LONDON MEED PRIMARY SCHOOL

London Meed Primary School Progression in Calculation Policy March 2022

To be reviewed annually

Reviewed: March 2023

Next review: March 2024

Bravery…..Community…..Curiosity……Resilience……Respect

Prior to moving children to written methods, they need to:

- Understand the number system
- Be fluent with basic number facts
- Understand the = symbol
- Look for patterns and make connections
- Have a good grasp of mental strategies
- Be confident using physical resources and pictorial representations of key concepts to solve problems and explain their reasoning

When children move to written methods, they need to think:

- *What will the answer be roughly?*
- *Can I work out the answer in my head?*
- *What can I use to help me (physical resources, pictures, diagrams)?*
- *Do I need a formal written method?*
- *Does that answer my question?*
- *Does it make sense?*
- *Can I check my answer?*

Purpose of the Policy:

- To ensure teachers, parents and carers are aware of the strategies taught in each year group and how these strategies support children in performing mental and written calculations. Pupils should not be moved on through the methods until they have a secure understanding of how to use them independently and confidently, including concrete and pictorial representations.
- To enable teachers to identify appropriate concrete apparatus and pictorial representations to help develop and secure children's understanding.
- To support parents and carers in reinforcing learning at home.

Aims of the policy:

- To ensure consistency and progression in our approach to calculation.
- To explain the development from concrete experiences through to mental jottings, mental strategies and on to written methods.
- To develop children's fluency in the use of written methods.
- To ensure that children can efficiently and independently use concrete resources.
- To ensure that children develop an efficient and reliable formal written method of calculation for all operations.
- To ensure that children can use these methods accurately with confidence and understanding.
- To ensure children are clear about the correct way of recording the written formal methods.

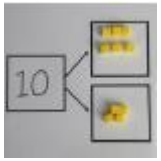
How to use this policy:

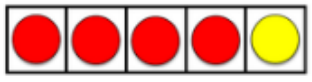
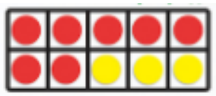
- Teachers to use the policy as the basis of their planning while ensuring the previous or following years' guidance is referred to in order to allow for personalised learning.
- Always use Assessment for Learning to identify suitable next steps in calculation for groups of children.
- If, at any time, children are making significant errors, return to the previous stage in calculation to identify and rectify their misconceptions.
- Always introduce a new concept/calculation using suitable resources, models and images to support children's understanding of the calculation and place value, as appropriate.
- Encourage children to make sensible choices about the methods they use when solving problems.
- Encourage children to use correct mathematical terminology and speak in full sentences.

more sum plus total **+ Addition +** add altogether combined

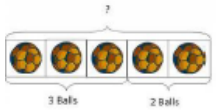
EYFS

Use multilink cubes, five frames, tens frames, Numicon, Rekenrek and other concrete resources to add two numbers together as a group or in a bar (combining 2 parts to make a whole: part-whole model).

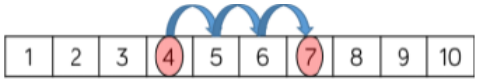


Also, use five and tens frames to practise **subitising** (instantly recognise a small quantity without having to count how many there are).

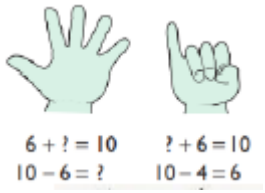


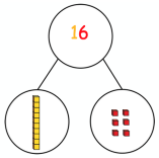
Use a number track/ number line to count on.

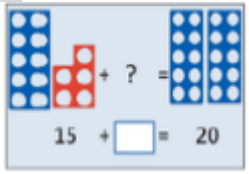


Year 1

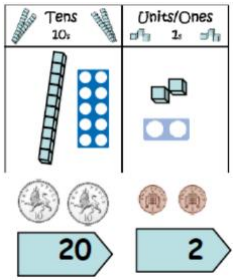
Use a variety of representations to teach number bonds up to and including 20 and the related *Fact Family* for each calculation.





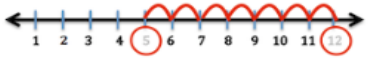


10 + ? = 16 Show this using part - whole model.



Understand place value by partitioning and recombining numbers.

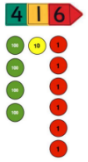
Add by starting at the larger number on the number line and count on in ones to find the answer.

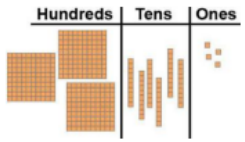


5 + 7 = 12

Year 2

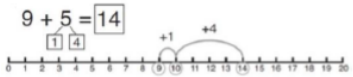
Continue developing place value through the use of manipulatives (place value counters, dienes).



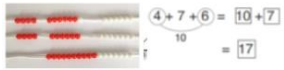


364

Addition can be done in any order (**commutative**)
47 + 53 = 100 or 53 + 47 = 100
Understand place value: can partition numbers and recombine numbers which may lead to column addition.
47 = 40 + 7 40 + 7 = 47
Use partitioning to add numbers: first, using concrete apparatus then, as a possible mental method.
Teach a range of mental methods for calculating: first, with numbers to 20 then, with numbers to 100, by partitioning numbers to use them flexibly.
Bridging strategy (e.g. 7+5 could be thought of as 7+3+2 or 5+5+2).
Compensating strategy (e.g. 7+9 could be thought of as 7+10 then -1).
Near double strategy (e.g. 7+8 =14+1).

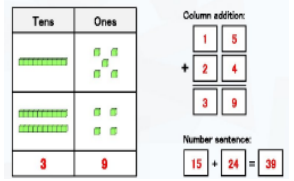


Learn to add three numbers by teaching them to spot number bonds 4 + 7 + 6 = 17. Notice that 4 and 6 are number bonds to 10 then, add on 7.



Use number bods 4+6=10 to work out 40 +60 =100.

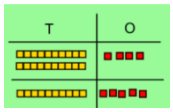
Expanded addition, TO then TO.

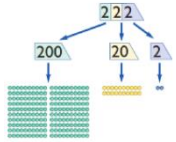


more sum plus total **+ Addition +** add altogether combined

Year 3

Continue to develop a secure understanding of place value: can partition and recombine numbers to support column addition.

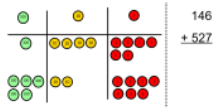




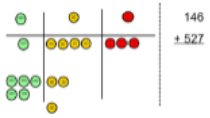
24 + 15= 39
Add together the ones first then add the tens. Start by using the Base 10 blocks/ dienes before moving onto place value counters.

Expanded addition: 3-digit numbers (HTO)

Make both numbers on a place value grid.



Add up the ones and exchange 10 ones for one 10.



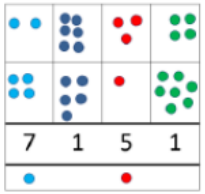
494 + 368 =
400 + 90 + 4
300 + 60 + 8
700 +150 +12 =862

Then, **compact addition (formal written method)**:

```
 494
+368
 862
 1 1
```

Year 4

Add ones, tens, hundreds to a 3-digit number. Children can draw a pictorial representation of the columns and place value counters, to further support their learning and understanding.



Compact addition – integers (whole numbers) only, with numbers up to 4 digits

```
 3698
+ 2485
 6183
 1 1 1
```

Expanded addition may be used for adding decimal numbers in real-life contexts (money, length).

£12.36 + £14.53 =

£10 + £2 + 30p + 6p
+ £10 + £4 + 50p + 3p
£20 + £6 + 80p + 9p = £26.89

Year 5

Compact addition with numbers larger than 4 digits.

```
 82409
+ 35097
 117506
  1 1
```

Compact addition with decimal numbers (up to 2 decimal places).

```
 32.45
+ 23.72
 56.17
  1
```

```
 2 3 . 3 6 1
   9 . 0 8 0
 5 9 . 7 7 0
+ 1 . 3 0 0
 9 3 . 5 1 1
 2 1   2
```

Year 6

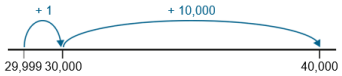
Compact addition involving larger numbers.

```
 237896
+ 860462
 1098358
  1 1
```

Compact addition with decimal numbers (up to 3 decimal places).

```
 83.285
+ 17.106
 100.391
  1   1
```

Continue using the number line to model strategies for efficient mental calculations.

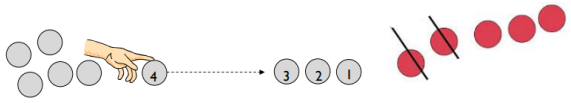


less than difference between **- Subtraction -** take away minus subtract

EYFS

Use physical objects, counters, cubes etc to show how objects can be taken away.

Practise taking away in different contexts; encourage children to physically remove the items they are taking away and then count or subitise to see how many are left.

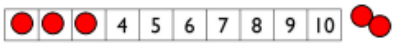


5 – 2 = 3

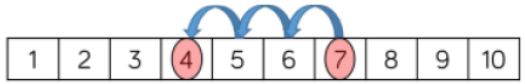
Use ***first***, ***then***, ***now*** to tell simple maths stories to practise taking away in familiar contexts.

First **Then** **Now**

First there were 5 people on the bus.
Then 2 people got off the bus.
Now there are 3 people on the bus.

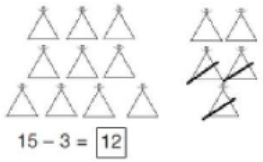


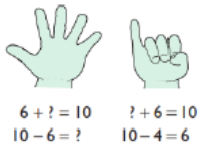
Use number tracks to show counting back.



Year 1

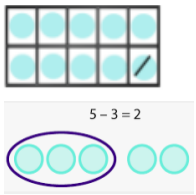
Cross out drawn objects to show what has been taken away. Continue practising *Fact Family*.



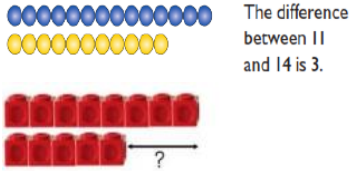


Gradually introduce children to the three structures of subtraction: taking away (reduction); finding the difference (comparison) and part-part-whole.

Take away

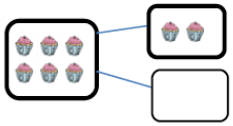


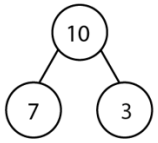
Find the difference



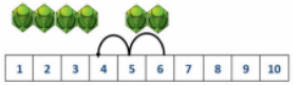
The difference between 11 and 14 is 3.

Part-part-whole

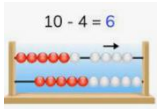




Continue using concrete apparatus, then a number line and a 100 square and, when possible, encourage mental calculations. Count back on a number line or number track when secure with physical resources.

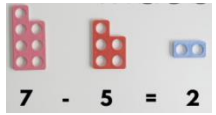


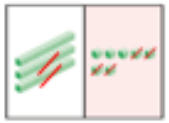
6 - 2 = 4

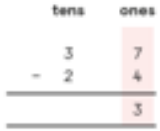


Year 2

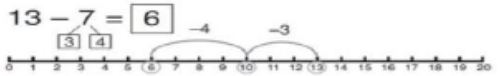
Continue subtracting using concrete apparatus then, progress to pictorial representations and mental methods.



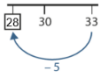


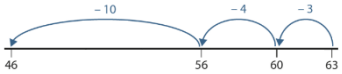


Start at 13. Take away 3 to reach 10. Then take away the remaining 4 so you have taken away 7 altogether. You have reached your answer.

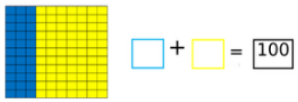


This can progress all the way to counting back using 2-digit numbers.

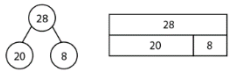




Practise number bonds to 100 – start with multiples of 10.



Understand that subtraction is the **inverse of addition** and continue practising *Fact Families*.



20 + 8 = 28
8 + 20 = 28

28 – 20 = 8
28 – 8 = 20

28 = 20 + 8
28 = 8 + 20

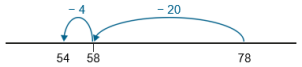
8 = 28 – 20
20 = 28 – 8

less than difference between **- Subtraction -** take away minus subtract

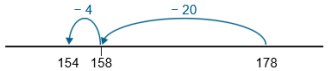
Year 3

Continue using the **number line.**

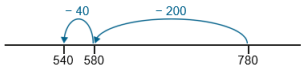
78 – 24 = 54

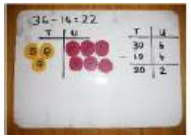


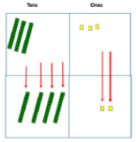
178 – 24 = 154



780 – 240 = 540



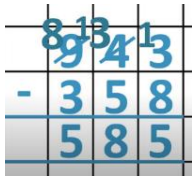




Expanded subtraction using concrete objects and pictorial representations.
Use Base 10 and place value counters to show one exchange before moving onto subtractions with two exchanges.
Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.

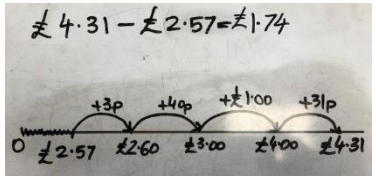
Move to written representations.

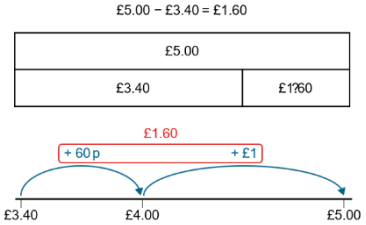
Compact subtraction:
HTO with no exchange, moving onto HTO with exchange from tens, then hundreds. When secure, move onto subtracting 3-digit numbers with more than one exchange.



Year 4

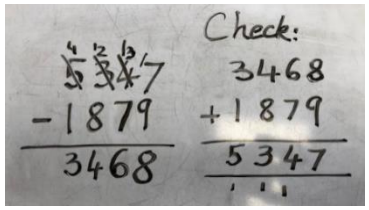
Continue using the **number line** method (2, 3 and 4-digit numbers) and extend it to decimal numbers in real-life contexts.





Compact subtraction involving ThHTO with no exchange, moving to ThHTO with exchange from tens, then hundreds, then thousands.

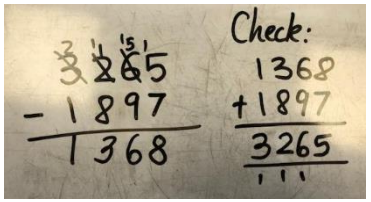
Then, move onto subtracting 4-digit numbers with more than one exchange.
5347 – 1879 = 3468



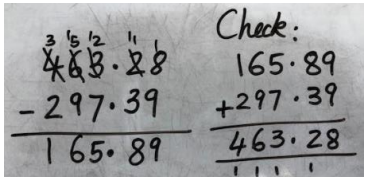
Year 5

Compact subtraction involving numbers larger than 4 digits and decimal numbers up to 2 decimal places.

3,265 – 1,897 = 1,368

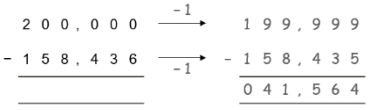


463.28 – 297.39 = 165.89



Model efficient strategies for subtraction.

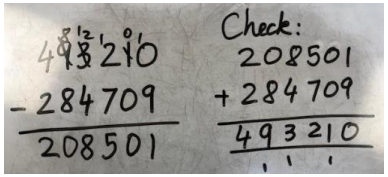
200,000 – 158,436 = 41,564

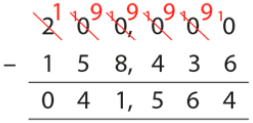


Year 6

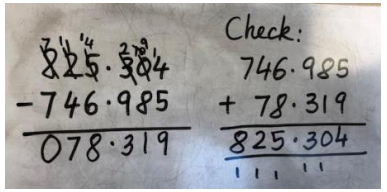
Compact subtraction involving large numbers and decimal numbers up to 3 decimal places.

493,210 – 284,709 = 208,501



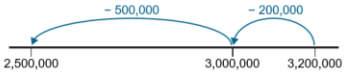


825.304 – 746.985 = 78.319



Continue using the number line to model strategies for efficient mental calculations.

3,200,000 – 700,000= 2,500,000



lots of groups of multiply **x Multiplication x** repeated addition times by product

EYFS

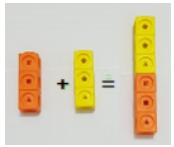
Expose children to the language of multiplication through practical experiences of equal groups, counting pairs of items and doubling.

Start by making pairs and creating patterns.

How many wheels are there?
(count in groups of 2)

3 pairs of wellies - 3 groups of 2

4 pairs of socks – 4 groups of 2



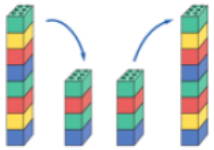
Double numbers up to 5 using concrete apparatus.

Double 3 is 6.

Year 1

Recall doubles to 10. Apply this knowledge to halving and doubling larger numbers.

Use practical resources to show how to double a number.



half of 8 is 4

double 4 is 8

Understand multiplication as repeated addition.
Count in groups of 2.

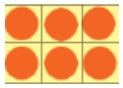
2+2+2+2 = 8

4 groups of 2 is 8

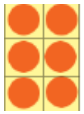
2 + 2 + 2 + 2 + 2 = 10

Count in groups of 5, 10.

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



2 groups of 3 is 6



3 groups of 2 is 6

Group sets of objects reliably in 2s, 5s and 10s.
Count in multiples of 2, 5 and 10 aloud and recognise number sequences.

Year 2

By the end of Year 2, children should become fluent in the 2, 5 and 10 multiplication tables.

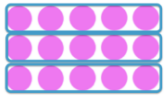
There are 3 groups of 5.
5 x 3 = 15

2p +2p +2p+2p+2p = 10p
2p x 5 = 10p

Use an array to write multiplication sentences and reinforce repeated addition.

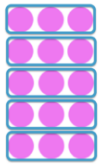
3 + 3 + 3 + 3 + 3= 15
5 + 5 + 5 = 15
3 x 5 = 15
5 x 3 = 15

Use arrays in different orientations, to model **commutativity** (multiplication can be done in any order).



3 x 5 = 15

15 ÷ 5 = 3

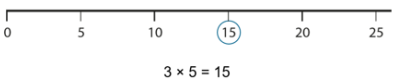


5 x 3 = 15

15 ÷ 3 = 5

Also, understand that multiplication and division are the inverse of each other.

Connect the 5 multiplication table to the divisions on the clock face.



lots of groups of multiply **x Multiplication x** repeated addition times by product

Year 3

Recall and use multiplication and division facts for 3, 4 and 8 times tables.

4 x 8 = 32
8 x 4 = 32
32 ÷ 4 = 8
32 ÷ 8 = 4

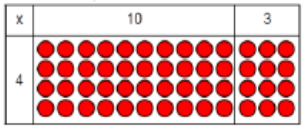
24					
4	4	4	4	4	4
8		8		8	

Understand multiplication as **scaling**.

The giraffe is twice as tall as the elephant.

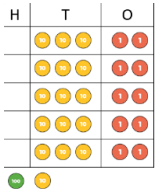
Before moving onto TO x O, the children need to be able to multiply a multiple of 10 by a one-digit number.
e.g. 20 x 3 = 60 40 x 5 = 200

Show the link with arrays to first introduce the grid method (TO x O).



4 rows of 10
4 rows of 3

Moving to expanded method TO x O within Year 3 multiplication tables.



Short multiplication

	H	T	O
		3	2
×			5
	1	6	0
	1	1	

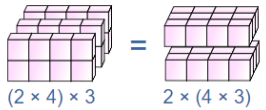
Long multiplication

x		3	2
			5
		1	0 (5 x 2)
+	1	5	0 (5 x 30)
	1	6	0

Use place value counters and dienes to model **exchanging**.

Year 4

By the end of Year 4, children should be fluent in all times tables facts up to **12 x 12**, including multiplying by 0 and 1. They learn to multiply 3 numbers together, using the **associative law** of multiplication (no matter how the numbers are grouped, the answer will always be the same).



Grid method
26 x 7 = 182

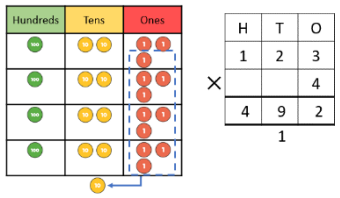
x	20	6	Total
7	140	42	182

348 x 9 = 3132

x	300	40	8	Total
9	2700	360	72	3132

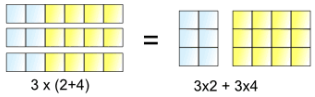
+ 2700, 360, 72 = 3132 (1 1)

Move onto expanded method, then compact.
123 x 4 = 492



	H	T	O
	1	2	3
×			4
	4	9	2
		1	

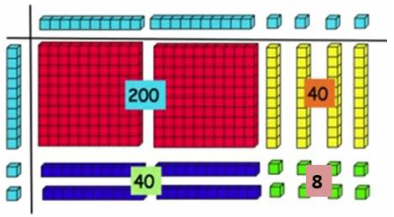
Introduce the **distributive law** (multiplying a number by a group of numbers added together is the same as doing each multiplication separately).



Year 5

Multiply numbers up to 4 digits by a one- and two-digit numbers, using the grid method and the formal written method. Children to practise multiplying and dividing whole numbers by 10, 100 and 1000 mentally.

24 X 12 = 200 +40 + 40 + 8 = 288



Grid method

x	20	4	Total
10	200	40	240
2	40	8	48
			288

Short multiplication

		2	4
x		1	2
		4	8
2	4	0	
2	8	8	

Long multiplication

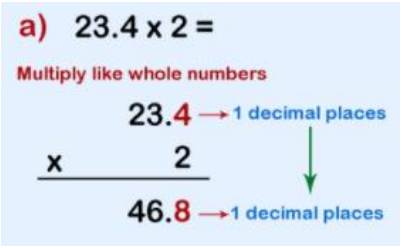
		2	4	
x		1	2	
			8	(2 x 4)
		4	0	(2 x 20)
		4	0	(10 x 4)
+	2	0	0	(10 x 20)
	2	8	8	

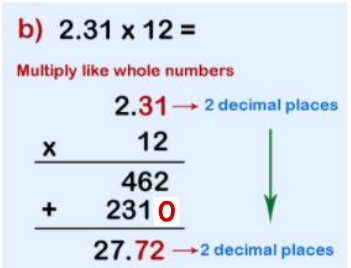
Year 6

Multiply numbers up to 4 digits by a 2-digit whole number, using the formal written method of multiplication. Consolidate multiplying whole numbers and decimal numbers by 10, 100 and 1000.

TTh	Th	H	T	O
	2	7	3	9
×			2	8
2 (2)	1 (5)	9 (3)	1 (7)	2
1 (5)	4	7 (1)	8	0
7	6	6	9	2

Moving to multiplying whole numbers by decimal numbers (up to 2 decimal places).

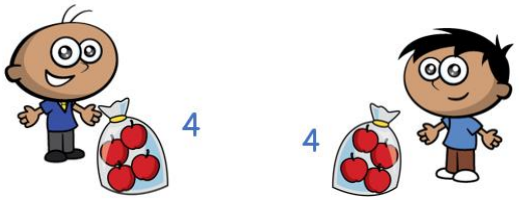




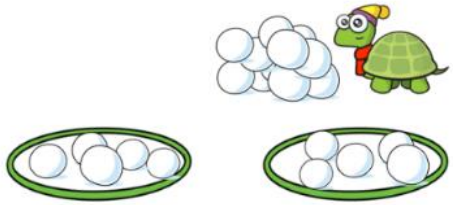
divide share equally quotient **÷ Division ÷** group equally remainder

EYFS

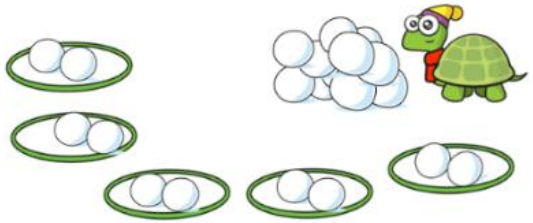
Introduce language and concept of sharing fairly and making equal groups.



Tiny, can you make 2 equal groups of 5?



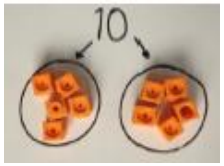
Tiny, can you make 5 equal groups of 2?



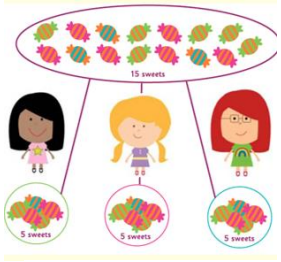
Year 1

Understand division as sharing into equal groups, using concrete objects, pictorial representations and arrays.

Share equally



10 cubes shared equally in 2 groups



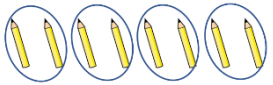
15 shared equally between 3

6 shared equally in 3 groups

Make equal groups

Make equal groups of 5.

Make equal groups of 2.



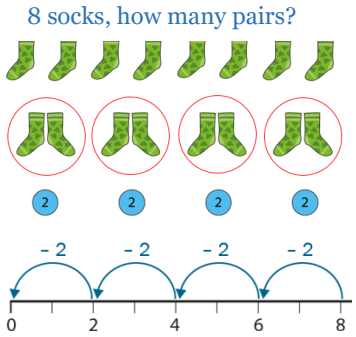
There are 8 pencils altogether.
There are 2 pencils in each group.
There are 4 equal groups of 2 pencils.

Array

There are _3_ columns.
There are _3_ counters in each column.
There are _9_ counters altogether.

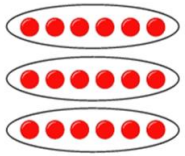
Year 2

By the end of Year 2, pupils should recall all division facts for 2, 5 and 10 times tables.



8 is divided into 2 groups.
There are 4 groups.
There are 4 groups of 2 in 8.

8 is divided into groups of 2. There are 4 groups.
8 ÷ 2 = 4
8 divided into groups of 2 is equal to 4.



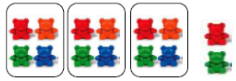
18 ÷ 3 = 6
number in all
number of groups
number in each group

Link division to multiplication by creating an array and deducing the number sentences.

15 ÷ 5 = 3
15 ÷ 3 = 5
3 x 5 = 15
5 x 3 = 15

35 ÷ 5 = 7

Finding remainders: divide objects between groups and see how much is left over.



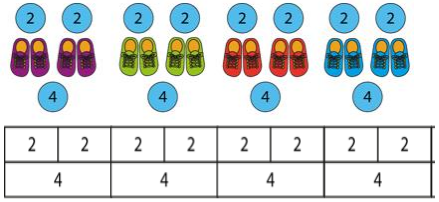
14 ÷ 3 = 4 remainder 2

14 ÷ 4 = 3 remainder 2

divide share equally quotient ÷ Division ÷ group equally remainder

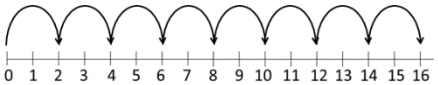
Year 3

Focus on understanding, representing and remembering the times tables facts for 2, 5, 10, 3, 4 and 8 and the related division facts.

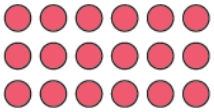


How many groups of two are there?
How many groups of four are there?

16 ÷ 2 = 8



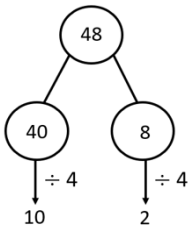
Fact family



18 ÷ 6 = 3
18 ÷ 3 = 6
3 x 6 = 18
6 x 3 = 18

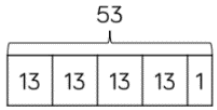
Divide 2-digit numbers by a 1-digit number by partitioning into tens and ones and sharing into equal groups.

48 ÷ 4 = 12



10 + 2 = 12

Divide 2-digit numbers by a 1-digit with remainder.

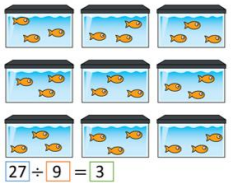


53 ÷ 4 = 13 r1

Year 4

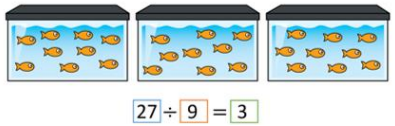
Focus on understanding, representing and remembering **all** the times tables facts up to 12 x 12 and the related division facts.

Sharing



3 fish in each of the 9 tanks
(27 shared equally between 9 is 3)

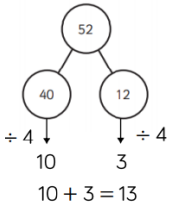
Grouping



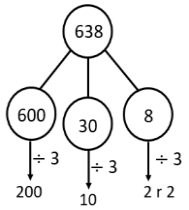
3 tanks with 9 fish each
(3 groups of 9)

Continue using partitioning and part-whole models to divide up to 3 digits by 1 digit with remainder.

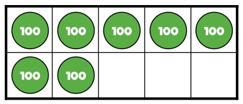
52 ÷ 4 = 13



638 ÷ 3 = 212 r 2

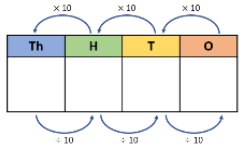


Also, consolidate **multiplying and dividing by 10 and 100**.



700 ÷ 100 = 7
700 = 7 groups of 100

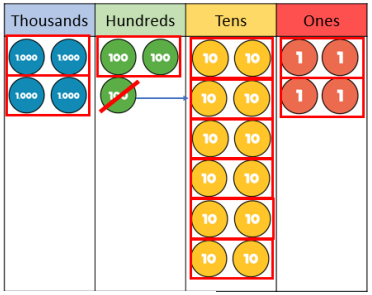
Use the place value grid.



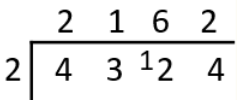
Year 5

Divide numbers up to 4 digits by a 1-digit number, using short division. Start with place value grids and place value counters.

4324 ÷ 2 = 2162

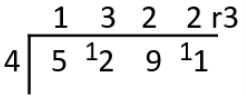


Short division

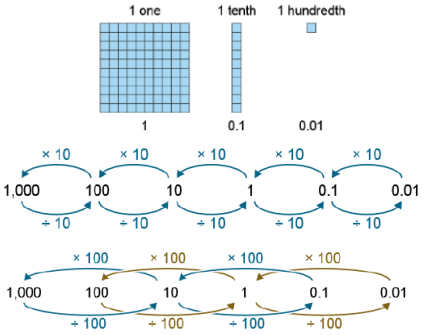


Interpret **remainders** appropriately for the context.

5291 ÷ 4 = 1322 r 3

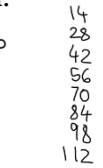


Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000, using the multiplicative relationships between powers of 10.

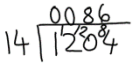


Year 6

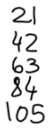
Divide up to 4 digits by 1 or 2 digits, using the formal written method of **short division**.



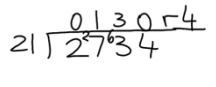
1204 ÷ 14 = 86

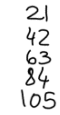


Express remainders as a whole number, a fraction or a decimal.

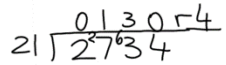


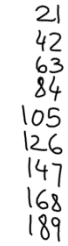
2734 ÷ 21 = 130 r4



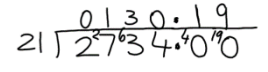


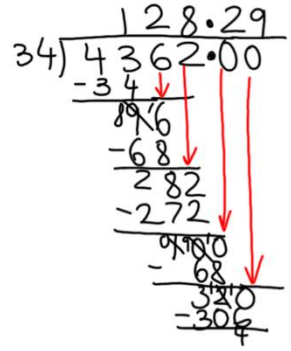
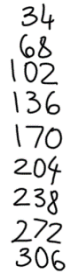
2734 ÷ 21 = 130 r 4/21





2734 ÷ 21 = 130.19



Long division

4362 ÷ 34 = 128.29