Progression in written calculation strategies for addition

(Examples indicate end of year expectations)

northleaze primary school

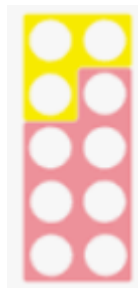| Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6

Reception

Statutory Guidance

Children count reliably with numbers from 1 to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer.
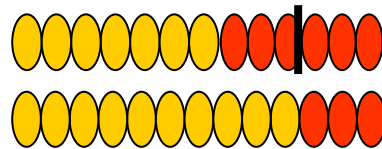
e.g. 7 add 3

Year 1

Statutory Guidance

Add one-digit and two-digit numbers to 20, including zero.
Solve one-step problems that involve addition, using concrete objects and pictorial representations, and missing number problems.
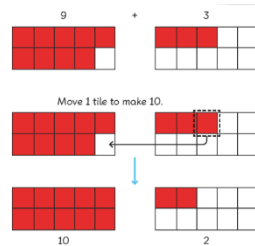
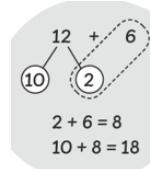**Possible representations**
e.g. 7 + 6 =
Using concrete objects

Using pictorial representations
e.g. 13 + 5 =

13 14 15 16 17 18

Add by making 10 e.g. 9 + 3 =

9 + 3

Move 1 tile to make 10.

10 + 2
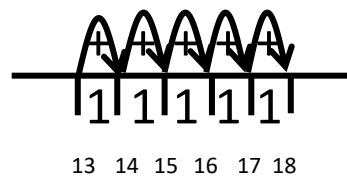
Add by adding ones
e.g. 12 + 6 =

12 + 6
10   2
2 + 6 = 8
10 + 8 = 18

Year 2

Statutory Guidance

Solve problems with addition:
- using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- applying their increasing knowledge of mental and written methods

Add numbers using concrete objects, pictorial representations, and mentally, including:
- a two-digit number and ones
- a two-digit number and tens
- two two-digit numbers
- adding three one-digit numbers

Using Base 10 representations to add two 2-digit numbers e.g.

33 + 40 =
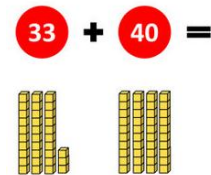
Adding two 2-digit numbers using columnar addition e.g.
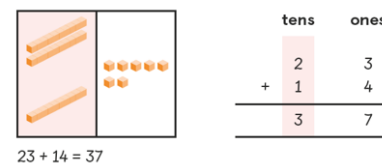
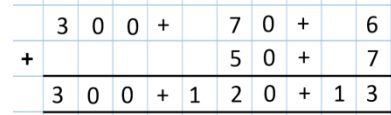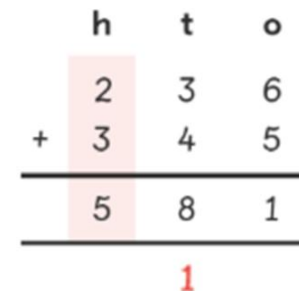|	tens	ones
	2	3
+	1	4
	3	7

23 + 14 = 37

Year 3

Statutory Guidance

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

Solve problems, including missing number problems, using number facts, place value, and more complex addition.
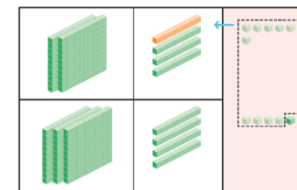
e.g. 376 + 57 = (expanded addition with regrouping)

	300 +	70 +	6
+		50 +	7
	300 + 1	20 + 1	3

Or 236 + 345 = 581 (compact addition with regrouping)

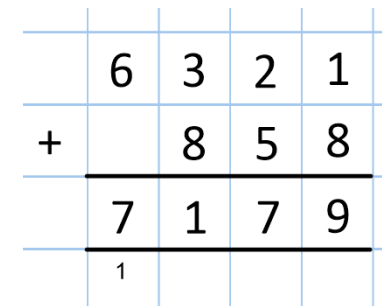|	h	t	o
	2	3	6
+	3	4	5
	5	8	1
		1	

Using Base 10 to support.
Add the ones.
6 ones + 5 ones = 11 ones
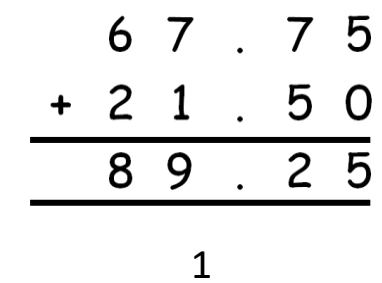Regroup the ones.
11 ones = 1 ten + 1 one

Year 4

Statutory Guidance

Add numbers with up to 4 digits using the formal written methods of columnar addition where appropriate
e.g. 6321 + 858

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

Measurement
Based on statutory guidance linked to money and measures to 2 decimal places.
e.g. 67.75 + 21.50

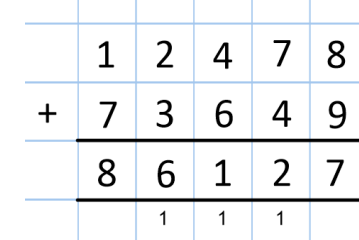|	6	7	.	7	5
+	2	1	.	5	0
	8	9	.	2	5

1

Year 5

Statutory Guidance

Add whole numbers with more than 4 digits, including using formal written methods (columnar addition)

e.g. 12478 + 73649

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

Measurement
Based on statutory guidance linked to money and measures to 2 decimal places.

Year 6

Statutory Guidance

Solve addition multi-step problems in contexts, deciding which operations and methods to use and why

Measurement
Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate

# Progression in written calculation strategies for subtraction

(Examples indicate end of year expectations)

Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Statutory Guidance	**Statutory Guidance**	**Statutory Guidance**	**Statutory Guidance**	**Statutory Guidance**	**Statutory Guidance**	**Statutory Guidance**

Reception

Children count reliably with numbers from 1 to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer.

e.g. 6 subtract 2
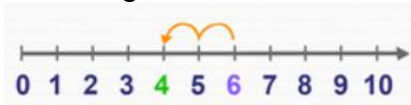
Year 1

Subtract one-digit and two-digit numbers to 20, including zero.

Solve one-step problems that involve subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = □ – 9.
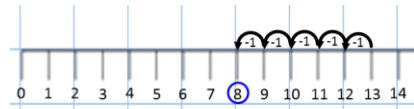
Possible representations
Using concrete objects
e.g. 13 – 5 =

Using pictorial representations
13 – 5 =

Subtract by subtracting ones or by subtracting from 10

15 – 2
5 – 2 = 3
10 + 3 = 13
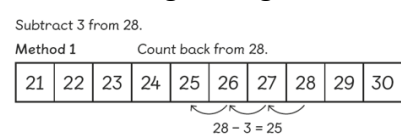
14 – 8
10 – 8 = 2
4 + 2 = 6

Year 2

Subtract numbers using concrete objects, pictorial representations, and mentally, including:
- a two-digit number and ones
- a two-digit number and tens
- two two-digit numbers

Possible representations
e.g. 28 – 3 =
Subtracting a 2-digit number

Subtract 3 from 28.
Method 1   Count back from 28.

| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |

28 – 3 = 25

from a 2-digit number using column subtraction
e.g. 36 – 20 =

Subtract the tens.
3 tens – 2 tens = 1 ten

tens	ones
3	6
2	0
1	6

36 – 20 = 16

Subtracting using column method with renaming
e.g. 32 – 16 =
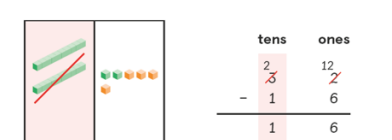
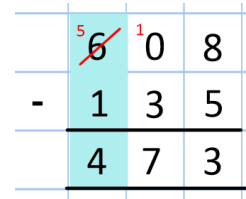| tens	ones
2 3	12 2
1	6
1	6

32 – 16 = 16

Year 3

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

Key strategy
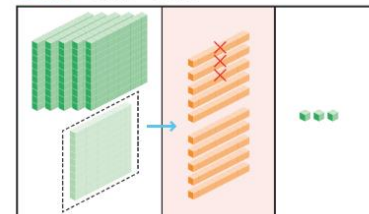Column subtraction with and without renaming

e.g. 608 - 135 (with renaming)

5 6	1 0	8
1	3	5
4	7	3

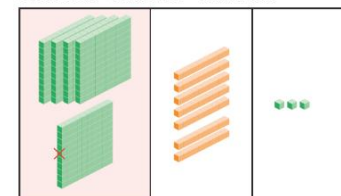Possible representations

Step 1   Subtract the ones.
8 ones – 5 ones = 3 ones

Regroup 1 hundred into 10 tens.
Subtract the tens.
10 tens – 3 tens = 7 tens

Subtract the hundreds.
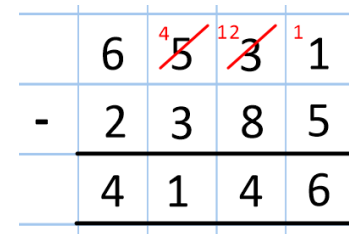5 hundreds – 1 hundred = 4 hundreds

Year 4

Subtract numbers with up to 4 digits using the formal written methods of columnar subtraction where appropriate
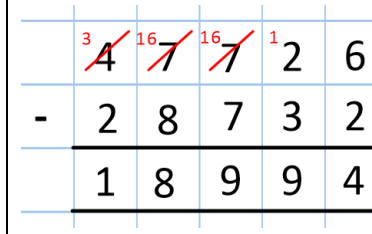
Key strategy
e.g. 6531 - 2385

6	4 5	12 3	1 1
2	3	8	5
4	1	4	6

Year 5

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

Key strategies
e.g. 47,726 – 28,723

3 4	16 7	16 7	1 2	6
2	8	7	3	2
1	8	9	9	4

Year 6

Solve subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Measurement
Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate.

Progression in written calculation strategies for multiplication

(Examples indicate end of year expectations)

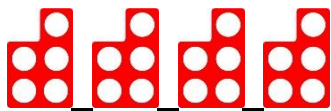| Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6

Reception

Statutory Guidance

Solve problems, including doubling, halving and sharing

Double 5

Non-statutory

Count in 2s, 5s and 10s

5   10   15   20

Year 1

Statutory Guidance

Solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.
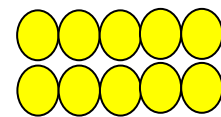
Possible representations

e.g. 2 lots of 3 =
There are two bowls with three apples in each. How many apples are there altogether?
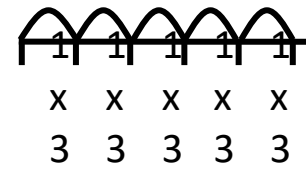
Non- Statutory guidance

They make connections between arrays, number patterns, and counting in twos, fives and tens.
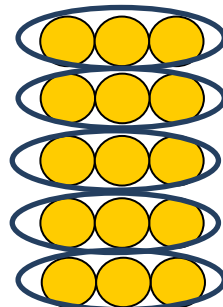
Year 2

Statutory Guidance

Solve problems involving multiplication using materials, arrays, repeated addition, mental methods, and multiplication facts, including problems in contexts.
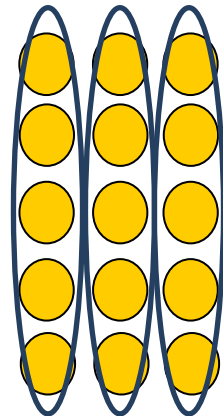
x   x   x   x   x
3   3   3   3   3

Possible representations

e.g. 5 x 3 =

5 x 3 =

3 x 5 =

Multiplication facts include: 2, 3, 5 and 10

Year 3

Statutory Guidance

Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.
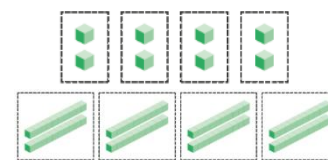
Multiplication facts include: 2,3,4,5,8 and 10

Key strategy:

Partitioning the two-digit number into tens and ones

```
         t   o
         2   3
    ×        2
    _____
             6
  +  4       0
  _____
     4       6
```
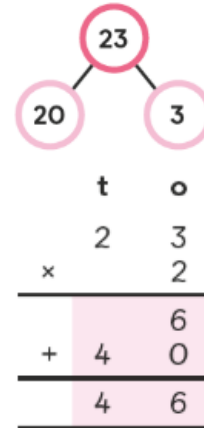
Children should use base ten to understand multiplication by multiples of 10 e.g. if 2 x 4 = 8 then 20 x 4 = 80

Year 4

Statutory Guidance

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

Key strategy:

Short multiplication

Expanded

```
      35
   ×   4
   120 (30 x 4)
  + 20 ( 5 x 4)
   _____
   140
```

Compact

```
    3   4   7
  x         7
  _____
2   4   2   9
    3   4
```

Multiplication facts up to 12 x 12
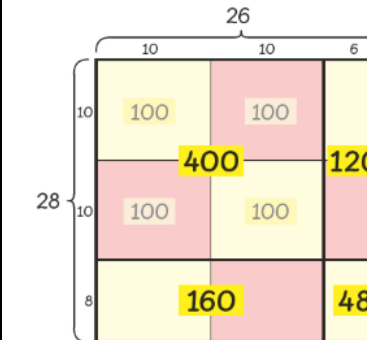
Year 5

Statutory Guidance

Multiply numbers up to 4 digits by a one – or two-digit number using the formal written method,

Key strategies:

Short multiplication

```
      3   7   4   1
  x               6
  _____
2   2   4   4   6
      4   2
```

Long multiplication – introduced using an area model first e.g. 28 x 26

```
      2 6
  x 2 8
  _____
  2 0 8   (26 x  8)
  5 2 0   (26 x 20)
  _____
  7 2 8
```

Year 6

Statutory Guidance

Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.

Key strategies:

Long multiplication
e.g. 2741 x 66

```
    2 7 4 1
  x     6 6
  _____
  1 6 4 4 6
  1 6 4 4 6 0
  _____
  1 8 0 9 0 6
```

Progression in written calculation strategies for division

(Examples indicate end of year expectations)

Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6

Reception

Statutory Guidance

Solve problems, including doubling, halving and sharing

Half of 6

Year 1

Statutory Guidance

Solve one-step problems involving division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Possible representations

Sharing

How many apples are in each bowl if I share 6 apples between three bowls?
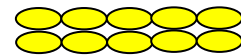

Grouping

Put these counters into groups of two. How many groups are there?

0   2   4   6

Non- statutory guidance
They make connections between arrays, number patterns, and counting in twos, fives and tens.

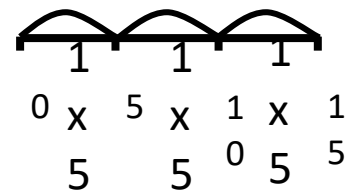(with the support of the teacher)

Year 2

Statutory Guidance

Solve problems involving division, using materials, arrays, repeated addition, mental methods, and division facts, including problems in contexts.
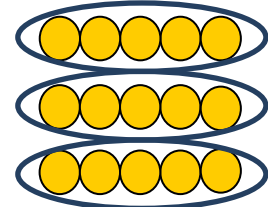
Possible representations
e.g. 15 ÷ 5 =
Counting up on a number line.

0 x 5 x 1 x 1
   5   5 0 5   5

Using arrays

Division facts: 2,3,5 & 10
Non- statutory guidance
They connect unit fractions to equal sharing and grouping, to numbers when they can be calculated, and to measures, finding fractions of lengths, quantities, sets of objects or shapes.
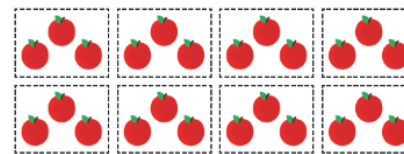
Year 3

Statutory Guidance

Write and calculate mathematical statements for division using the multiplication tables that they know.
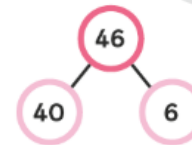
Division facts include: 2,3,4,5,8 and 10.

e.g. 24 ÷ 8 =

Possible representations

Put 24 apples into 8 equal groups.

46 ÷ 2 =

Non-statutory guidance

Use known division facts to derive related facts. e.g.
If I know that 24 ÷ 8 = 3, then...
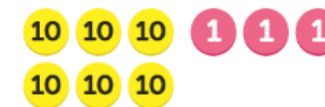240 ÷ 8 =30

Year 4

Statutory Guidance

No reference to written division calculations.

Children continue to relate division to known multiplication facts (up to 12 x 12)
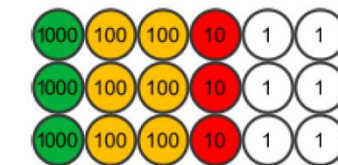
Possible representations

63 ÷ 3 =

Year 5

Statutory Guidance

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.
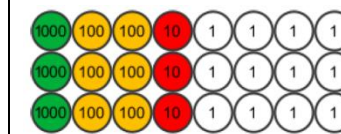

What's the same, what's different?

Th	H	T	1s
1	2	1	2
3	3	6	3 6

Place value counters are useful representations when regrouping is required e.g.
3642 ÷ 3

Th	H	T	1s
	1	2	1 4
3	3	6	4 ¹2

8 6 r 2
     3
5 | 4 3 2

Year 6

Statutory Guidance

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.
Long division e.g. 432 ÷ 15

432 ÷ 15 becomes

And short division are statutory requiremnts
496 ÷ 11 becomes

Answer: $45\frac{1}{11}$