Wroxall Primary School

WROXALL
PRIMARY SCHOOL

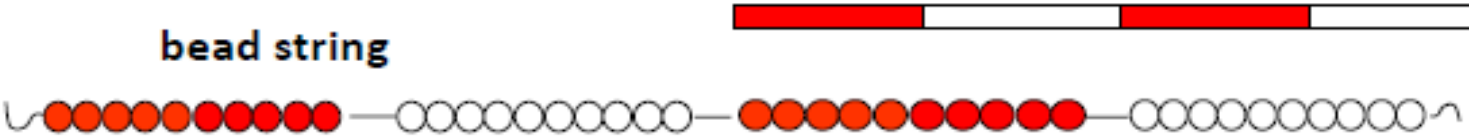
CHALLENGE • ACHIEVEMENT • RESILIENCE • ENJOYMENT

Whole School Written Calculation Policy
Foundation Stage, Key Stage 1 and Key Stage 2

July 2024

Facilitating a 'concrete' experience and using models and images. (possible resources)

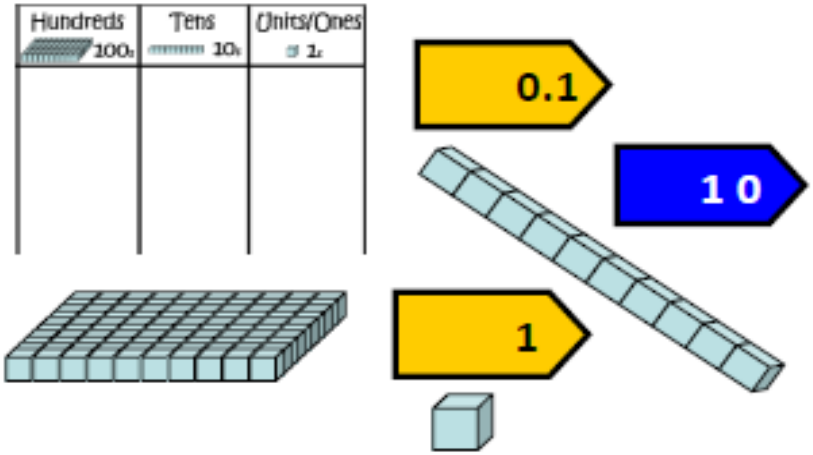
bead string



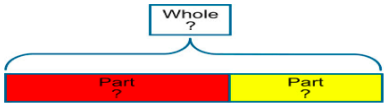
count stick

Bar Model

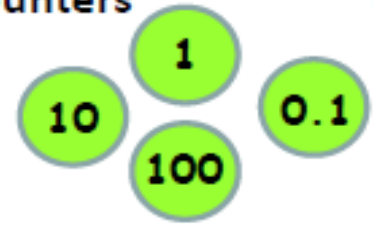
place value apparatus

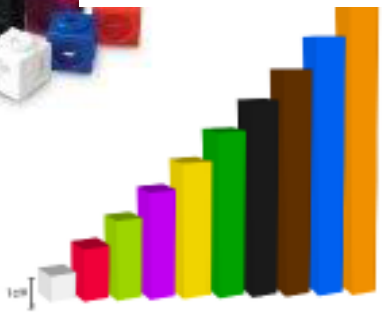


Multilink



place value counters





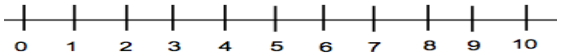
Cuisenaire

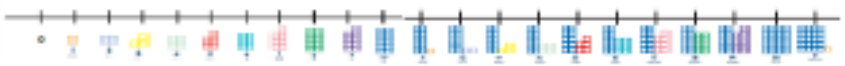
Numicon

double sided counters

number grids 100 and 200

number line





Vocabulary – Years 1-6

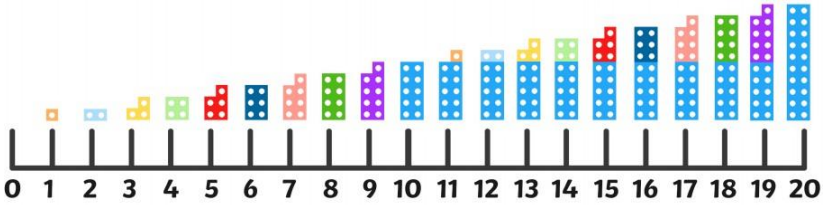
	Addition - Vocabulary	Subtraction - Vocabulary
Year 1	Ones and tens Number bonds, number line. Add, more, plus, make, sum, total, altogether. Double Half Equals, same as Difference How many more to make ….? How many more is ….?	Half Difference How many more is ….? Subtract, take away, minus How many fewer is … ? How much less is ….?
Year 2	Numbers to one hundred Hundreds Inverse Double, near double Partition Recombine Hundred more/less	
Year 3	Numbers to one thousand Column addition Column subtraction	
Year 4	Tenths, hundredths, decimal places Round Thousand more/less Roman numerals Count through zero Negative numbers	
Year 5	Power of	
Year 6	Numbers to ten million	

	Multiplication - Vocabulary	Division - Vocabulary
Year 1	Odd, even Count on in twos Count on in tens (forwards from/backwards from) How many times? Lots of, groups of Repeated addition Double	Halve Share, share equally Groups in pairs, twos, fives, tens etc Equal groups of … Divide, divided by, left, left over
Year 2	Once, twice, five times, ten times How many times? Times, multiply, multiply by Multiple of Division facts	
Year 3	How many times? Three times, Four times Product Multiples of four, eight, fifty and one hundred	
Year 4	Multiplication facts (up to 12 x 12) Division facts Inverse Derive	
Year 5	Factor pairs Composite numbers Prime numbers Prime factors Square number Cubed number	
Year 6	Order of operations Common factors, common multiples BODMAS	

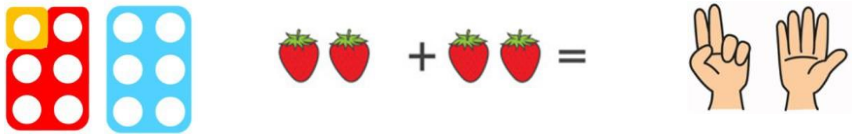
FOUNDATION STAGE

ADDITION

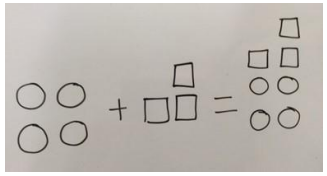
Have an understanding of what “more” means and be able to say what is one more than a given number, at first to 10 and then to 20.

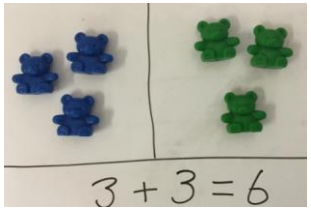


Begin to combine groups of objects or pictures using a variety of concrete apparatus.



Make a record in pictures, Numicon shapes or symbols of addition activities.





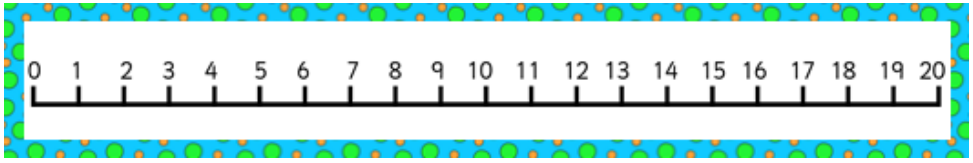
Children are encouraged to read number sentences aloud in different ways: e.g. “Three add two equals 5” “Four plus 3 makes 7”

Number lines can be used alongside practical apparatus to solve addition calculations and word problems. Children “jump” along the number line to “count on”, adding 2 single-digit numbers.

4 + 3 = 7

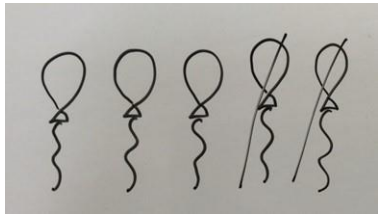
SUBTRACTION

Have an understanding of what “less” means and be able to say what is one less than a given number, at first from 10 and then from 20.



Begin to use objects, pictures and concrete apparatus to relate subtraction to taking away and counting how many objects are left.

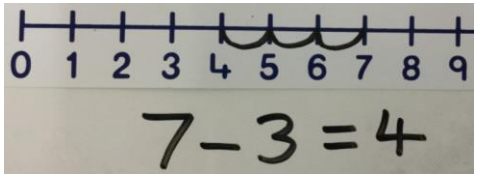
Make a record in pictures, words, Numicon shapes or symbols of subtraction activities.



6 - 1 = 5

Children are encouraged to read number sentences aloud in different ways e.g. “Five subtract one leaves four” “Six take away 3 equals 3”.

Number lines can be used alongside practical apparatus to solve subtraction calculations and word problems, “jump” back to “count down“ the number line.

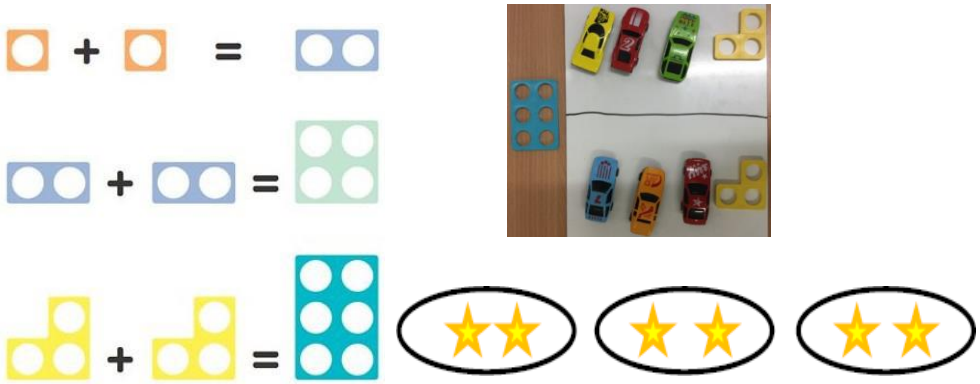


Jump back under the number line

FOUNDATION STAGE

MULTIPLICATION

The link between addition and multiplication can be introduced through doubling and reinforced through repeated addition of the same number.



Children begin with pictorial representations. Use real life contexts and practical equipment to count in repeated groups of the same size.

Extending to count in twos, fives and tens, both aloud and with objects, such as Numicon or other concrete apparatus.

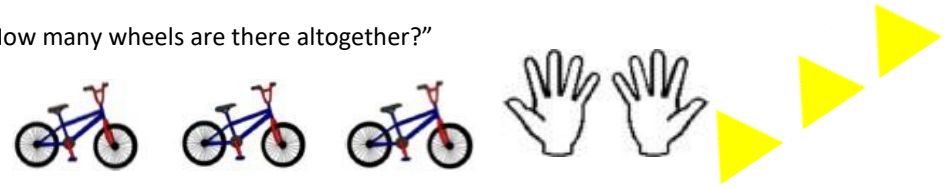
Children are encouraged to read number sentences aloud in different ways

e.g. “Five groups of two makes ten” “Three lots of two makes six”.

Children are given multiplication problems set in a real life context and are encouraged to visualise the problem.

e.g. “How many fingers on two hands?” “How many sides on three triangles?”

“How many wheels are there altogether?”



DIVISION

Division can be introduced through halving or sharing an equal amount into 2 groups.

“6 gingerbread men shared between 2 people means they get 3 each”

“6 shared between 2 equals 3”

Children begin with mostly pictorial representations linked to real life contexts, recording their work using these objects such as the example above.

Children need to see and hear representations of division as both grouping and sharing, although the focus at this stage is on division as sharing.

Grouping Model
Mum has 6 socks. She grouped them into pairs. How many pairs did she make?

Sharing Model
I have 10 sweets. I want to share them with my friend. How many will we have each?

ADDITION

Year 1

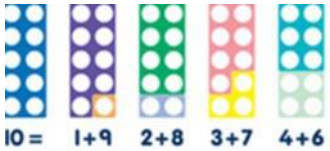
+ = signs and missing numbers

3 + 4 = • • = 3 + 4

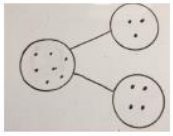
3 + • = 7 7 = • + 4

• + 4 = 7 7 = 3 + •

• + = 7 7 = • +



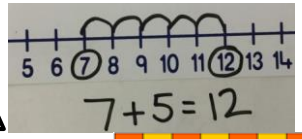
3 + 4 is the same as 7 as modelled using Numicon



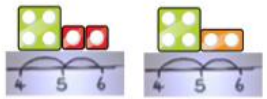
Use a Part Part Whole model to support balancing equations

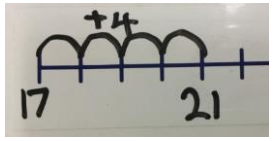
Using number tracks / lines

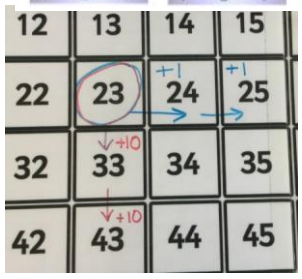
Counting up in ones



Moving onto blank number lines with partitions

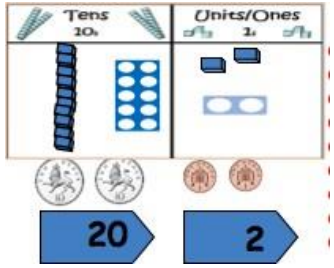






Using a hundred square

Secure understanding of adding 1s and 10s on a hundred square

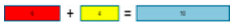


Children need of practice of partitioning into 10s and 1s using a variety of apparatus

Year 2

+ = signs and missing numbers

Extend to



14 + 5 = 10 + •

and adding three numbers

32 + • + • = 100 35 = 1 + • + 5

Partition into tens and ones and recombine

12 + 23 = 10 + 2 + 20 + 3

= 30 + 5

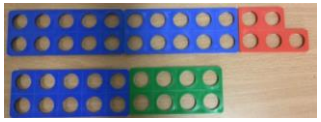
= 35

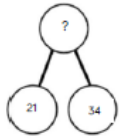
refine to partitioning the second number only:

23 + 12 = 23 + 10 +1 + 1

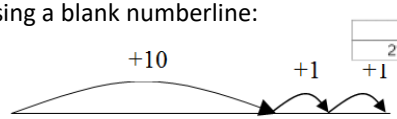
= 33 + 1 + 1

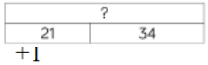
Use numicon, PPW or bar modelling to support, combine tens first



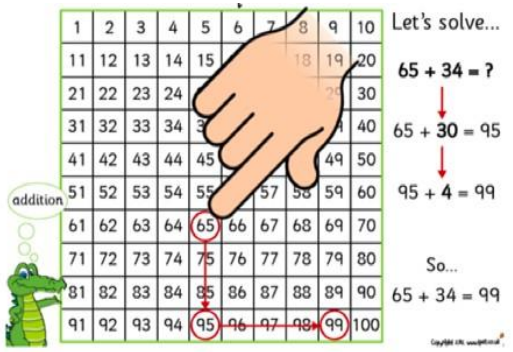


Using a blank numberline:





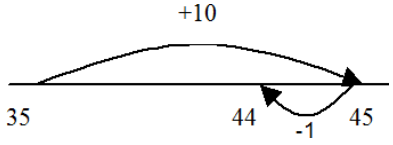
Using a hundred square:



Mental Method

Add 9 or 11 by adding 10 and adjusting by 1

35 + 9 = 44



Year 3

+ = signs and missing numbers

Continue using a range of equations as in Stages 1 and 2 but with appropriate, larger numbers.

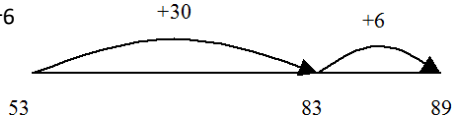
Partition into tens and ones and recombine

Partition both numbers and recombine. Refine to partitioning the second number only e.g.

36 + 53 = 53 + 30 +6

= 83 + 6

= 89



Can continue to use numicon / dienes / hundred square to model and support as required.

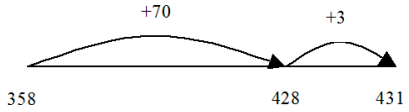
Partition into hundreds, tens and ones and recombine

Either partition both numbers and recombine or partition the second number only e.g.

358 + 73 = 358 + 70 + 3

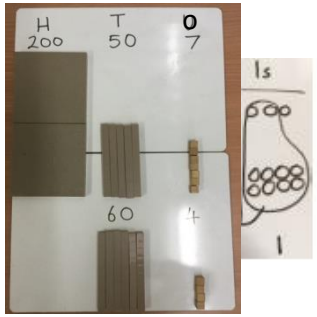
= 428 + 3

= 431



Using dienes 257 + 64 = 321

Concrete Representation



Pictorial Representation

ADDITION

Year 4

Introducing pencil and paper procedures

Begin with partition both numbers and recombining, adding the tens first

83 + 42 = 125

Progress this to units first

```
 8 3
+4 2
   5
 120
 125
```

```
  80 + 3
+ 40 + 2
 120 + 5 = 125
```

Extend this to 3 digit numbers

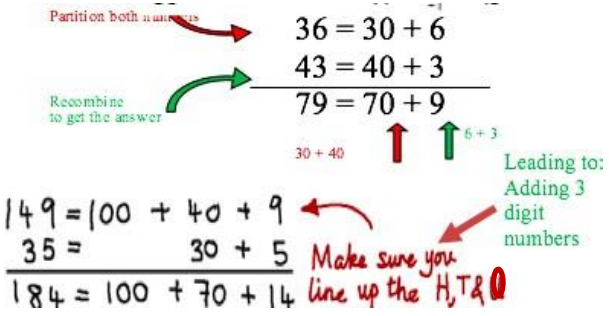
358 + 73 = 431

either **or**

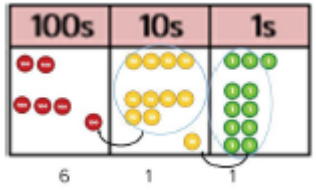
```
  300 +  50 +  8
+       70 +  3
  300 + 120 + 11 = 431
```

```
  358
   73
   11
  120
  300
  431
```

Alternative layout, helping to show equivalence:



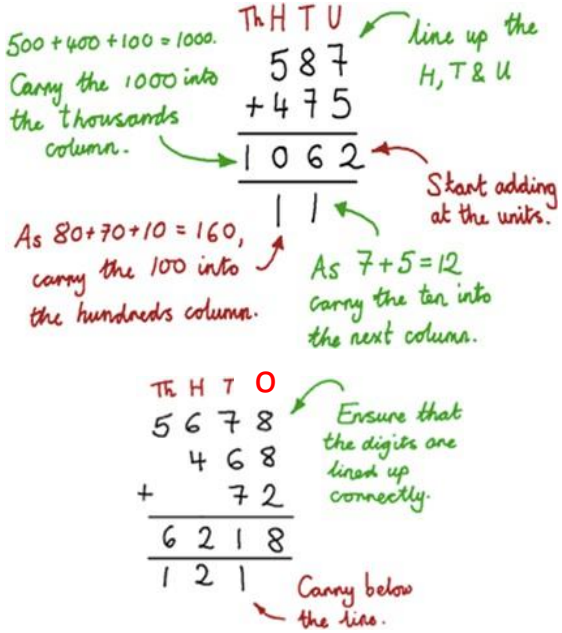
Concrete Method



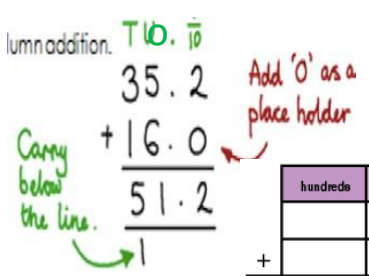
Year 5

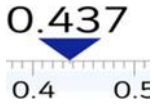
Pencil and paper procedures

Leading to more developed formal method, showing numbers carried underneath: 587 + 475 = 1062



Extend to decimals, using the same number of decimal places to begin:





	hundreds	tens	ones		tenths	hundredths
			2	.	4	
+			3	.	2	5
			5	.	6	5

Year 6

Pencil and paper procedures

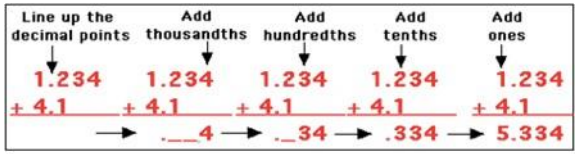
Extend to numbers with any number of digits and decimals with 1 and 2 decimal places.

124.9 + 117.25 = 242.15

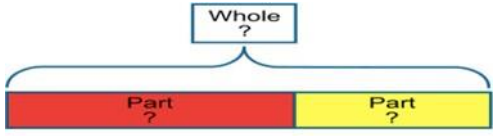
```
 124.90
+117.25
 242.15
  1 1
```

add in a zero to keep the place value

Extend to 3 decimals places:




```
  1.830
 21.105
236.800
+  0.900
260.635
```



□ + □ = □ + □

□ + □ = □ - □

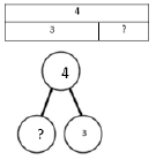
SUBTRACTION

Year 1

Pictures / marks

Sam spent 4p. What was his change from 10p?

PPW model



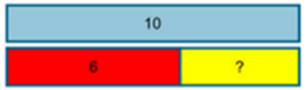
- = signs and missing numbers

7 - 3 = • • = 7 - 3

7 - • = 4 4 = • - 3

□ - 3 = 4 4 = 7 - •

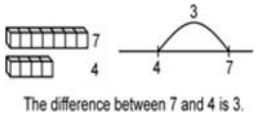
□ Δ = 4 4 = • -

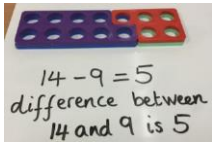


Understanding subtraction as take away, using concrete apparatus to begin

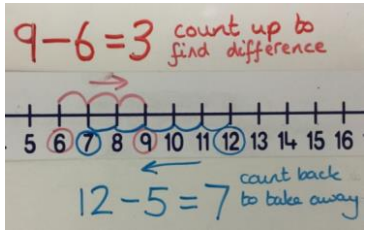
Moving to using number tracks and then numberlines, counting backwards to take away

Understanding subtraction as finding the difference

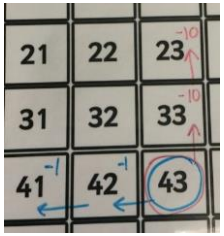




Finding the difference on a numberline by counting up



Can begin to use blank numberlines if appropriate (counting on or back in ones)



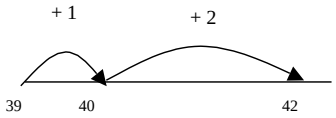
Using a hundred square for taking away ones and tens

Year 2

- = signs and missing numbers

Extend to 14 + 5 = 20 - •

Find a small difference by counting up



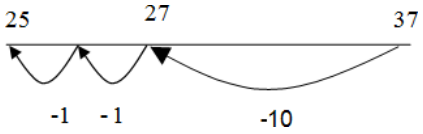
42 – 39 = 3

Use known number facts and place value to subtract (partition second number only)

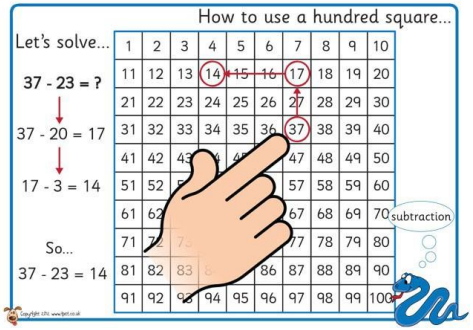
37 – 12 = 37 – 10 – 2

= 27 – 2

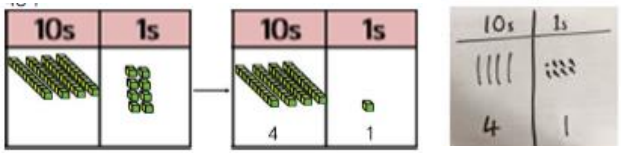
= 25



Using a hundred square



Concrete/ Pictorial Method



Year 3

Find a small difference by counting up

Continue as in Stage 2 but with appropriate numbers e.g. 102 – 97 = 5

Use known number facts and place value to subtract

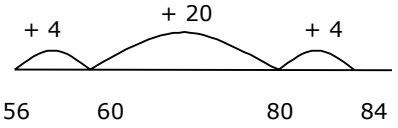
Continue as in Stage 2 but with appropriate numbers e.g. 3 digit number – 2 digit number.

197 – 15 = 182

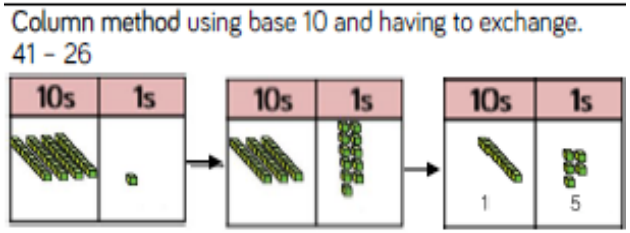
Complementary addition

Starting at the lower number, jumping to the nearest ten. Add the tens and then count on the extra

84 – 56 = 28



Throughout this stage continue to use concrete apparatus to model such as numicon and dienes to model taking away and finding the difference.



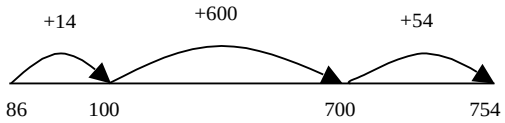
SUBTRACTION

Year 4

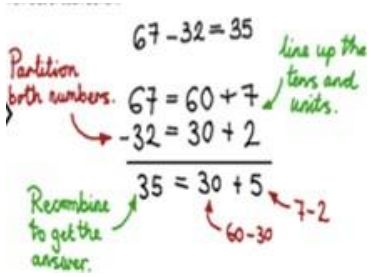
Complementary addition

Using 3 digit numbers, counting on in 100s

754 – 86 = 668



Introduce expanded written methods for 2 digit numbers



Using decomposition (exchanging) of tens:

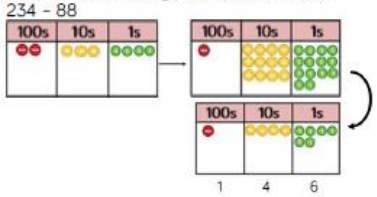
92 - 38

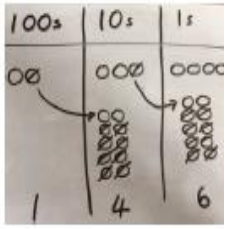
90 + 2 → 80 + 12
30 + 8 - 30 + 8
50 + 4

181 – 57

		70	11
181	=	100 + ~~80~~ + ~~1~~	
- 57	=	50 + 7	
124		100 + 20 + 4	

Column method using place value counters.
234 - 88





Concrete/Pictorial method

Year 5

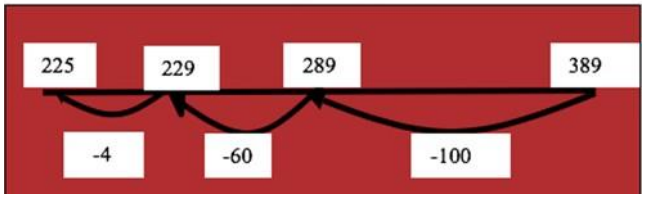
Find a difference by counting up

e.g. 8006 – 2993 = 5013

This can be modelled on an empty number line, as in lower KS2.

Continue to extend counting back on a blank number line to cover 3 digit minus 3 digit

389 – 164 = 225



Leading to expanded written method without exchanging:

774 - 432 =

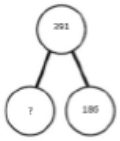
774 = 700 + 70 + 4
432 = 400 + 30 + 2

342 = 300 + 40 + 2

889 - 647 = 442

8	8	9
- 6	4	7
4	4	2

Introduce compact method when understanding of expanded method is secure



391	
186	?

Year 6

Expanded method with exchanging

935 - 587 =

800 +100 +10
935 = 900 + 30 + 5
587 = 500 + 80 + 7

348 = 300 + 40 + 8

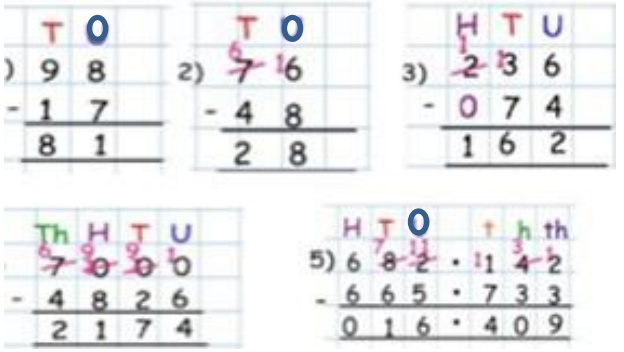
1004 – 692 = 442

1000 100

	0	0	4
-	6	9	2
	4	4	2

Continue to use expanded and compact method until children are secure

Apply across 2, 3 and 4 digit numbers, including decimals



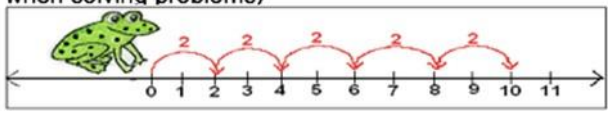
MULTIPLICATION

Year 1

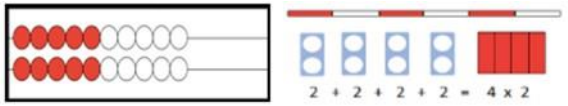
Counting in 2s, 5s and 10s using pictures and symbols

For example using objects and money

(Recording on a number line modelled by the teacher when solving problems)



Use concrete apparatus to show groups, such as bead strings,



Show counting in groups of 2s, 5s and 10s on a hundred square

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Year 2

Securing knowledge of 2s, 5s and 10s as times tables

Counting up and back in 2s, 5s and 10s

Recall of number facts

x = signs and missing numbers

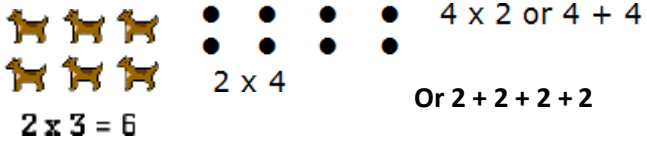
7 x 2 = ☐ ☐ = 2 x 7

7 x ☐ = 14 14 = ☐ x 7

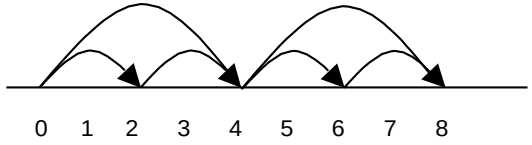
☐ x 2 = 14 14 = 2 x ☐

☐ x = 14 14 = ☐ x

Arrays and repeated addition

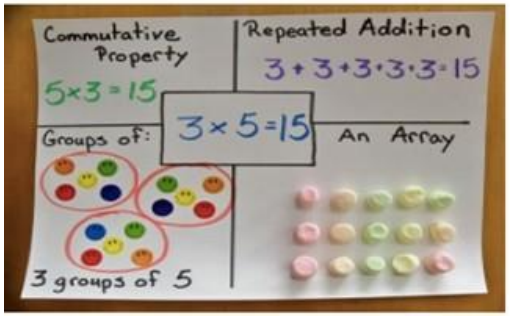


Shown on a numberline:



Understanding calculations

Ensure understanding of repeated addition and the commutative property are secure

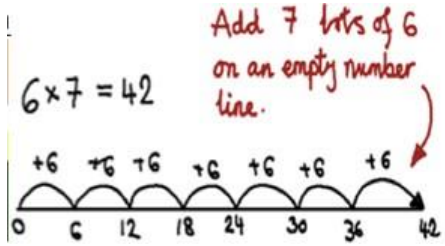


Year 3

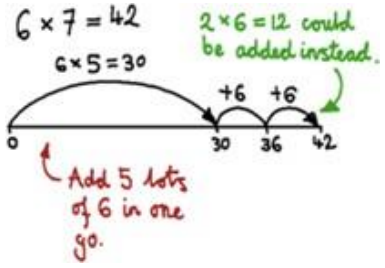
x = signs and missing numbers

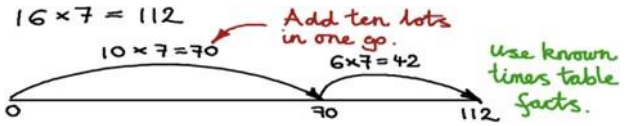
Continue using a range of equations as in Year 2 but with appropriate numbers.

Repeated addition on numberlines



Using knowledge of known number facts





Doubling multiples of 5 up to 100

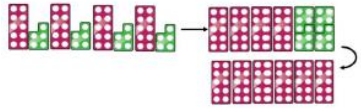
15 x 2 = 30

Partition (10 x 2) + (5 x 2)

20 + 10 = 30

Partition to multiply using Numicon, base 10 or Cuisenaire rods.

4 x 15



MULTIPLICATION

Year 4

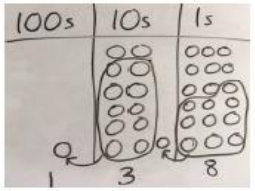
Introduce grid method

Tens and Ones x Ones

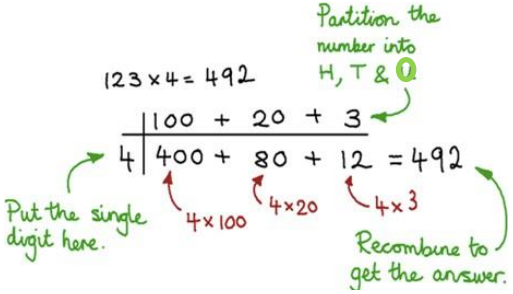
23 x 7 is approximately 20 x 10 = 200

23 x 7 = 161

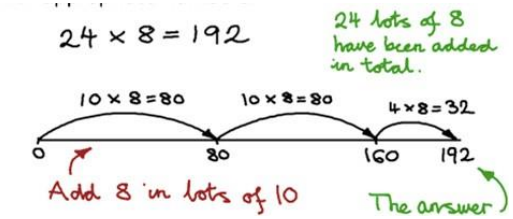
x	T: 20	O: 3
7	140	21



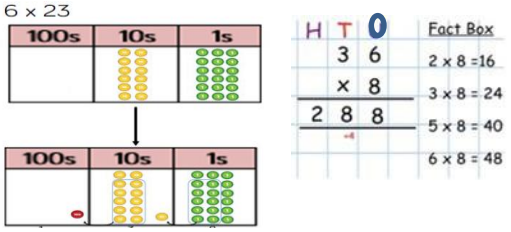
Hundreds, Tens and Units x Units



Using known number facts on a numberline



Begin to use column method with known number facts as aids



H	T	O
	3	6
x		8
2	8	8

Fact Box
2 x 8 = 16
3 x 8 = 24
5 x 8 = 40
6 x 8 = 48

Year 5

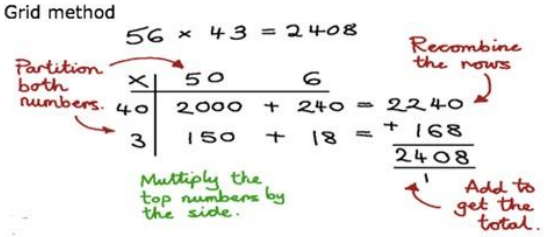
x = signs and missing numbers

2 digit x 2 digit using grid method

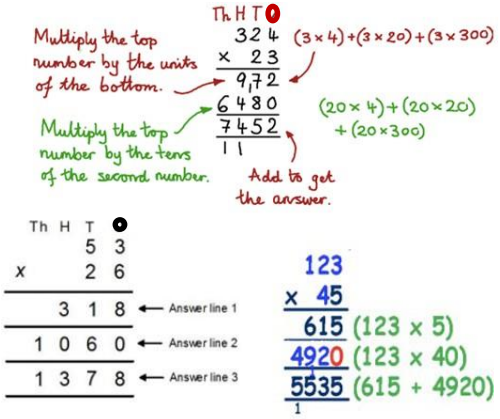
Grid method - estimate and check

56 x 43 is approximately 60 x 40 = 2400

Grid method



Long multiplication



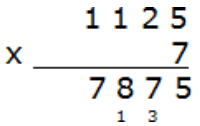
Grid method for single digit x decimal

5.9 x 3 =

X	5	0.9
3	15	2.7

15 + 2.7 = 17.7

Short multiplication can be introduced when secure with grid method and long multiplication eg



And TO x TO, HTO x TO

Year 6

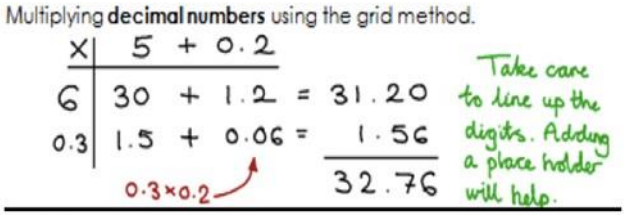
x = signs and missing numbers

Continue to use grid method, extending to 3 digit by 2 digit.

Estimate and check.

Grid method for decimals

5.2 x 6.3



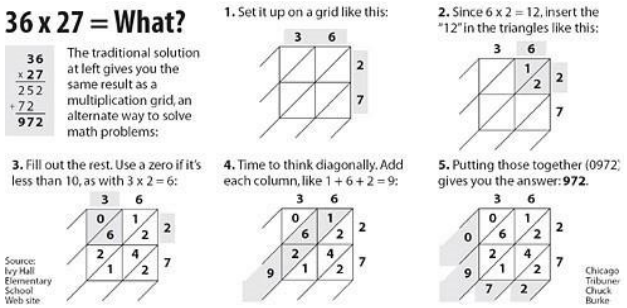
7.2 x 3.8

x	7	0.2	
3	21	0.6	= 21.60
0.8	5.6	0.16	= 5.76 +
			27.36
			1

2 decimal places

3.77 x 2.8

3.77 (2 decimal places)
2.80 (2 decimal places)
Remove the decimals and multiply, then add the decimal point after counting the decimal places in the question.
377
x 280
30160
75400
10.5560



DIVISION

Year 1

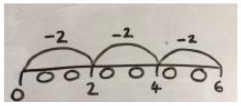
Pictures / marks

Division to be introduced as sharing and grouping, building on

Foundation Stage learning.

Grouping Model

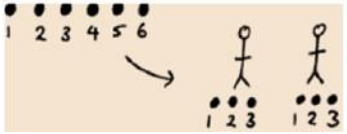
Mum has 6 socks. She grouped them into pairs. How many pairs did she make?

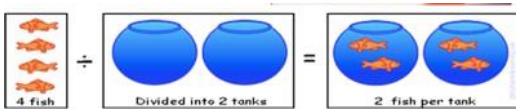


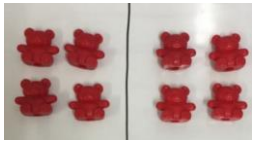
Sharing Model

I have 10 sweets. I want to share them with my friend. How many will we have each?

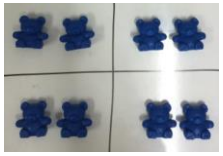
This should be reinforced with a variety of different counting objects and images:







8 shared between 2 = 4



8 shared between 4 = 2

Year 2

÷ = signs and missing numbers

To be used once children have an understanding of dividing

Numbers of objects and know the corresponding multiplication facts

6 ÷ 2 = □ □ = 6 ÷ 2

6 ÷ □ = 3 3 = 6 ÷ □

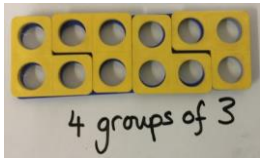
□ ÷ 2 = 3 3 = □ ÷ 2

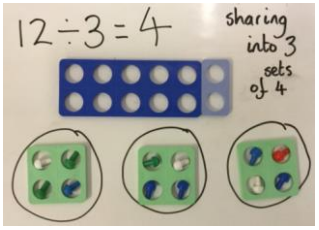
□ ÷ = 3 3 = □ ÷

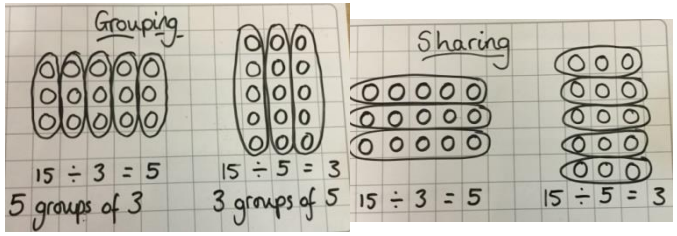
Understand division as sharing and grouping

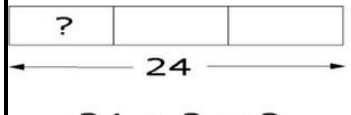
Build on the understand developed in stage one by working with a variety of models, including grouping on a blank numberline

12 ÷ 3 = 4

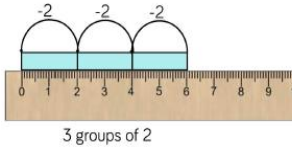




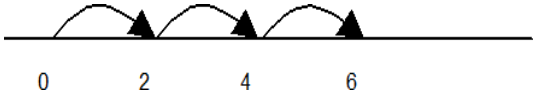




Cuisinaire rods



Grouping – There are 6 sweets. How many people can have 2 each? (How many 2's make 6?)



Year 3

÷ = signs and missing numbers

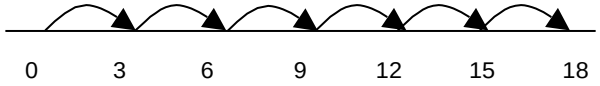
Continue using a range of equations as in Year 2 but with appropriate numbers.

Understand division as sharing and grouping

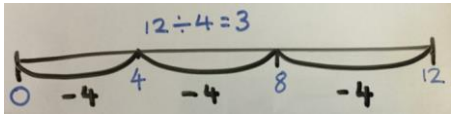
18 ÷ 3 can be modelled as:

Sharing – 18 shared between 3 using a variety of models as shown in Stage 1 and 2

Grouping - How many 3's make 18?

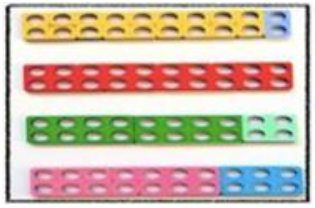


Repeated subtraction - how many groups of 4 fit into 12?



Remainders

Using numicon to introduce:



20 ÷ 3 = 6r2

20 ÷ 5 = 4

24 ÷ 8 = 2r4

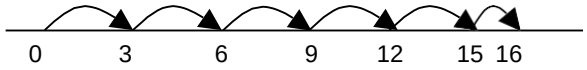
20 ÷ 7 = 2r6

16 ÷ 3 = 5 r1

Sharing - 16 shared between 3, how many left over?

Grouping – How many 3's make 16, how many left over?

e.g.



DIVISION

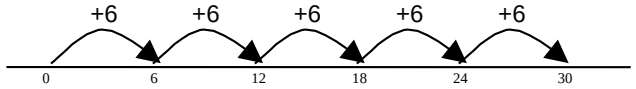
Year 4

÷ = signs and missing numbers

Sharing and grouping

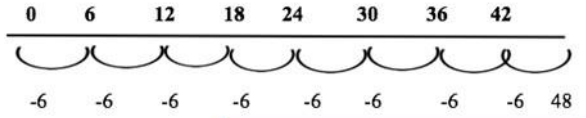
30 ÷ 6 can be modelled as:

Grouping – groups of 6 taken away and the number of groups counted e.g.



Use repeated subtraction. Subtract 6 repeatedly

48 ÷ 6 =

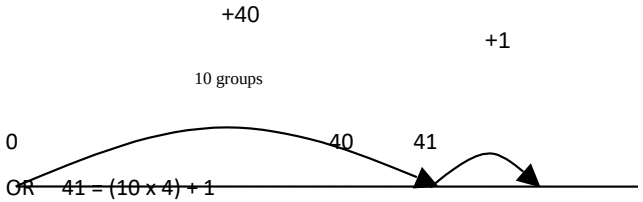


8 lots of 6 has been taken

Sharing – sharing among 6, the number given to each person

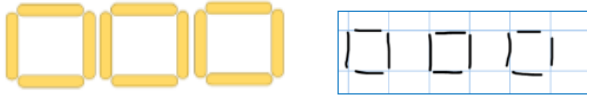
Number lines with remainders - jumping in sets of known number facts e.g.

41÷ 4 = 10 r1



Starting to use remainders:

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.

Year 5

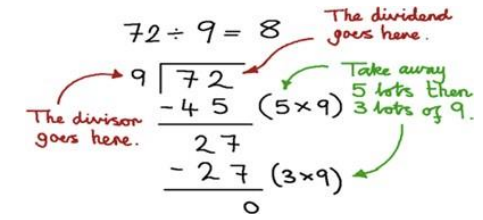
÷ = signs and missing numbers

Remainders

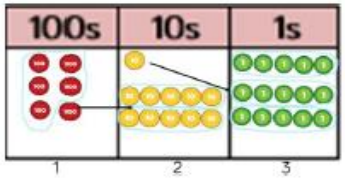
Quotients expressed as fractions or decimal fractions

61 ÷ 4 = 15 ¼ or 15.25

Using chunking for division

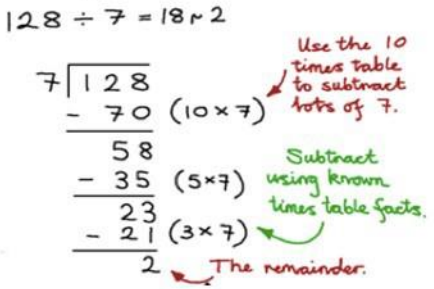


Short division using place value counters to group.
615 ÷ 5

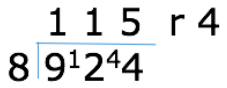


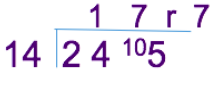
Chunking using times table facts.

Children will continue to explore division as repeated subtraction. They will use their increasing knowledge of times tables to subtract in larger chunks.



Chunking is best used for 2 or more digit divisors, whilst short division is better for 1 digit or simple 2 digit divisors





Year 6

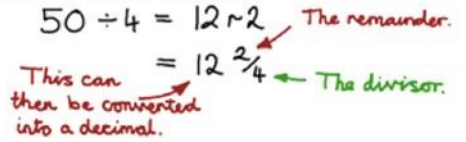
÷ = signs and missing numbers

Remainders

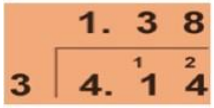
Quotients expressed as fractions or decimal fractions

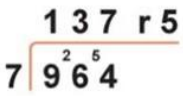
676 ÷ 8 = 84.5

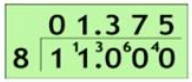
Expressing the remainder as a fraction.



This leads into short division with decimals:







Leading into long division as appropriate: