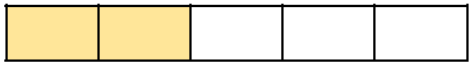


10th=180

Division of fractions

Year 6

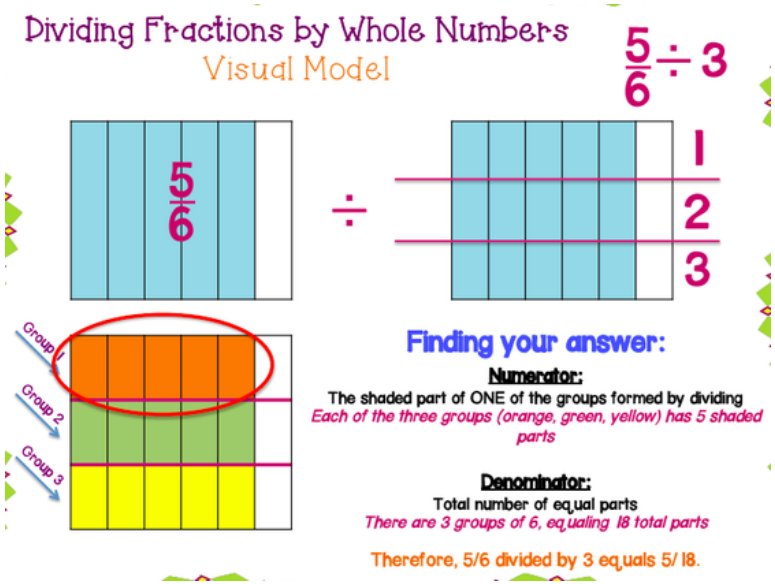
Begin with fractions where numerator is divisible by divisor



2/3 divided by 2= 1/3

$\frac{3}{4} \div 3$ $\frac{4}{6} \div 2$

Divide a fraction by a whole number when the numerator is not divisible byt the divisor 3/4÷5= 3/20



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