The image of subtraction

Partitioning – into two groups

Reduction - by a quantity of an amount -

Comparison – of the difference

Inverse – how much more

The National Curriculum in England. ©Crown Copyright 2013

Year 1 Expectation

Statutory requirements

Pupils should be taught to:

- 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 $7 = \square - 9$.

Children need to be confident with:

- solving missing number problems e.g. $15 - 7 = \square$; $20 - \square = 8$; $17 - 0 = \square$; $7 = \square - 9$; $\square = 4 + \square$; $\square - \square = 13$. What could the numbers be? What couldn't they be?
- number bonds to 20- build upon facts to 10 to approach facts to 20 with the same confidence

$6 + ? = 10$ $? + 6 = 10$
$10 - 6 = ?$ $10 - 4 = 6$

- having a true understanding of 'equals'
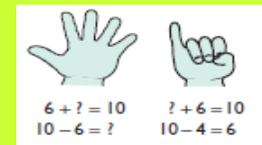
Use concrete objects and pictorial representations, progress from using number tracks to number lines, with every number marked to ones with only significant numbers marked.

Ensure children understand the concept of subtraction as **difference** and **take away**:

The difference is?

$11 - 3 =$

4 5 6 7 8 9 10 11
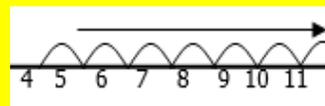
There were 8 cakes on a plate. Mary ate 3 of them. How many were left?

$8 - 3 = 5$

The National Curriculum in England
©Crown Copyright 2013

Year 2 Expectation

Linked resources and guidance

- The image of subtraction
- Mental key skills and strategies
- Resources
- Key vocabulary
- Strengthening subtraction through reasoning
- Non-statutory notes and guidance

Strengthen understanding with concrete objects and pictorial representations.

Moving from fully marked number lines to partially marked, progressing to empty number lines where possible.

Exemplification of strategy

Statutory requirements

Pupils should be taught to:

- 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
- 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-digit number and tens
  - two two-digit numbers
  - adding three one-digit numbers
- show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot
- recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

Children need to be confident with:
- counting back from given numbers in 10s (63, 53, 43,…) and linking this to calculation (53 – 10 = ?)
- reordering calculations to simplify e.g. 20 – 3 – 10, would be better as 20 – 10 – 3, and know that 10 – 20 – 3 would be different
- solving missing number problems e.g. 57 – 9 = □; □ – 30 = 15; 36 = □ – 22; 7 + □ + 4 = 16 What could the numbers be? What couldn't they be?
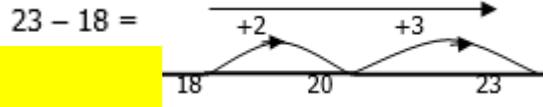- answering subtraction in one and two step problems

Year 2 continued

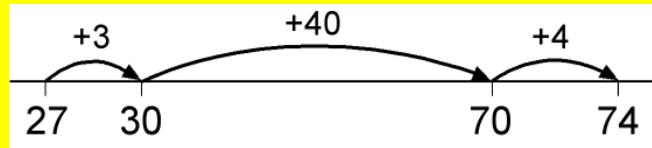Ensure children understand the concept of subtraction as:

difference *by 'counting on or up'*   and   **take away** *by 'counting back' in chunks*
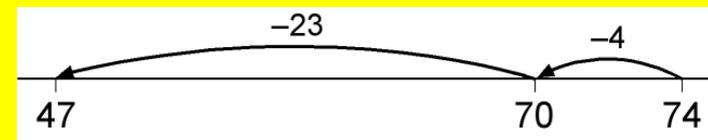
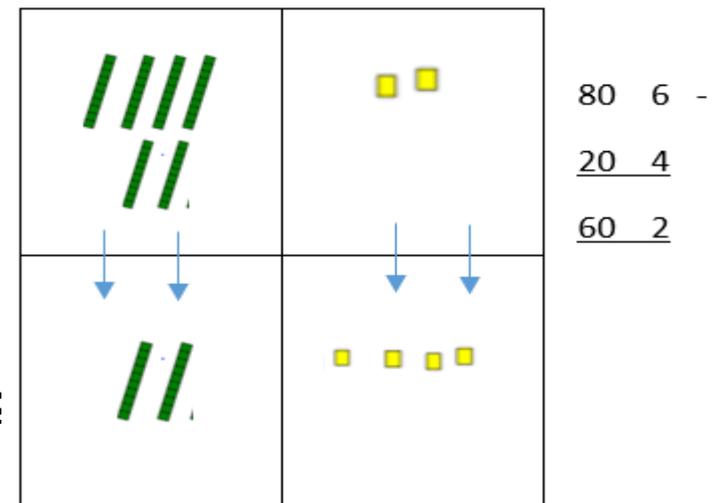There were 23 children in the class, 18 were school dinners. How many have sandwiches?

23 – 18 =

+2   +3

18   20   23

−3   −4   −20

47   50   54   74

progressing to larger numbers

+3   +40   +4

27   30   70   74

develop efficiency using larger partitioned chunks

−23   −4

47   70   74

Combine objects with a simplified bar model to support understanding

5 pens

3 pencils

?

80   6 −
20   4
60   2
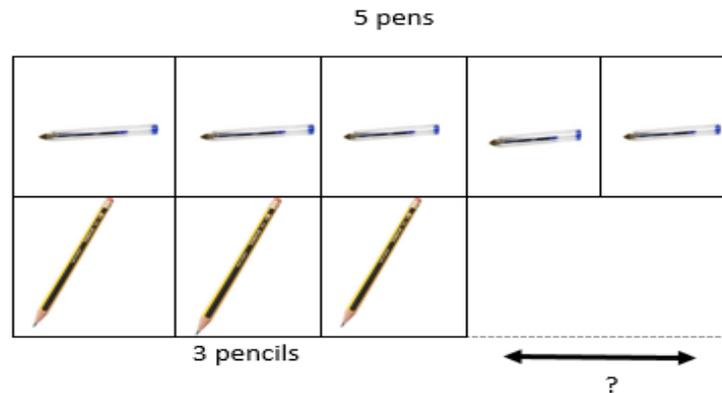
Early development towards written methods in columns:
Use expanded columns alongside concrete apparatus to support understanding of place value

The National Curriculum in England.
©Crown Copyright 2013
Year 3 Expectation

Linked resources and guidance
- [The image of subtraction](#)
- [Mental key skills and strategies](#)
- [Resources](#)
- [Key vocabulary](#)
- [Strengthening subtraction through reasoning](#)
- [Non-statutory notes and guidance](#)

Strengthen understanding with concrete objects and pictorial representations.

Moving from partially marked number lines to empty number lines.

[Exemplification of strategy](#)

Statutory requirements

Pupils should be taught to:

- 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.

Children need to be confident with:
- place value up to 3 digits, including to 1 decimal place
- counting back in 10s (163, 153, 143,...) and linking this to calculation (153 – 10 = ? Extending to 153 – 20 = ?)
- linking counting back in 10s to counting back in 100s- explore for themselves and notice what happens to the digits e.g. 567, 467, 367, 267 which digit changes? Why? How is this different to 10s?
- reordering or rounding to simplify calculations, e.g. 123 – 9, could be 123 – 10 then add 1
- solving missing number problems e.g. □ = 83 – 56; 165 – □ = 98; 393 – 50 = □; 375 – □ = 185; 567 – 300 = □; 464 – 135 = □; 117 + □ + 64 = 199 What could the numbers be? What couldn't they be?
- answering subtraction in one and two step problems

Ensure children use the number line for mental subtraction where needed, with larger numbers (up to 3 digits) and less jumps, and know when to use which depending upon the numbers involved:

- **difference** *by 'counting on or up'*
- **take away** *by 'counting back' in chunks*

Continued use of the bar model to aid confidence with problems

There are 96 children in Year 3 and 4, in Year 3 there are 45 children. How many children are in Y4?

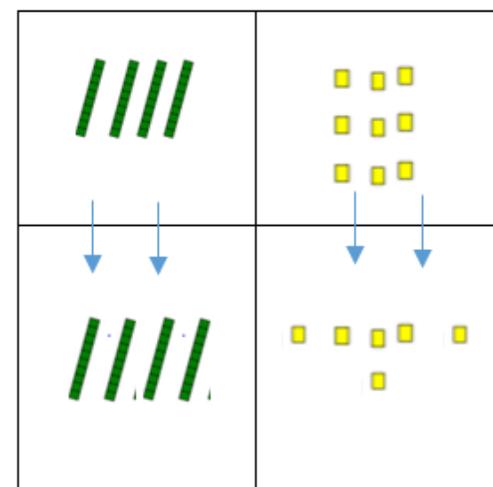| 96	
45	How many in Y4?
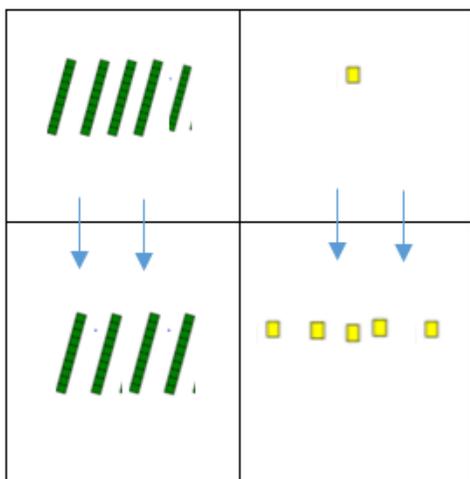
Column subtraction

$$90 + 6 \ -$$
$$40 + 5$$
$$\overline{50 + 1}$$

Without any exchanging (decomposition) using concrete equipment as needed

Progressing to exchanging and larger numbers

$$\begin{array}{r} {}^{80} \quad {}^{1} \\ \cancel{90} + 5 \ - \\ 40 + 6 \\ \hline 40 + 9 \end{array}$$

Progressing to the formal columnar algorithm initially introduced alongside the expanded method for some pupils.

It is a more efficient (streamlined) version of the expanded method, not a new method!

$$\begin{array}{r} 7\ 9 \ - \\ 3\ 6 \\ \hline 4\ 3 \end{array}$$

$$\begin{array}{r} {}^{6\ 1} \\ \cancel{7}\ \cancel{4} \ - \\ 3\ 6 \\ \hline 3\ 8 \end{array}$$

Grading of difficulty (−)

Year 3 continued

The National Curriculum in England.
©Crown Copyright 2013
Year 4 Expectation

Linked resources and guidance

- [The image of subtraction](#)
- [Mental key skills and strategies](#)
- [Resources](#)
- [Key vocabulary](#)
- [Strengthening subtraction through reasoning](#)
- [Non-statutory notes and guidance](#)

Strengthen understanding with pictorial representations, encourage pupils to visualise to fully understand trickier calculations.

Use empty number lines only if applicable.

[Exemplification of strategy](#)

Statutory requirements

Pupils should be taught to:

- 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.

Children need to be confident with:
- place value up to 4 digits, including to 2 decimal places
- counting back in 1000s (10630, 9630, 8630,…) and linking this to calculation (8750 – 1000 = ? Extending to 8750 – 3000 = ?)
- linking counting back in 10s, 100s and 1/10s to counting back in 1000s- explore for themselves and notice what happens to the digits e.g. which digit changes? Why? How is this different to 10s and 100s?
- reordering or rounding to simplify calculations, e.g. 1523 – 999, could be 1523 – 1000 then add 1
- solving missing number problems e.g. 564 + □ = 760; 765 - □ = 275; □ – 163 = 67; □ + 99 + 90 = 250; 800 – 75 – 125 = □; 8470 – 1000 = □; □ - 3000 = 1900; 26□ + □ 6□ = 500 What could the numbers be? What couldn't they be?
- answering subtraction in multi- step problems

Ensure children continue to develop confidence and understanding with mental subtraction, with more difficult numbers, including larger (up to 4 digits) and decimal numbers, with the use of number lines as needed, in particular within the context of time.

Use of the bar model with problems if applicable

The rope is 12.4 m long. I use 7.9 m, how much is left?

12.4 m	
7.9 m	How much is left?

Columnar subtraction

As with Y3, reinforce understanding of the expanded method, using concrete equipment as needed to model and support progression to more pupils using the formal columnar algorithm by the end of the year.

Without any exchanging (decomposition), then with exchanging, with *decimals* and *up to 4 digits*.

$300 + 90 + 8$ -

$100 + 60 + 1$

$200 + 30 + 7$

With exchanging:

$\overset{200}{\cancel{300}} + 70 + 8$ -

$100 + 90 + 6$

$100 + 80 + 2$

It is a more efficient (streamlined) version of the expanded method, not a new method!

569 -

326

243

$\overset{2 1 4 1}{\cancel{3 5 4}}$ -

186

168

Year 4 continued

Grading of difficulty (−)

Year 5 Expectation

Linked resources and guidance

- [The image of subtraction](#)
- [Mental key skills and strategies](#)
- [Resources](#)
- [Key vocabulary](#)
- [Strengthening subtraction through reasoning](#)
- [Non-statutory notes and guidance](#)

Encourage pupils to visualise to fully understand trickier calculations, model understanding with pictorial representations.

Use empty number lines only if applicable.

[Exemplification of strategy](#)

Statutory requirements

Pupils should be taught to:

- add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)
- 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 multi-step problems in contexts, deciding which operations and methods to use and why.

Children need to be confident with:

- counting back in 10s, 100s, 1000s, 10 000s, 1/10s and 1/100s and linking this to calculation (8750 – 3000 = ? Knowing how to do this through counting back)
- linking counting back in 10s and 100s to counting back in 1000s and 10 000s- explore for themselves and notice what happens to the digits e.g. which digit changes? Why? How is this different to 10s/ 100s/1000s?
- rounding to simplify calculations and as a method to check accuracy of calculation
- solving missing number problems e.g. 679 - □ = 485; 1000 000 - □ = 899 000; □ + 3000 + 700 000 = 771 000; 11 792 – 3700 = □; 11.94 = 11+ □ +0.04; What could the numbers be? What couldn't they be?
- answering subtraction in multi- step problems in all contexts

Continue to develop confidence and understanding with mental subtraction, with increasingly larger numbers, including up to 4 digits (and more than if applicable) and decimal numbers, with the use of number lines as needed, in particular within the context of time.

Continued use of the bar model to support problem solving if applicable

My shopping trip costs £175.45 in total. I spent £39.99 in the first shop, £54.50 in the third, how much did I spend in the second shop?

£39.99 + □ + £54.50 = £175.45

£175.45		
£39.99	How much?	£54.50

Columnar subtraction

With secure understanding of the expanded method all pupils should progress to the formal columnar algorithm by the end of the year.

Pupil understanding can continue to be supported using concrete equipment so that they can work confidently with *decimals* and numbers with more than *4 digits* (see previous year exemplification).

$$5975 - 3863 = 2112$$

$$7254 - 5116 = 1138$$

$$56.8 - 32.7 = 24.1$$

Grading of difficulty (−)

Year 5 continued

It is a more efficient (streamlined) version of the expanded method, not a new method!

Year 6 Expectation

Linked resources and guidance
- The image of subtraction
- Mental key skills and strategies
- Resources
- Key vocabulary
- Strengthening subtraction through reasoning
- Non-statutory notes and guidance

The Y6 expectation is that children are fluent, and can calculate confidently using both mental and written strategies.

Less confident children should be encouraged to visualise or use resources.

Exemplification of strategy

Statutory requirements

Pupils should be taught to:

- 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

- 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

135

Mathematics

Statutory requirements

- solve problems involving addition, subtraction, multiplication and division
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.

Children need to be confident with:

Y6 Children need to be confident with:

- place value with numbers greater than 4 digits, including to 3 decimal places
- counting back in 10s, 100s, 1000s, 10 000s, 1/10s, 1/100s and 1/1000s, and linking this to calculation (81 750 – 30 000 = ? Or 7.753- 0.02 = ? Knowing how to do this through counting back)
- linking counting back in 10s, 100s,1000s,10 000s, 1/10s, 1/100s and 1/1000s to counting back in and 100 000s and 1 000 000s- explore for themselves and notice what happens to the digits e.g. which digit changes? Why? How is this different to 10s/ 100s/1000s…?
- rounding to simplify calculations and as a method to check accuracy of calculation
- accurate conversion between all measures
- solving missing number problems e.g. 1 000 000 = 9 000 950 + □; 125 000 = 14 500 + 75 000 + □ ; 75.12 − □ = 2.14; 813.99 - □ = 72.15; 12.145 + □ = 15.0 What could the numbers be? What couldn't they be?
- BODMAS
- answering subtraction in multi- step problems in all contexts, with different mixed units and mathematics in use e.g. there are 160 marbles in the jar, ¼ of them are glass, 40% are plastic, how many are rubber?

Continue to develop confidence and understanding with mental subtraction, with increasingly larger numbers, including up to 4 digits (and more than if applicable) and decimal numbers, with the use of number lines as needed, in particular within the context of time.

Continued use of the bar model to support problem solving if applicable
I sold my house for £349 950. I bought a cheaper house costing £225 500 and a posh new speed boat! I managed to keep £35 000 for my savings, how much did I spent on my new boat?

£225 500 + □ + £35 000 = £349 950

£349 950		
£225 500	How much is the boat?	£35 000

Columnar subtraction

All pupils should work confidently with the formal columnar algorithm, progressing larger numbers and numbers to 3 decimal places.

To secure both conceptual understanding and procedural fluency teachers may choose to model the method using the expanded method, pictorial or concrete apparatus as with previous years.

```
9 3 5 9 9  -
5 0 2 9 5
4 0 3 0 4
```

```
    8  12 1
2 9 3 0 9 9  -
1 5 4 9 5 5
1 3 8 1 4 4
```

```
265.85  -
132.75
133.10
```

```
  7 1   4 1
8 2 5 .5  -
5 5 1 .6
2 7 3 .9
```

Alternative efficient written methods could help develop conceptual understanding, examples are available from:
National Curriculum Appendix 1

Grading of difficulty (−)

Grading of difficulty (-)

This is an analysis of the difficulty of the calculation, and is independent of the method used to complete the calculation. Simpler calculations should be done mentally.

1	No adjustment			−	47 23	−	864 621
2	Adjustment tens to ones			−	51 36	−	432 217
3	Adjustment hundreds to tens			−	437 182	−	658 287
4	Adjustment hundreds to tens and tens to ones			−	432 187		
5	Zeros	−	470 142	−	700 236	−	604 347

Key Vocabulary

The words listed below should be seen as a starting point, the more we consider which vocabulary is 'key' to strengthening understanding and supporting independent application the wider the vocabulary list grows.

Our children should be confident with all these words listed as well as being supported to find other vocabulary related to the four operations by themselves.

End of KS1	End of Y4	End of KS2
Difference, subtract, minus, take away, decrease, count back, count back from/ in, count up, take, less, how many fewer, how many more, partition, calculate, largest, smallest, operation, half, double, near double, extra, inverse, estimate, re-order, equal, balance, jumps, steps, forwards, backwards, mentally	Deduct, reduce by, remove, remains, left over, loss, discount, efficient, exchanging, commutative, associative and distributive laws, written method, decimal and values, expanded method, algorithm	Brackets, order of operations, BODMAS (or BIDMAS), aggregation, augmentation

Other resources

- Support with making connections with the wider curriculum – NCETM www.ncetm.org.uk
- Problems Linked to the Primary National Curriculum for:
  - [Mathematics in EYFS, Year 1 and Year 2]
  - [Mathematics in Years 3, 4, 5 and 6]
- [Laws of mathematics]
- [PNS model and image charts]
- Interactive teaching programmes (ITPS) www.taw.org.uk/lic/itp