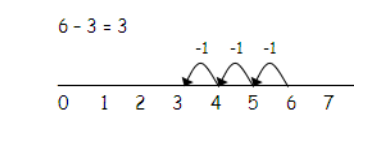
Progression of written methods for subtraction

Mental images and pictures
Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, etc.

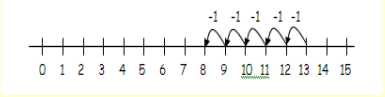
Numbered lines
Numberlines and practical resources are used to support calculation. Teacher demonstrates the use of the numberline.

The numberline should also be used to show that 6 - 3 means the 'difference between 6 and 3' or 'the difference between 3 and 6' and how many jumps they are apart.

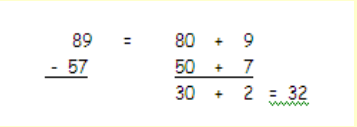


Empty number line
Children then begin to use numbered lines to support their own calculations - using a numbered line to count back in ones.

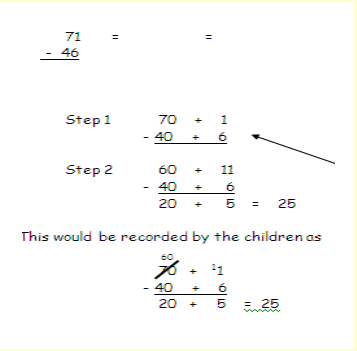
First to count back and then to use counting on when numbers are close together or near multiples of 10, 100 etc.



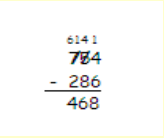
Horizontal expanded column.
Without exchange



With exchange



Decomposition
Fomal method of subtraction



Number line
Where numbers are close together or near multiples of 10, 100 etc then a numberline should be used.

Year 1 – Subtraction

EYFS COULD

- Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs
- Represent and use number bonds and related subtraction facts within 20

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

Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = – 9.

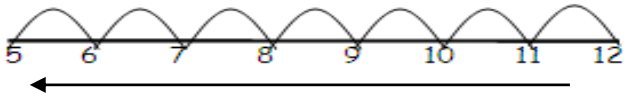
Calculation methods

Numicon:
Children can find the 'difference' by placing smaller Numicon shapes on top of larger ones. Shapes can be used to aid understanding of 'bridging' through 10.

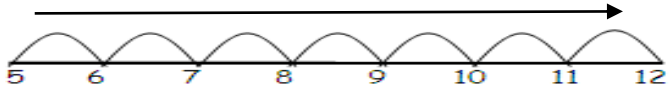
Pictures and marks:
There were 8 cakes on a plate. Mary ate 3 of them. How many were left?

Marked number line: to count back (take away) or to count on (find the difference) and record number sentences.

12 – 7 (counting back) - marked line – when multiple of 10 – counting back the answer is the number 'landed' on (5)



What is the difference between 5 and 12? (counting up) – marked line – when counting on, the answer is the number of 'jumps' (7)



– and = and missing numbers:

6 - 2 = Δ Δ = 6 – 2 6 - Δ = 4
4 = Δ - 2 Δ - 2 = 4 4 = O - Δ

Practice

Counting back verbally.
Counting back from any number.
Counting back on a number line.
Counting back using a 100 number square.,
Counting back on a labelled/partially labelled number line.
Practical experience of using the vocabulary related to subtraction e.g. how many more to make...? how many more is... than...? how much more is...?, subtract, take (away), minus, leave, how many are left/left over? How many are gone? one less, two less, ten less... how many fewer is... than...? how much less is...? difference between half, halve =, equals, sign, is the same as

Steps 2 Success

To use a number line to count back in ones:

- Read the number sentence e.g. 24 - 5
- Draw a number line and write the **largest** number at the **end** of the number line.

24

- Jump **back** the smallest number in ones. Remember to write the number you jump to under the line.

-1 -1 -1 -1 -1

19 20 21 22 23 24

- The number you jump to is the answer.

Year 2 – Subtraction

Year 1 COULD

Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100	Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones; a two-di numbers; adding three one-digit numbers	Solve problems with addition and subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measures; applying their increasing knowledge of mental and written methods

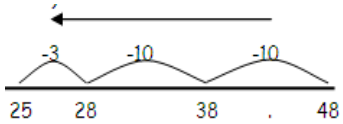
Calculation methods

Numicon:
Children may hide holes in a shape to support calculations or can use the shapes to find two numbers with a given difference'. Children can make up subtraction stories with the shapes and record as a number sentence.

Number line:
Use the number line as a model to support empty box questions
e.g. 60 – □ = 26

Understand when it is sensible (more efficient) to count back and when to count up e.g. 93 – 5 (count back) and 93 - 88 (count up)

Counting back – *taking away*
Counting on – *finding the difference*
Compensation: subtract near multiples of 10 by compensating e.g. 45 - 9



Horizontal expanded method (TU-TU):
(not crossing the tens boundary)

75 – 32

7 0 + 5	or	7 0 and 5
3 0 + 2		3 0 and 2
4 0 + 3		4 0 and 3

(crossing the tens boundary)

82 – 37

7 0		7 0 1 5
8 ~~0~~ + 12	or	8 ~~0~~ and 5
-3 0 + 7		-3 0 and 7
4 0 + 5		4 0 and 5

Steps 2 Success

To use the expanded horizontal column for subtraction:

- Read the number sentence and partition the largest number into tens and ones.
- Partition the second number (the smallest) into tens and ones and write it below the first number (make sure the tens and units are lined up)

```
 9 0 + 6
-4 0 + 4
```

- Subtract the units and write the answer underneath (in the units column).

```
 9 0 + 6
-4 0 + 4
     2
```

- Subtract the tens and write the answer underneath (in the tens column).

```
 9 0 + 6
-4 0 + 4
 5 0 + 2
```

- Add the digits together – that is the answer.

50 + 2 = 52.

Year 3 - Subtraction

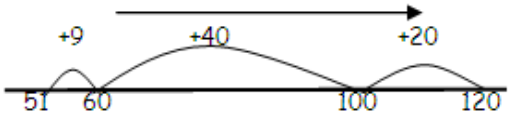
Year 2 COULD

Add and subtract numbers mentally, including: a three-digit number and ones; a three-digit number and tens; a three-digit number and hundreds.	Add and subtract numbers with up to three 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.

Calculation methods

Blank number lines (to find the difference):
TU – TU (see year 2)

HTU - TU
120 – 51 =69



Horizontal expanded method:
(not crossing the tens boundary)

75 – 32

7 0 + 5
3 0 + 2
4 0 + 3

or

7 0 and 5
3 0 and 2
4 0 and 3

(crossing the tens boundary)

82 – 37

7 0
8 0 + 12
-3 0 + 7
4 0 + 5

or

7 0 1 5
8 0 and 5
-3 0 and 7
4 0 and 5

Formal Column Method - with up to 3-digits:

3
3 ~~4~~ 15
- 1 3 7
1 0 8

Steps 2 Success

To use the formal method for subtraction:

- Write the largest number on top.
- Write the smallest number underneath, make sure you line up the digits in the place value columns.

3 4 5
- 1 3 7

- Start by subtracting the units column, taking the bottom number away from the top.
- If the top digit is **less** than the digit you are going to subtract, you need to exchange with a digit in the column to the **left**. (*Make the left neighbour 1 less, write the 1 beside your digit on its left*)

3
3 ~~4~~ 15
- 1 3 7
1 0 8

Year 4 – Subtraction

		Year 3 COULD
	• 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.

Calculation methods

Horizontal expanded method:
(not crossing the tens boundary)

75 – 32

70 + 5
30 + 2
40 + 3

or

70 and 5
30 and 2
40 and 3

Horizontal expanded method:

456 – 274

300 150
~~400~~ + ~~50~~ + 6
- 200 + 70 + 4
100 + 80 + 2

Formal Column Method - with up to 4-digits:

```
   3
 23 4 15
-  1 1 3 7
   1 2 0 8
```

Steps 2 Success

To use the formal method for subtraction:

- Write the largest number on top.
- Write the smallest number underneath, make sure you line up the digits in the place value columns.

```
  3 4 5
-   1 3 7
```

- Start by subtracting the units column, taking the bottom number away from the top.
- If the top digit is **less** than the digit you are going to subtract, you need to exchange with a digit in the column to the **left**. *Make the left neighbour 1 less, write the 1 beside your digit on its left)*

```
   3
 3 4 15
-  1 3 7
   1 0 8
```

Year 5 - Subtraction

Year 4 COULD		
Add and subtract numbers mentally with increasingly large numbers.	• Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) • Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.	Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Calculation methods

Horizontal expanded column: (see year 4)

Dealing with zeros when adjusting

500 + 00 + 3	400 + ~~100~~ + ~~3~~ 90 13
- 200 + 70 + 8	- 200 + 70 + 8
	200 + 20 + 5

Here 0 acts as a place holder for the tens. The adjustment has to be done in two stages. First the 500 + 0 is partitioned into 400 + 100 and then the 100 + 3 is partitioned into 90 + 13.

Formal method with up to 5 digits:

```
  4 6 4 16 7
-   3 2 6  8 4
  ---------
  1 3 7  8 3
```

Formal method with decomposition:

```
    5 13 16
    ~~6~~ 4 ~~6~~ 7
-     2 6 8 4
    -------
    3 7 8 3
```

```
    4  17   3   10
    ~~5~~ 7 6 4 . ~~0~~
-       8 2 1 . 6
    -------------
    4 9 4 2 . 4
```

Steps 2 Success

To use the formal method for subtraction:

- Write the largest number on top.
- Write the smallest number underneath, make sure you line up the digits in the place value columns.

```
  4 3 4 5
-   2 1 3 7
```

- Start by subtracting the units column, taking the bottom number away from the top.
- If the top digit is **less** than the digit you are going to subtract, you need to exchange with a digit in the column to the **left**. *Make the left neighbour 1 less, write the 1 beside your digit on its left)*

```
      3
  4 3~~4~~ 15
-   2 1 3 7
  ---------
  2 1 0 8
```

Year 6 – Subtraction

Year 5 COULD

- perform mental calculations, including with mixed operations and large numbers
- identify common factors, common multiples and prime numbers

Use their knowledge of the order of operations to carry out calculations involving the four operations.

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

Calculation method

By Y6 pupils should be able to calculate with different numbers of integers and decimals. (see Y5) It is important that pupils use a method which is EFFICIENT and RELIABLE for them, whichever method the school / pupil chooses.

Formal method with decomposition:

```
  5 13 16          4 17  3  10
   6 4 6 7          5 7 6 4 . 0
-  2 6 8 4       -    8 2 1 . 6
   3 7 8 3          4 9 4 2 . 4
```

- = signs and missing numbers

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

Steps 2 Success

To use the formal column method for subtraction:

- Write the largest number on top.
- Write the smallest number underneath; make sure you line up the digits in the place value columns.

```
  4 3 4 5
-   2 1 3 7
```

- Start by subtracting the units column, taking the bottom number away from the top.
- If the top digit is **less** than the digit you are going to subtract, you need to exchange with a digit in the column to the left. *Make the left neighbour 1 less, write the 1 beside your digit on its left)*

```
      3
  4 3 415
-   2 1 3 7
    2 1 0 8
```