



Calculation Policy

Addition – Years 1-3



+ = signs and missing numbers

Children need to understand the concept of equality before using the '=' sign. Calculations should be written either side of the equality sign so that the sign 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

Counting and Combining sets of Objects

Combining two sets of objects (aggregation) which will progress onto adding on to a set (augmentation)

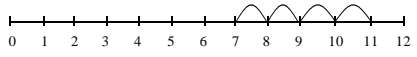


Understanding of counting on with a numbertrack.



Understanding of counting on with a numberline (supported by models and images).

7 + 4

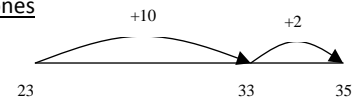


Missing number problems e.g $14 + 5 = 10 + \square$ $32 + \square + \square = 100$
 $35 = 1 + \square + 5$

It is valuable to use a range of representations (also see Y1). Continue to use numberlines to develop understanding of:

Counting on in tens and ones

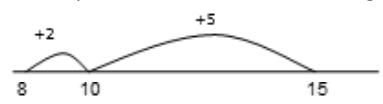
$23 + 12 = 23 + 10 + 2$
 $= 33 + 2$
 $= 35$



Partitioning and bridging through 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.

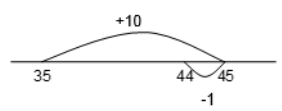
$8 + 7 = 15$



Adding 9 or 11 by adding 10 and adjusting by 1

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

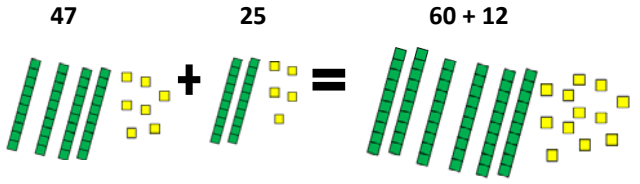
$35 + 9 = 44$



Towards a Written Method

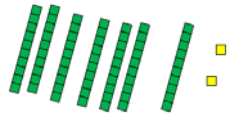
Partitioning in different ways and recombine

47 + 25



Leading to exchanging:

72



Expanded written method

$40 + 7 + 20 + 5 =$
 $40 + 20 + 7 + 5 =$
 $60 + 12 = 72$

$40 + 7$
 $+ 20 + 5$
 $60 + 12 = 72$

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

Partition into tens and ones

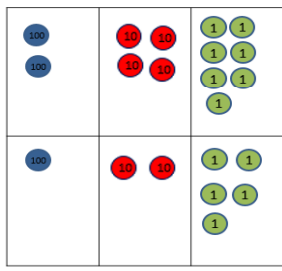
Partition both numbers and recombine.

Count on by partitioning the second number only e.g.
 $247 + 125 = 247 + 100 + 20 + 5$
 $= 347 + 20 + 5$
 $= 367 + 5$
 $= 372$

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

Towards a Written Method

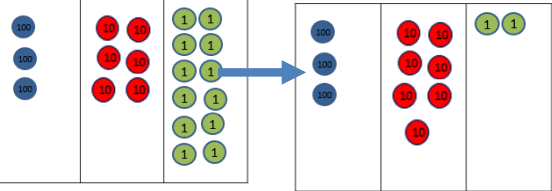
Introduce expanded column addition modelled with place value counters (Dienes could be used for those who need a less abstract representation)



$200 + 40 + 7$
 $100 + 20 + 5$
 $300 + 60 + 12 = 372$

247
 $+125$
 12
 60
 300
 372

Leading to children understanding the exchange between tens and ones.



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

247
 $+125$
 372
 10

Year 1 objectives

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 $7 = \square - 9$.



Year 1 guidance

Notes and guidance (non-statutory)

Pupils memorise and reason with number bonds to 10 and 20 in several forms (for example, $9 + 7 = 16$; $16 - 7 = 9$; $7 = 16 - 9$). They should realise the effect of adding or subtracting zero. This establishes addition and subtraction as related operations.

Pupils combine and increase numbers, counting forwards and backwards.

They discuss and solve problems in familiar practical contexts, including using quantities. Problems should include the terms: put together, add, altogether, total, take away, distance between, difference between, more than and less than, so that pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly.



Year 2 objectives

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.



Return

Year 2 guidance

Notes and guidance (non-statutory)

Pupils extend their understanding of the language of addition and subtraction to include sum and difference.

Pupils practise addition and subtraction to 20 to become increasingly fluent in deriving facts such as using $3 + 7 = 10$; $10 - 7 = 3$ and $7 = 10 - 3$ to calculate $30 + 70 = 100$; $100 - 70 = 30$ and $70 = 100 - 30$. They check their calculations, including by adding to check subtraction and adding numbers in a different order to check addition (for example, $5 + 2 + 1 = 1 + 5 + 2 = 1 + 2 + 5$). This establishes commutativity and associativity of addition.

Recording addition and subtraction in columns supports place value and prepares for formal written methods with larger numbers.



Year 3 objectives

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.



Year 3 guidance

Notes and guidance (non-statutory)

Pupils practise solving varied addition and subtraction questions. For mental calculations with two-digit numbers, the answers could exceed 100.

Pupils use their understanding of place value and partitioning, and practise using columnar addition and subtraction with increasingly large numbers up to three digits to become fluent (see [Mathematics Appendix 1](#)).



Addition

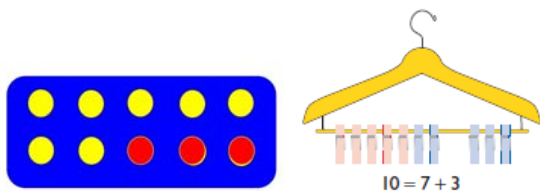
Year 1

Mental Strategies (addition and subtraction)

Children should experience [regular counting](#) on and back from different numbers in 1s and in multiples of 2, 5 and 10.

Children should memorise and reason with number bonds for numbers to 20, experiencing the = sign in different positions.

They should see addition and subtraction as related operations. E.g. $7 + 3 = 10$ is related to $10 - 3 = 7$, understanding of which could be supported by an image like this.



Use bundles of straws and Dienes to model partitioning teen numbers into tens and ones and develop understanding of place value.

Children have opportunities to explore partitioning numbers in different ways.

e.g. $7 = 6 + 1$, $7 = 5 + 2$, $7 = 4 + 3 =$

Children should begin to understand addition as combining groups and counting on.



Vocabulary

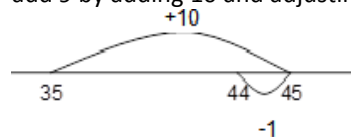
Addition, add, forwards, put together, more than, total, altogether, distance between, difference between, equals = same as, most, pattern, odd, even, digit, counting on.

Year 2

Mental Strategies

Children should count regularly, on and back, in steps of 2, 3, 5 and 10. Counting forwards in tens from any number should lead to adding multiples of 10.

Number lines should continue to be an important image to support mathematical thinking, for example to model how to add 9 by adding 10 and adjusting.



Children should practise addition to 20 to become increasingly fluent. They should use the facts they know to derive others, e.g. using $7 + 3 = 10$ to find $17 + 3 = 20$, $70 + 30 = 100$. They should use concrete objects such as bead strings and number lines to explore missing numbers $-45 + \quad = 50$.

As well as number lines, 100 squares could be used to explore patterns in calculations such as $74 + 11$, $77 + 9$ encouraging children to think about 'What do you notice?' where partitioning or adjusting is used.

Children should learn to check their calculations, by using the inverse.

They should continue to see addition as both combining groups and counting on.

They should use Dienes to model partitioning into tens and ones and learn to partition numbers in different ways e.g. $23 = 20 + 3 = 10 + 13$.

Vocabulary

+, add, addition, more, plus, make, sum, total, altogether, how many more to make...? how many more is... than...? how much more is...? =, equals, sign, is the same as, Tens, ones, partition Near multiple of 10, tens boundary, More than, one more, two more... ten more... one hundred more

Year 3

Mental Strategies

Children should continue to count regularly, on and back, now including multiples of 4, 8, 50, and 100, and steps of 1/10.

The number line should continue to be used as an important image to support thinking, and the use of informal jottings should be encouraged. This will help to develop children's understanding of working mentally.

Children should continue to partition numbers in different ways.

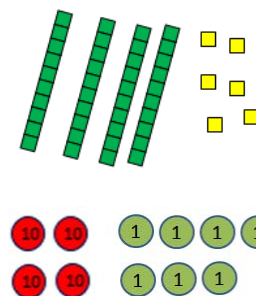
They should be encouraged to choose the mental strategies which are most efficient for the numbers involved, e.g.

Add the nearest multiple of 10, then adjust such as $63 + 29$ is the same as $63 + 30 - 1$;

counting on by partitioning the second number only such as $72 + 31 = 72 + 30 + 1 = 102 + 1 = 103$

Manipulatives can be used to support mental imagery and conceptual understanding. Children need to be shown how these images are related eg.

What's the same? What's different?



Vocabulary

Hundreds, tens, ones, estimate, partition, recombine, difference, decrease, near multiple of 10 and 100, inverse, rounding, column subtraction, exchange See also Y1 and Y2

Generalisations

- True or false? Addition makes numbers bigger.
- True or false? You can add numbers in any order and still get the same answer.

(Links between addition and subtraction)

When introduced to the equals sign, children should see it as signifying equality. They should become used to seeing it in different positions.

Another example here...

Some Key Questions

How many altogether? How many more to make...? I add ...more. What is the total? How many more is... than...?

How much more is...? One more, two more, ten more...

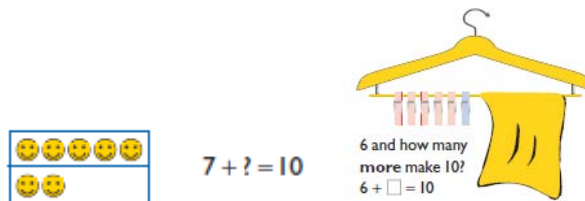
What can you see here?

Is this true or false?

What is the same? What is different?

Generalisation

- Noticing what happens when you count in tens (the digits in the ones column stay the same)
- Odd + odd = even; odd + even = odd; etc
- 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 missing number problems. This understanding could be supported by images such as this.



Some Key Questions

How many altogether? How many more to make...? How many more is... than...? How much more is...?

Is this true or false?

If I know that $17 + 2 = 19$, what else do I know? (e.g. $2 + 17 = 19$; $19 - 17 = 2$; $19 - 2 = 17$; $190 - 20 = 170$ etc).

What do you notice? What patterns can you see?

Generalisations

Noticing what happens to the digits when you count in tens and hundreds.

Odd + odd = even etc (see Year 2)

Inverses and related facts – develop fluency in finding related addition and subtraction facts.

Develop the knowledge that the inverse relationship can be used as a checking method.

Key Questions

What do you notice? What patterns can you see?

When comparing two methods alongside each other: What's the same? What's different? Look at this number in the formal method; can you see where it is in the expanded method / on the number line?

