Winterbourne Earls CE Primary Calculation Policy

Year 1

Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number.
Count, read and write numbers to 100 in numerals; count in multiples of 2s, 5s and 10s.

Addition

Read, write and interpret maths statements including +, -, =.
Represent and use number facts **within 20**.
Add and subtract one and two-digit **numbers to 20 including 0**.
Given a number, identify one more and one less
Identify and represent numbers using objects and pictorial representations including the number line and use the language of: equal to, more than, less than (fewer), most, least
Read and write numbers from 1 to 20 in numerals and words
Solve **one step problems** that involve addition and subtraction using **concrete objects** and **pictorial representations**, and **missing number problems**.

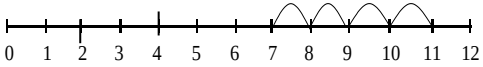
+ = signs and missing numbers

13 + 4 = □	□ = 13 + 4
3 + □ =17	17 = □ + 4
□ + 4 = 17	7 =1 3 + □
□ + ∇ =17	17 = □ + ∇

Promoting covering up of operations and numbers.

Number lines (numbered to 20)

7 + 4



Recording by - drawing jumps on prepared lines

-constructing own lines

(Teachers model using empty number lines)

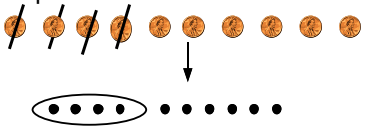
(Teachers model jottings appropriate for larger numbers)

For problem solving refer to DfES Models & Images

Subtraction

Pictures / marks

Sam spent 8p. What was his change from 20p?

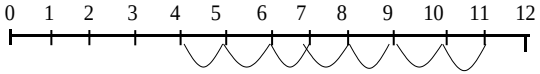


- = signs and missing numbers

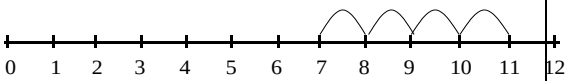
17 - 3 = □	□ = 17 - 3
17 - □ = 4	4 = □ - 3
□ - 1 3 = 4	4 = 17 - □
□ - ∇ = 4	4 = □ - ∇

Number lines (numbered to 20)

11 – 7
(Counting back)



The difference between 7 and 11
(Counting up)



Recording by - drawing jumps on prepared lines
- constructing own lines

(Teachers model jottings appropriate for larger numbers)

Multiplication

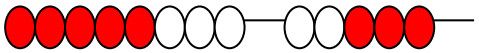
Double and halve numbers to 20
Solve **one step problems** involving multiplication and division, calculating the answer using **concrete objects**, **pictorial representations** and **arrays** with the support of the teacher.

Pictures and symbols

There are 3 sweets in one bag.
How many sweets are there in 5 bags?

For counting in 2, 5s, 10s see Models and Images document.
(Recording on a number line modelled by the teacher when solving problems)

Use of bead strings to model groups of.



Division

Pictures / marks

12 children get into teams of 4 to play a game. How many teams are there?

Winterbourne Earls CE Primary Calculation Policy

Year 2

Count in steps of 2, 3 and 5 from 0 and in tens from any number forwards and backwards.
Recognise the place value of each digit in a 2 digit number.
Recall and use multiplication and division facts for 2s, 5s and 10.

Addition

Solve problems with addition and subtraction using concrete objects, pictorial representations, including those involving numbers, quantities and measures.
Recall and use addition and subtraction facts to 20 fluently and derive and use related facts to 100.
Add and subtract numbers using equipment and pictures and mentally including:
2 digit number and ones (18 + 3); 2 digit number and tens (18 +10); Two 2 digit numbers (18 + 13); Adding three 1 digit numbers (5+6+7).
Show addition can be done in any order but subtraction cannot.
Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

+ = signs and missing numbers

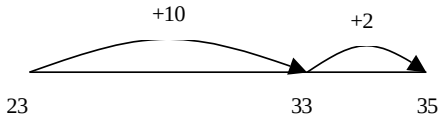
Continue using a range of equations as in Year 1 but with appropriate, larger numbers.
Extend to
14 + 5 = 10 + □
and adding three numbers
32 + □ + □ = 100 35 = 1 + □ + 5

Partition into tens and ones and recombine

12 + 23 = 10 + 2 + 20 + 3
= 30 + 5
= 35

Refine to partitioning the second number only:

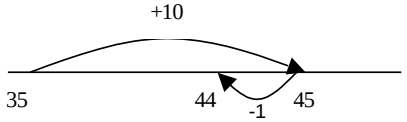
23 + 12 = 23 + 10 + 2
= 33 + 2
= 35



Once secure begin expanded columnar method

20 + 3
10 + 2
30 + 5

Add 9 or 11 by adding 10 and adjusting by 1
35 + 9 = 44



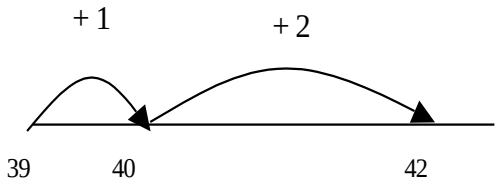
Subtraction

- = signs and missing numbers

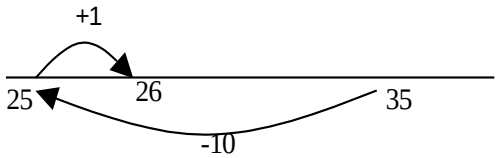
Continue using a range of equations as in Year 1 but with appropriate numbers.
Extend to 14 + 5 = 20 - □

Find a small difference by counting up

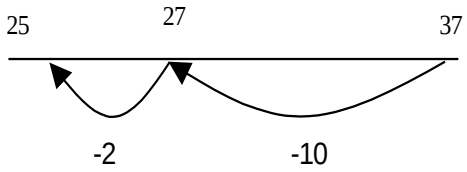
42 – 39 = 3



Subtract 9 or 11. Begin to add/subtract 19 or 21
35 – 9 = 26



Use known number facts and place value to subtract (partition second number only)
37 – 12 = 37 – 10 – 2
= 27 – 2
= 25



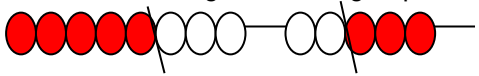
Multiplication

Recall and use x and ÷ facts for 2, 5 and 10 tables including recognising odd and even numbers.
Calculate mathematical statements for x and ÷ within the multiplication tables and write them using the x, ÷ and = signs.
Show multiplication can be done in any order (commutative) and division cannot.
Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods and x and ÷ facts including problems in context.
Connect the 10x table to place value.

There are 3 sweets in one bag.
How many sweets are there in 5 bags?

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

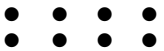
Use of bead strings to model groups of.



x = signs and missing numbers

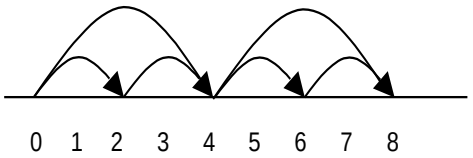
7 x 2 = □	□ = 2 x 7
7 x □ = 14	14 = □ x 7
□ x 2 = 14	14 = 2 x □
□ x ∇ = 14	14 = □ x ∇

Arrays and repeated addition



4 x 2 or 4 + 4
2 x 4
or repeated addition

2 + 2 + 2 + 2



Doubling multiples of 5 up to 50

15 x 2 = 30

Division

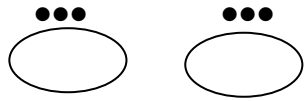
÷ = signs and missing numbers

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

Understand division as sharing and grouping

Sharing – 6 sweets are shared between 2 people. How many do they have each?

Grouping: 6 ÷ 2 can be modelled as 6 divided into 2 groups. 3 in each group.



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

Winterbourne Earls CE Primary Calculation Policy

Year 3

Pupils should be taught to

- count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number
- recognise the place value of each digit in a three-digit number (hundreds, tens, ones)
- compare and order numbers up to 1000
- identify, represent and estimate numbers using different representations
- read and write numbers up to 1000 in numerals and in words
- solve number problems and practical problems involving these ideas

Addition	Subtraction	Multiplication	Division
Add and subtract numbers mentally, including: A 3 digit number and ones A 3 digit number and tens A 3 digit number and 100s Add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction. Estimate the answer to a calculation and use inverse operations to check answers Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction. Add and subtract fractions with the same denominator within one whole. Add and subtract amounts of money to give change, using both £ and p in practical contexts.		Pupils continue to practise their mental recall of multiplication tables when they are calculating mathematical statements in order to improve fluency. Through doubling, they connect the 2, 4 and 8 multiplication tables. Pupils develop efficient mental methods, for example, using commutativity and associativity (for example, 4 × 12 × 5 = 4 × 5 × 12 = 20 × 12 = 240) and multiplication and division facts (for example, using 3 × 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (for example, 30 × 2 = 60, 60 ÷ 3 = 20 and 20 = 60 ÷ 3). Pupils develop reliable written methods for multiplication and division, starting with calculations of two-digit numbers by one-digit numbers and progressing to the formal written methods of short multiplication and division. Recognise that tenths arise from dividing an object into 10 equal parts and in dividing one digit numbers or quantities by 10.	
Pupils solve simple problems (one and two step) in contexts, deciding which of the four operations to use and why. These include measuring and scaling contexts, (for example, four times as high, eight times as long etc.) and correspondence problems in which m objects are connected to n objects. Solve problems that involve fractions. Estimate & Use inverse operations to check answers.			
+ = signs and missing numbers Continue using a range of equations as in Year 1 and 2 but with appropriate, larger numbers. **Add a near multiple of 10 to a two-digit & three digit number** Continue as in Year 2 but with appropriate numbers e.g. 35 + 19 is the same as 35 + 20 – 1. **Partition into hundreds, tens and ones and recombine** Partition both numbers and recombine. Refine to partitioning the second number only e.g.	**- = signs and missing numbers** Continue using a range of equations as in Year and 2 but with appropriate numbers. **Find a small difference by counting up** Continue as in Year 2 but with appropriate numbers e.g. 102 – 97 = 5 **Subtract mentally a 'near multiple of 10' to or from a two-digit & three digit number** Continue as in Year 2 but with appropriate numbers e.g. 78 – 49 is the same as 78 – 50 + 1	**x = signs and missing numbers** Continue using a range of equations as in Year 2 but with appropriate numbers. **Partitioning progressing to short multiplication.** Use known facts and place value to carry out simple multiplications e.g. 32 x 3 =(30x3)+(2x3) =90+6 =96	**÷ = 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 (see Year 2 diagram) Grouping - How many 3's make 18?

Winterbourne Earls CE Primary Calculation Policy

136 + 53 = 100 +50+ 30 + 6+ 3
= 100+ 80 + 9
= 189

Column addition (expanded progressing to compacting)

183 + 42 = 225

100+ 80 + 3
+40 + 2
100+120+5 =225

183
+ 42
5
120
100
225

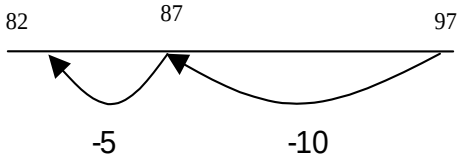
183
+ 42
225
1

Adding fractions with the same denominator

5 + 1 = 6
7 7 7

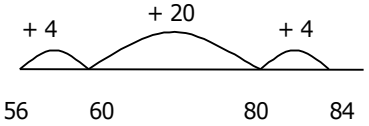
Use known number facts and place value to subtract

Continue as in Year 2 but with appropriate numbers e.g.
97 – 15 = 72



Pencil and paper procedures

Complementary addition
84 – 56 = 28

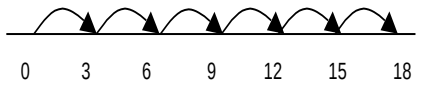


Column subtractions (expanded progressing to compacting) refer to column addition examples.

Subtracting fractions with the same denominator (see addition example).

Short multiplication

24
x 6
144
2



Remainders

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.

Progress to short division

98 ÷ 7 becomes

1 4
7 ⟌ 9 2 8

Winterbourne Earls CE Primary Calculation Policy

Year 4

Pupils should be taught to

- count in multiples of 6, 7, 9, 25 and 1000
- find 1000 more or less than a given number
- count backwards through zero to include negative numbers
- recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones)
- order and compare numbers beyond 1000
- identify, represent and estimate numbers using different representations
- round any number to the nearest 10, 100 or 1000
- solve number and practical problems that involve all of the above and with increasingly large positive numbers
- read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value.

Addition	Subtraction	Multiplication	Division
Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate. Estimate and use inverse operations to check answers to a calculation. Solve addition and subtraction two step problems in contexts, deciding which operations and methods to use and why. Add and subtract fractions with the same denominator.		Recall multiplication and division facts for multiplication tables up to 12 × 12. Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers. Recognise and use factor pairs and commutativity in mental calculations. Multiply 2 digit and 3 digit numbers by a 1 digit number using formal written layout. Solve problems involving multiplying and adding, using the distributive law to multiply 2 digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects. Divide a one or two-digit number by 10 and 100, identifying the value of digits in the answer as ones, tenths and hundredths.	

Solve number and practical problems (two step) involving 4 digit numbers.
Solve simple measure and money problems (two step) involving fractions and decimals to two decimal places.
Estimate & use inverse operations to check answers

+ = signs and missing numbers

Continue using a range of equations as in Year 3 but with appropriate larger numbers (4 digits).

Column addition (expanded and compacted)

Expanded example see Year 3.

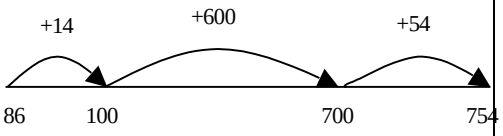
```
   7 8 9
+  6 4 2
-------
 1 4 3 1
   1 1
```

Answer: 1431

+ = signs and missing numbers

Continue using a range of equations as in Year 3 but with appropriate larger numbers (4 digits).

Complementary addition
754 – 86 = 668



x = signs and missing numbers

Continue using a range of equations as in Year 3 but with appropriate numbers

Multiply two and three digit numbers by a one digit using formal written layout:

24 × 6 becomes

```
  2 4
×   6
-----
1 4 4
  2
```

Answer: 144

342 × 7 becomes

```
  3 4 2
×     7
-------
2 3 9 4
  2 1
```

Answer: 2394

÷ = signs and missing numbers

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

Focus upon mental division using place value, known and derived facts.
For example:
42÷6= 7
420÷6=70
420÷60=7

Practise to become fluent in the formal written methods of short division:

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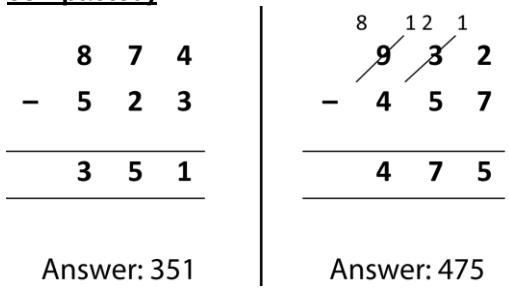
Extend to decimals in the context of money (vertically)
£ 2.50 + £ 1.75 = £ 4.25

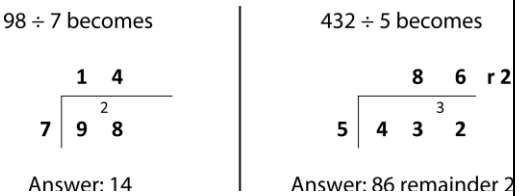
£ 2.50
+ £ 1.75
£ 4.25
1

(Revert to expanded methods if the children experience any difficulty.)

Column subtraction (expanded and compacted)



Short division



Scaling problems e.g. distances on maps and ingredients in cooking.

Winterbourne Earls CE Primary Calculation Policy

Year 5

Read, write, order and compare numbers to **at least 1,000,000** and determine the value of each digit
Count forwards or backwards in steps of powers of 10 for any given number up to 1,000,000
Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers including through zero
Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000
Solve number problems and practical problems that involve all of the above
Read Roman numerals to 1000 (M) and recognise years written in Roman numerals
Recognise and use square numbers and cube numbers, and the notation (^{2}) and cubed (^{3})
Recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal

Addition	Subtraction	Multiplication	Division
Add and subtract numbers with more than 4 digits using formal written methods Add and subtract numbers mentally with increasingly large numbers Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy Solve addition and subtraction multistep problems in contexts, deciding which operations and methods to use and why Add and subtract fractions of the same denominator and denominators that are multiples of the same number		Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers Know and use the vocabulary of prime numbers, prime factors and composite (non- prime) numbers Establish whether a number up to 100 is prime and recall prime numbers up to 19 Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers Multiply and divide numbers mentally drawing upon known facts Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context. Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 Solve problems involving multiplication and division including their knowledge of factors and multiples, squares and cubes	

Addition, subtraction, multiplication and division

Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign
Solve problems involving converting between units of time
Use all four operations to solve problems involving measure (for example length, mass, volume, money) using decimal notation, including scaling

Fractions, decimals and percentages

Solve problems involving number up to three decimal places
Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates
Solve problems which require knowing percentage and decimal equivalents of 1/2, 1/4, 1/5, 2/5, 4/5 and those fractions with a denominator of a multiple of 10 or 25
Multiply proper fractions and mixed numbers by whole numbers supported by materials and diagrams

+ = signs and missing numbers

Continue using a range of equations as in Year 4 but with appropriate numbers.

Pencil and paper procedures

Continue as in Year 4 with numbers up to 1,000,000

With all calculations ensure children use their knowledge of number to create a sensible estimate and use this as a method of checking.

Extend to numbers with any number of digits and decimals with any number of decimal places.
124.9 + 117.25 = 242.15

- = signs and missing numbers

Continue using a range of equations as in Year 4 but with appropriate numbers.

Pencil and paper procedures

Continue as in Year 4 with numbers up to 1,000,000

With all calculations ensure children use their knowledge of number to create a sensible estimate and use this as a method of checking

Column method using decomposition

x = signs and missing numbers

Continue using a range of equations as in Year 4 but with appropriate numbers

Pencil and paper procedures

Grid method:

372 x 24 is approximately 400 x 20 = 8000

x	300	70	2
20	6000	1400	40
4	1200	280	8

7440
+ 1488
8928
1

Short Multiplication

÷ = signs and missing numbers

Continue using a range of equations as in Year 4 but with appropriate numbers.

Pencil and paper procedures

977 ÷ 36 is approximately 1000 ÷ 40 = 25

977
- 720 (20 groups) -
257
- 180 (5 groups)
77
72 (2 groups)
5

Answer: 27 r 5 or 27 5/36

Winterbourne Earls CE Primary Calculation Policy

124.90
+ 117.25
242.15
11

Extend to decimals with different decimal places

Add and subtract fractions with the same denominator and denominators that are multiples of the same number (using as many visual resources as possible- chocolate / pizzas etc)

1/3 +1/3 = 2/3

3/8 + 1/8 = 4/8

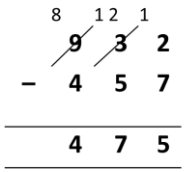
1/4 + 3/8 = 2/8 + 3/8 =5/8

3/5 + 1/10 = 6/10 + 1/10 = 7/10

4/7 – 3/7 = 1/7

3/8 – 1/4 = 3/8 – 2/8 =1/8

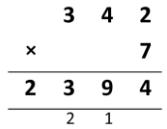
932 – 457 becomes



Answer: 475

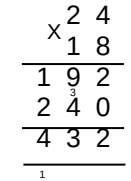
(Extend this method to include decimals)

342 × 7 becomes

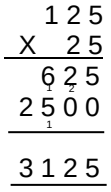


Answer: 2394

Long Multiplication:



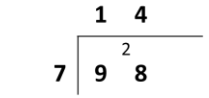
Extend to decimals with up to two decimal places: eg. 12.5 x 2.5 - 2 dp in question so 2 dp will be in answer. Remove dp and x then add dp back in answer



so 12.5 x 2.5 =31.25

Bus stop method

98 ÷ 7 becomes

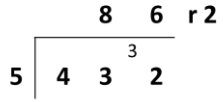


Answer: 14

Word problems to interpret remainders:

432 pens need to be packed into boxes of 5. How many full boxes will there be and how many pens are left over?

432 ÷ 5 becomes



Answer: 86 remainder 2

So there are 86 boxes and 2 pens left over.
Or: 432 children need to go on a school trip. They can travel in cars which seat 5. How many cars will we need to get all of the children there?
Answer: 86 full cars, 2 children need another car, so 87 cars in total.

Multiply proper fractions and mixed numbers by whole numbers

$^{5}/_{4}$ x 5 = $^{25}/_{4}$
=6 ¼

2 ½ x 3 = $^{5}/_{2}$ x 3
= $^{15}/_{2}$
= 7 ½
Or alternatively by partitioning:
2 ½ x 3 = (2 x 3) + (½ x 3)
= 6 +1 ½
= 7 ½

Winterbourne Earls CE Primary Calculation Policy

Year 6

Read, write, order and compare numbers up to 10 million and determine the value of each digit
Round any number to a required degree of accuracy
Use negative numbers in context and calculate intervals across zero
Solve number and practical problems that involve all of the above
Identify common factors, common multiples and prime numbers.

Addition	Subtraction	Multiplication	Division
Solve addition and subtraction multistep problems in contexts, deciding which operations and methods to use and why. Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy		Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication. Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context. Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context. Perform mental calculations, including with mixed operations and large numbers Solve problems involving multiplication and division.	

Addition, subtraction, multiplication and division

Solve problems involving addition, subtraction, multiplication and division
Use their knowledge of the order of operations to carry out calculations involving the four operations
Use estimation to check answers to calculations and determine , in the context of a problem, an appropriate degree of accuracy

+ = signs and missing numbers

Continue using a range of equations as in Year 5 but with appropriate numbers.

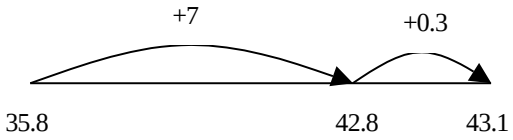
Pencil and paper procedures

Continue as in Year 5 with numbers up to 10,000,000

Partition into hundreds, tens, ones and decimal fractions and recombine

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

35.8 + 7.3 = 35.8 + 7 + 0.3
= 42.8 + 0.3
= 43.1



Add the nearest multiple of 1, 10, 100 or 1000, then adjust

Continue as in Year 5 but with appropriate numbers including extending to adding 0.9, 1.9,

- = signs and missing numbers

Continue using a range of equations as in Year 5 but with appropriate numbers.

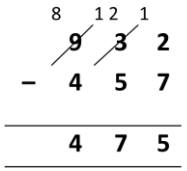
Pencil and paper procedures

Continue as in Year 5 with numbers up to 10,000,000

With all calculations ensure children use their knowledge of number to create a sensible estimate and use this as a method of checking

Column method using decomposition

932 – 457 becomes



Answer: 475

x = signs and missing numbers

Continue using a range of equations as in Year 5 but with appropriate numbers

Pencil and paper procedures

Grid method:

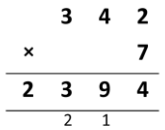
372 x 24 is approximately 400 x 20 = 8000

x	300	70	2
20	6000	1400	40
4	1200	280	8

7440
+ 1488
8928
1

Short Multiplication

342 × 7 becomes



Answer: 2394

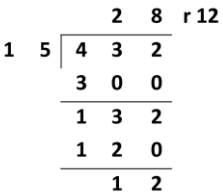
÷ = signs and missing numbers

Continue using a range of equations as in Year 5 but with appropriate numbers.

Pencil and paper procedures

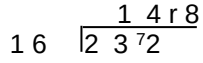
Bus stop method for Long Division:

432 ÷ 15 becomes



Answer : 28 remainder 12

Alternatively 232 ÷ 16 becomes



2.9 etc

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
    11
```

Revert to expanded methods if the children experience any difficulty.
Extend to decimals with different decimal places

Extend this method to include decimals

Long Multiplication:

```
    2 4
  x 1 8
  1 9 2
    3
  2 4 0
  4 3 2
  1
```

Extend to decimals with up to two decimal places: eg. 12.5 x 2.5 - 2 dp in question so 2 dp will be in answer. Remove dp and x then add dp back in answer

```
   1 2 5
 X   2 5
   6 2 5
   1 2
 2 5 0 0
   1
 3 1 2 5
 1
```

so 12.5 x 2.5 =31.25

Answer: 14 remainder 8

or with remainder as a fraction

```
        1 4  8/16 = 14 ½
 1 6  |2 3 ⁷2
```

Answer: 14 ½

or with a remainder as a decimal

```
        1 4 . 5
 1 6  | 2 3 ⁷2 .⁸0
```

Answer: 14.5

or 14 (rounded to nearest whole number)

Word problems to interpret remainders:

432 pens need to be packed into boxes of 5. How many full boxes will there be and how many pens are left over?

432 ÷ 5 becomes

```
      8   6  r 2
   | 4   3  ³2
 5 |
```

Answer: 86 remainder 2

So there are 86 boxes and 2 pens left over.
Or: 432 children need to go on a school trip. They can travel in cars which seat 5. How many cars will we need to get all of the children there?
Answer: 86 full cars, 2 children need another car, so 87 cars in total.