Reeth and Gunnerside Schools

Calculation Policy for Mathematics


Addition


Subtraction


Multiplication


Division

Year 1

Counting and combining sets of objects

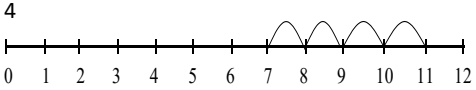
Combining two sets of objects will progress to adding on to a set.

Counting on with a number track

1	2	3	4	5	6	7	8	9	10	11	12

Counting on with a number line

7+ 4



+ and = signs and missing numbers

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

2 = 1+ 1

2 + 3 = 4 + 1

Missing numbers need to be placed in all possible places.

3 + 4 = □ □ = 3 + 4

3 + □ = 7 7 = □ + 4

Year 2

Missing number problems

e.g. 14 + 5 = 10 + □ 32 + □ + □ = 100 35 = 1 + □ + 5

It is valuable to use a range of representations (also see Y1).

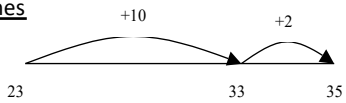
Continue to use number lines to develop understanding of:

Counting on in tens and ones

23 + 12 = 23 + 10 + 2

= 33 + 2

= 35

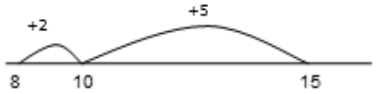


Bridging over multiples of 10

The steps in addition often bridge through a multiple of 10

e.g. Children should be able to partition the 7 to relate adding the 2 and then the 5.

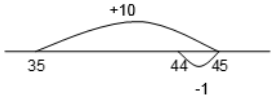
8 + 7 = 15



Adding 9 or 11 by adding 10 and adjusting by 1

e.g. Add 9 by adding 10 and adjusting by 1

35 + 9 = 44

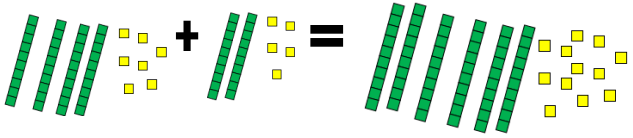


Towards a written method

Partitioning in different ways and recombine

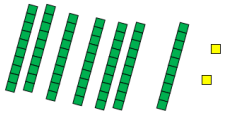
47+25

47 25 60 + 12



Leading to exchanging:

72



Expanded written method

40 + 7

+ 20 + 5

60 + 12 = 72

Year 3

Missing number problems using a range of equations as in Year 1 and 2 but with appropriate, larger numbers.

Bridging over multiples of 1, 10 and 100 and 1,000

Bridging over multiples of 10 37 + 4 = 41

Bridging over multiples of 100 280 + 40 = 320

Bridging over 1,000 800 + 500 = 1,300

Bridging over whole numbers 3.6 + 0.8 = 4.4

Progress to trickier numbers 753 + 500 = 1,253

Children need to be secure adding multiples of 10 and 100 to any three-digit number including those that are not multiples of 10.

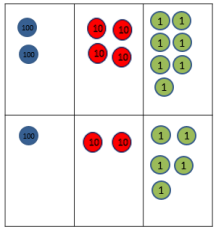
Partition into tens and ones

Partition both numbers and recombine. **45 + 32 = 77**

70 **7**

Towards a written method

Introduce expanded column addition modelled with place value counters or Dienes.



200 + 40 + 7

100 + 20 + 5

300 + 60 +12 = 372

247

+125

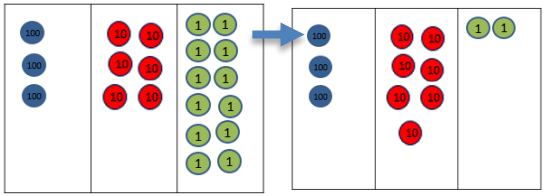
12

60

300

372

Leading to children understanding the exchange between tens and ones.



Some children will begin to use a formal columnar algorithm. The formal method should be seen as a more streamlined version of the expanded method, not a new method.

247

+125

372

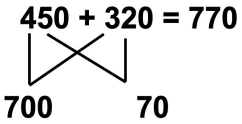
Year 4

Missing number / digit problems
e.g. 0.95 + ___ = 1.05

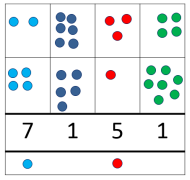
Bridging should continue to be developed, building on that covered in Y3.

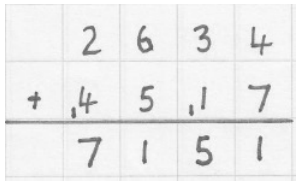
Bridging over thousands	6,700 + 500 = 7,200
Progressing to tricky numbers	6,735 + 500 = 7,235
Bridging over tenths	0.07 + 0.04 = 0.11

Partitioning
Partition numbers and recombine.



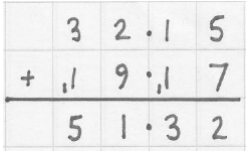
Column addition
Progressing to 4 digits:



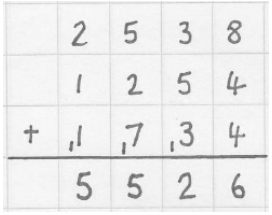


Children should be able to make the choice of reverting to expanded methods if experiencing any difficulty.

Decimals:

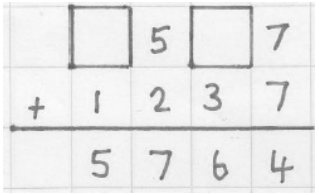


3 number stack:



Year 5

Missing number / digit problems
e.g. 6.995 + ___ = 7

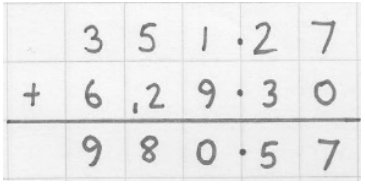


Bridging should continue to be secured and extended.

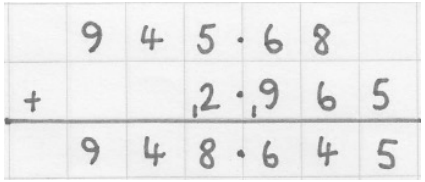
Larger numbers	680,000 + 30,000 = 710,000
Tricky numbers	681,422 + 30,000 = 711,422
Bridging over hundredths	0.007 + 0.005 = 0.012

Partitioning
Partition numbers and recombine. Children should practise with increasingly large numbers to aid fluency
e.g. 12462 + 2300 = 14762

Column addition
Progressing to more than 4 digits:

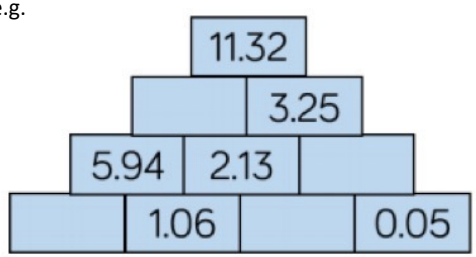


Numbers with digits in different place value columns:



Year 6

Missing number / digit problems
e.g.



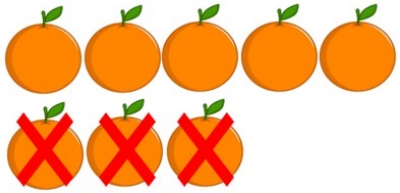
Mental methods should continue to develop, supported by a range of models and images.

Column addition
As year 5, progressing to larger numbers, aiming for both conceptual understanding and procedural fluency.

Year 1

Understand subtraction as taking away:

8 – 3 = 5

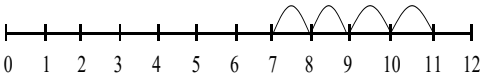


Counting back with a number track

1	2	3	4	5	6	7	8	9	10	11	12

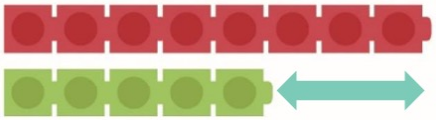
Counting back with a number line

11 – 4



Understand subtraction as finding the difference:

8 – 5 = 3

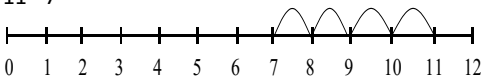


Find the difference with a number track

1	2	3	4	5	6	7	8	9	10	11	12

Find the difference with a number line

11 - 7



Missing numbers need to be placed in all possible places.

7 – 4 = □ □ = 7 – 4

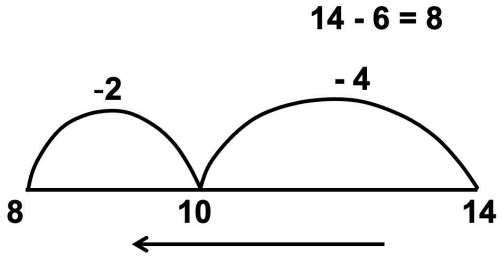
7 – □ = 3 3 = □ – 4

Year 2

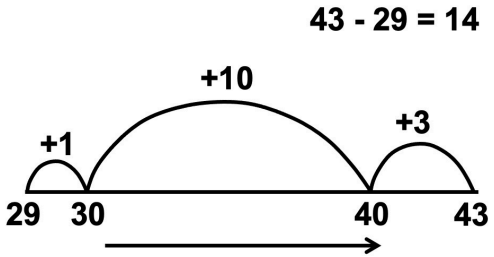
Missing number problems

e.g. 52 – 8 = □ □ – 20 = 25 22 = □ – 21 6 + □ + 3 = 11

Bridging back over multiples of 10



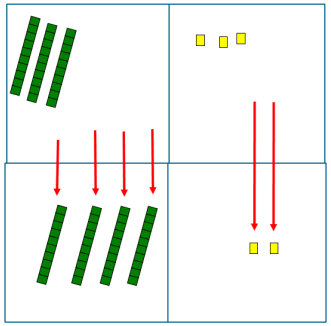
Find the difference



Towards a written method

Recording addition and subtraction in expanded columns can support understanding of the quantity aspect of place value and prepare for efficient written methods with larger numbers. The numbers may be represented with Dienes apparatus.

e.g.. 75 – 42



$$\begin{array}{r} 70\ \ 5 \\ -\ 40\ \ 2 \\ \hline 30\ \ 3 \end{array}$$

Year 3

Missing number problems

e.g. □ = 43 – 29 145 – □ = 138 245 – □ = 195

532 – 200 = □ □ – 25 = 198 □ – 60 = 152

Mental methods should continue to develop, supported by a range of images. Children should decide whether to use bridging back or find the difference.

Bridging back over multiples of 1, 10 and 100

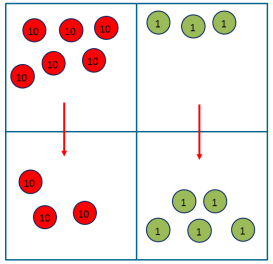
Bridging back over multiples of 10	41 – 4 = 37
Bridging back over multiples of 100	250 – 70 = 180
Bridging back over whole numbers	3.3 – 0.8 = 2.5
Progress to trickier numbers	723 – 50 = 673

Find the difference

e.g. 231 – 198 = 33 6.4 – 5.8 = 0.6

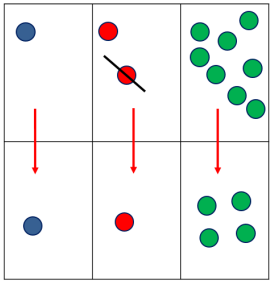
Towards a Written Method

Introduce expanded column subtraction with no decomposition, modelled with place value counters or Dienes



$$\begin{array}{r} 90\ \ 8 \\ -\ 30\ \ 5 \\ \hline 60\ \ 3 \end{array}$$

Explore exchanging, using counters or Dienes.



$$\begin{array}{r} {}^{2}\not{2}\,{}^{1}3\not{2} \\ -\ 114 \\ \hline 118 \end{array}$$

Some children will begin to use a formal columnar algorithm. The formal method should be seen as a more streamlined version of the expanded method, not a new method.

Year 4

Missing number problems

e.g. 200 – 90 – 80 = □ 225 – □5 = 150

3,450 – 1,000 = □ □ – 2,000 = 900 1,025 – □ = 998

Mental methods should continue to develop, supported by a range of models and images, including the number line.

Bridging back

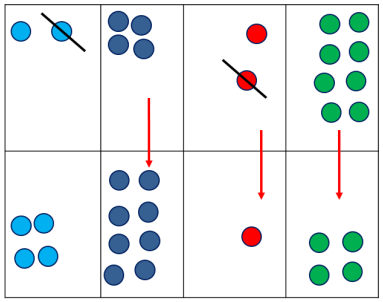
Bridging back over thousands	6,300 + 500 = 5,800
Progressing to tricky numbers	6,335 + 500 = 5,835
Bridging back over tenths	0.55 + 0.09 = 0.46

Find the difference

e.g. 2,200 – 1,900 = 300 2.54 – 1.98 = 0.56

Decomposition

Progressing to 4 digits:



5 1 2 1

6232

- 4814

1418

Children should be able to make the choice of reverting to expanded methods if experiencing any difficulty.

Decimals:

	2			
	~~3~~	'5	. 7	5
–	1	8	. 4	0
	1	7	. 3	5

Year 5

Missing number problems

1,000,000 – □ = 999,000 12,462 – 2,300 = □ 7,325 – 400 = □

Mental methods should continue to develop, supported by a range of models and images, including the number line.

Bridging back

Larger numbers	620,000 – 30,000 = 590,000
Tricky numbers	620,422 – 30,000 = 590,422
Bridging back over hundredths	0.015 – 0.007 = 0.008

Find the difference

e.g. 145,000 – 96,000 = 49,000 0.541 – 0.53 = 0.011

Decomposition

Progressing to more than 4 digits:

		2	16		
		~~3~~	~~7~~	. 10	5	9
–		1	8	. 4	2	3
		1	8	. 6	3	6

Tricky numbers (often found in tasks involving money):

		3	9	9	
		~~4~~	~~0~~	. ~~0~~	0
–			9	. 3	5
		3	0	. 6	5

Year 6

Missing number problems

	□	7	. 2	□
–	1	9	. 0	8
	1	8	. 1	6

Mental methods should continue to develop, supported by a range of models and images.

Decomposition

As year 5, progressing to larger numbers, aiming for both conceptual understanding and procedural fluency.

Continue calculating with decimals, including those with different numbers of decimal places, adding zeros as required.

e.g. 236.7 – 17.853

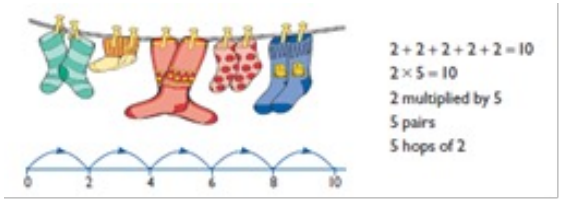
	2		15	16	9	
		~~3~~	~~6~~	. ~~7~~	~~0~~	0
–		1	7	. 8	5	3
	2	1	8	. 8	4	7

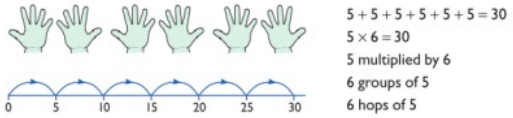
Year 1

Counting
Count in multiples of twos, fives and tens.

Understand multiplication as repeated addition
Understand multiplication is related to doubling and combining groups of the same size – repeated addition.

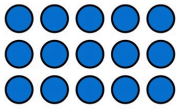
Use practical resources for counting – a washing line, concrete objects, Numicon, bundles of straws, bead strings.





Use hands on resources to develop the vocabulary relating to multiplication – e.g. pick up five, 4 times

Introduce arrays
Use arrays to understand multiplication can be done in any order.



5 x 3 = 15

3 x 5 = 15

Year 2

Counting
Count in multiples of twos, threes, fives and tens. Recall facts too.

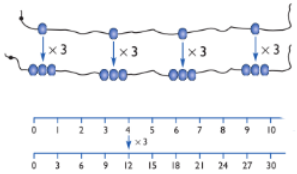
Express multiplication as a number sentence
Understand that multiplication can be done in any order.
5 x 3 = 15 3 x 5 = 15

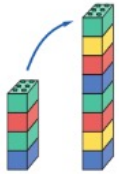
Use understanding of the inverse and practical resources to solve missing number problems.

7 x □ =	□ = 2 x 7
7 x □ = 14	14 = □ x 7
□ x 2 = 14	14 = 2 x □
□ x ◯ = 14	14 = □ x ◯

Explore arrays
Develop understanding of multiplication using array and number lines (see Year 1). Include multiplications not in the 2, 5 or 10 times tables.

Doubling and scaling
Double numbers up to 10 + 10. Use known doubles and partitioning to double 2 digit numbers (double 15 = double 10 + double 5)





double 4 is 8
4 × 2 = 8

Begin to develop understanding of multiplication as scaling (3 times bigger/taller)

Towards a written method
Use jottings to develop an understanding of doubling two digit numbers.

16 x 2 = 32

10 x 2 = 20 **6 x 2 = 12**

Year 3

Counting
Count in multiples of 2, 3, 4, 5, 8, 10, 50 and 100. Recall multiplication facts for the 2, 3, 4, 5, 8 and 10 times tables.

Missing number problems
Continue with a range of equations as in Year 2 but with appropriate numbers.

8 x 7 = □	□ = 7 x 8
8 x □ = 56	56 = □ x 8
□ x 7 = 56	56 = 7 x □
□ x ◯ = 56	56 = □ x ◯

Mental multiplication with partitioning
Double 2 digit numbers using partitioning.
14 x 2 = 10 x 2 and 4 x 2 = 20 and 8 = 28

Multiplication with multiples of 10 and tenths
Explore multiplication of multiples of 10 and tenths.
e.g.

3 x 7 = 21	3 x 7 = 21
30 x 7 = 210	0.3 x 7 = 2.1
30 x 70 = 2,100	(Note that pupils learn about hundredths in Y4)

Towards a written method
Extend the mental methods above to record partitioning of trickier numbers:
e.g.
23 x 5 =
20 x 5 = 100
3 x 5 = 15
100 + 15 = 115

Some Year 3 pupils may be ready to use short multiplication – see Year 4.

Year 4

Counting

Count in multiples of 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 25, 50, 100 and 1000. Count in tenths and hundredths. Recall multiplication facts up to 12 x 12.

Missing number problems

Continue with a range of equations as in Year 2 & 3 but with appropriate numbers. Also include equations with missing digits:

□2 x 5 = 160

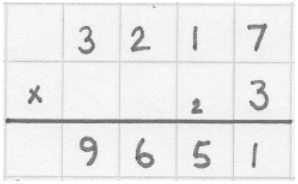
Multiplication with multiples of 10 and 100 and tenths and hundredths

e.g.

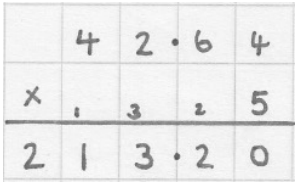
3 x 7 = 21	3 x 7 = 21
30 x 7 = 210	0.3 x 7 = 2.1
30 x 70 = 2,100	0.3 x 0.7 = 0.21
300 x 7 = 2,100	0.03 x 7 = 0.21
	(Note that pupils learn about thousandths in Y5)

Short multiplication

Make connections with previous learning of column addition and decomposition.



Include decimal numbers:



Year 5

Counting

Consolidate times tables knowledge. Count in thousandths. Count in other multiples of numbers like 15 and 75.

Multiplication with multiples of 10, 100 and 1,000 and tenths, hundredths and thousandths

e.g.

3 x 7 = 21	3 x 7 = 21
30 x 7 = 210	0.3 x 7 = 2.1
30 x 70 = 2,100	0.3 x 0.7 = 0.21
300 x 70 = 21,000	0.03 x 7 = 0.21
	0.03 x 0.7 = 0.021

Complete missing number questions with this knowledge.

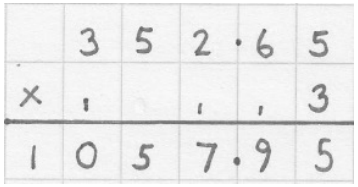
□ x 7 = 2,100

Other mental skills and knowledge

Use practical resources and jottings to explore equivalent statements (e.g. 4 x 35 = 2 x 2 x 35).
Identify factor pairs for numbers.
Recall prime numbers up to 50 and identify prime numbers up to 100.

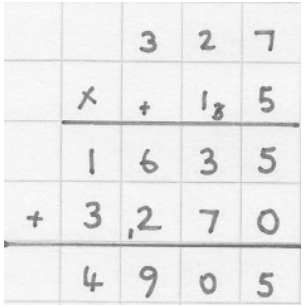
Short multiplication

Progressing to more than 4 digits:



Long multiplication

Begin with straightforward calculations.



Year 6

Counting

Continue to practise times tables knowledge. Count in thousandths. Count in other multiples of numbers like 15 and 75.

Multiplication with multiples of 10, 100 and 1,000 and tenths, hundredths and thousandths

See Y5.

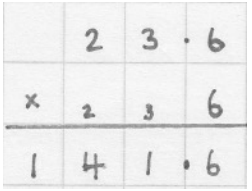
Other mental skills and knowledge

Use practical resources and jottings to explore equivalent statements (e.g. 4 x 35 = 2 x 2 x 35).
Identify factor pairs for numbers.
Recall prime numbers up to 50 and identify prime numbers up to 100.

Short multiplication

Extend to deal with tricky number situations like 23.6 x 0.6

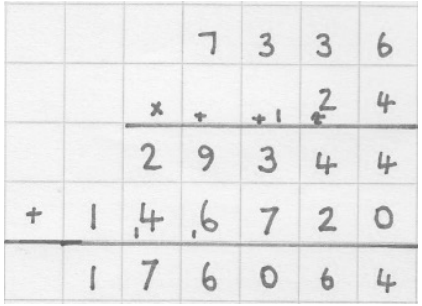
Work with 6 instead of 0.6



Divide the answer by 10.
141.6 ÷ 10 = 14.16

Long multiplication

Develop fluency with long multiplication.



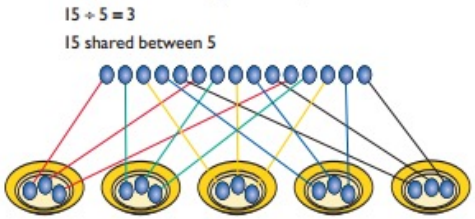
Year 1

Counting

Children must have secure counting skills – being able to confidently count in twos, fives and tens. Children should be given opportunities to reason about what they notice in number patterns.

Sharing

Children should be taught to share using concrete apparatus. Sharing develops one-to-one correspondence.

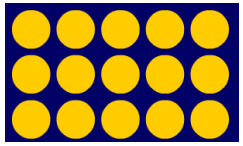


Grouping

Children should apply their counting skills to develop understanding of grouping.

Use of arrays as a pictorial representation for division.

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



Children should learn to find ½ and ¼ of simple objects, numbers and quantities.

Year 2

Counting

Learn to recall the associated division facts for the 2, 5 and 10 times tables.

Missing numbers

6 ÷ 2 = □ □ = 6 ÷ 2
6 ÷ □ = 3 3 = 6 ÷ □
□ ÷ 2 = 3 2 = □ ÷ 3
□ ÷ 3 = 2 2 = 6 ÷ □

Sharing and grouping

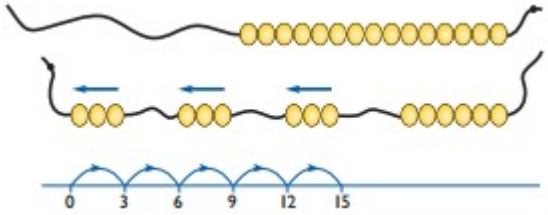
Know and understand sharing and grouping – introducing children to the ÷ sign.

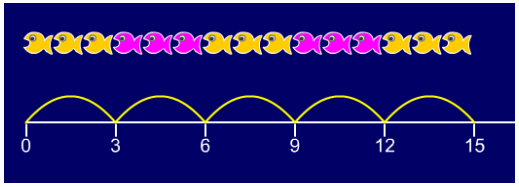
Children should continue to use grouping and sharing for division using practical apparatus, arrays and pictorial representations.

Grouping using a numberline

Group from zero in jumps of the divisor to find our 'how many groups of 3 are there in 15?'

15 ÷ 3 = 5





Continue work with arrays. Support children to understand how multiplication and division are inverse. Look at an array – what do you see?

Year 3

Counting

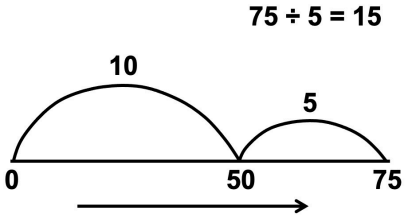
Recall division facts for the 2, 3, 4, 5, 8 and 10 times tables.

Missing numbers

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

24 ÷ 4 = □ □ = 24 ÷ 4
24 ÷ □ = 6 6 = 24 ÷ □
□ ÷ 4 = 6 4 = □ ÷ 6
□ ÷ 6 = 4 4 = 24 ÷ □

Towards a written method



Some pupils will begin to use a more efficient version of the number line. At school we call this a *What I know line.*

75 ÷ 5 = 15

1	5
10	50
5	25
15	75

Remainders

Children learn to complete calculations that involve remainders.

e.g.
49 ÷ 4 = 12 r1

Year 4

Counting

Recall associated division facts for all tables up to 12 x 12.

Division with multiples of 10 and 100

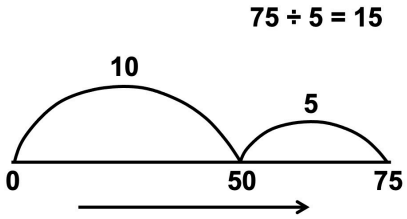
e.g.

240 ÷ 4 = 60 2,400 ÷ 4 = 600

Missing number problems

Continue with a range of equations as in Year 2 & 3 but with appropriate numbers.

Towards a written method



When ready, pupils develop fluency with a *What I know line.*

75 ÷ 5 = 15

1	5
10	50
5	25
15	75

Remainders

Children learn to complete calculations that involve remainders.

e.g.

49 ÷ 4 = 12 r1

Year 5

Counting

Pupils consolidate and practise division facts for all tables up to 12 x 12.

Division with multiples of 10, 100 and 1,000

e.g.

240 ÷ 4 = 60 2,400 ÷ 4 = 600 24,000 ÷ 4 = 6,000

3,200 ÷ 8 = 400 3,200 ÷ 80 = 40 3,200 ÷ 800 = 4

Missing number problems

e.g.

240 ÷ □ = 60 □ ÷ 50 = 30 □ ÷ ◯ = 20

Further use of the *What I know line*

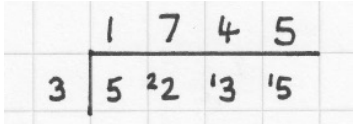
This strategy continues to be used through to Y6 for money questions.

e.g. Fred has £10. He buys as many toy planes as he can at the shop. They each cost £1.20. How many planes does he buy?

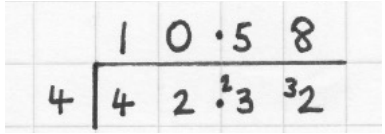
1	£1.20
10	£12
5	£6
2	£2.40
7	£8.40
8	£9.60

Short division

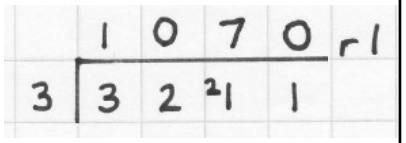
Whole number answers:



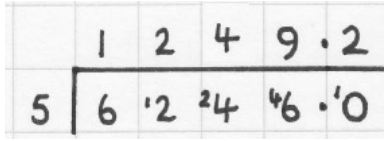
Decimals:



Reminders:



Decimal answers:



Year 6

Counting

Pupils continue to practise basic division facts.

Division with multiples of 10, 100 and 1,000

Further consolidation of calculations introduced in Year 5, aiming for both conceptual understanding and procedural fluency.

Missing number problems

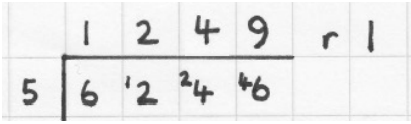
Further consolidation, aiming for both conceptual understanding and procedural fluency.

Further use of the *What I know line*

This strategy continues to be used through to Y6 for money questions. See Year 5 example.

Short division

Consolidation of Year 5 strategies, with a link made between fractions and decimals.



6246 ÷ 5 = 1259 r 1

= 1259 1/5

= 1259.2

Long division