PROGRESSION THROUGH CALCULATIONS FOR ADDITION

THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE BY THE END OF THE YEAR.

YR

Pupils should be taught to:

- Count reliably with numbers from one to twenty
- Place numbers in order
- Say which number is one more or one less than a given number
- Using quantities and objects, they add two single-digit numbers and count on to find the answer
- Using quantities and objects, they subtract two single-digit numbers and count back to find the answer
- Solve problems, including doubling, halving and sharing

Y1

Pupils should be taught to:

- 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 twos, fives and tens
- 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.
- 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.

Children are encouraged to develop a mental picture of the number system in their heads to use for calculation to at least 20. They develop ways of recording calculations using pictures, etc.

Make 6

2 and 4   3 and 3   4 and 2

0 and 6   1 and 5   5 and 1
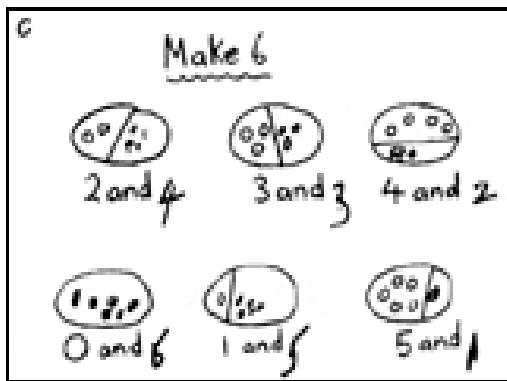
The children will be given lots of practical experiences to aid their learning.
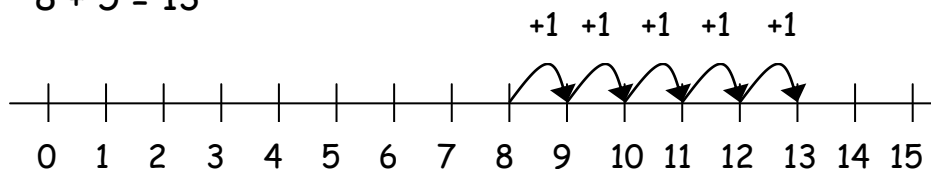Resources such as counters, beads, multi-link, base 10 etc.

They use numberlines and practical resources to support calculation and teachers
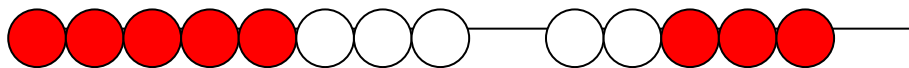*demonstrate* the use of the numberline.

$3 + 2 = 5$

0   1   2   3   4   5   6   7   8   9
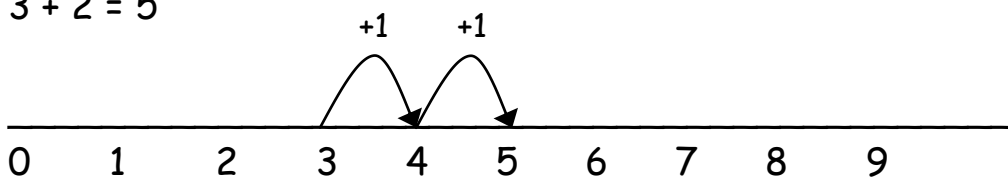
Children then begin to use numbered lines to support their own calculations using a numbered
line to count on in ones.

$8 + 5 = 13$

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Bead strings or bead bars can be used to illustrate addition including bridging through ten by
counting on 2 then counting on 3.

Higher attaining pupils will also be able to solve calculations mentally such as:
- 20 + 18   = 20 + 10 + 8
           = 30 + 8
           = 38

  10 + 20   =   30
- (12) + (23) = (35)
    2 + 3   5

Y2

Pupils should be taught to:
- count in steps of 2, 3, and 5 from 0, and in tens from any number, forward or backward
- recognise the place value of each digit in a two-digit number (tens, ones)
- identify, represent and estimate numbers using different representations, including the number line
- compare and order numbers from 0 up to 100; use <, > and = signs
- read and write numbers to at least 100 in numerals and in words
- use place value and number facts to solve problems.
- 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 missing number problems.

Children will begin to use 'empty number lines' themselves starting with the larger number and counting on.
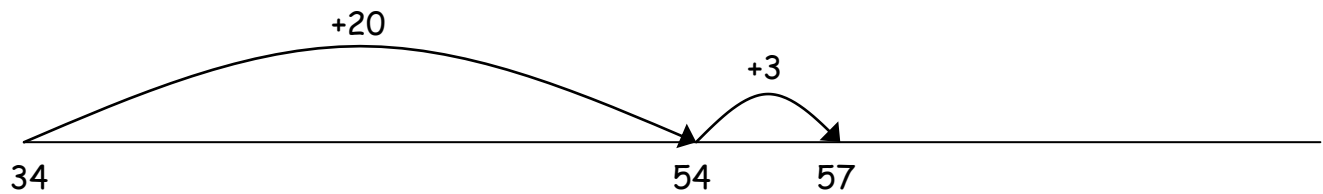
- First counting on in tens and ones.

✓ Then helping children to become more efficient by adding the units in one jump (by using the known fact 4 + 3 = 7).
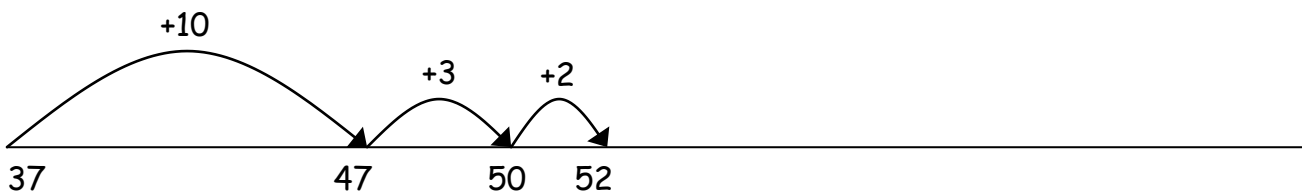
34 + 23 = 57
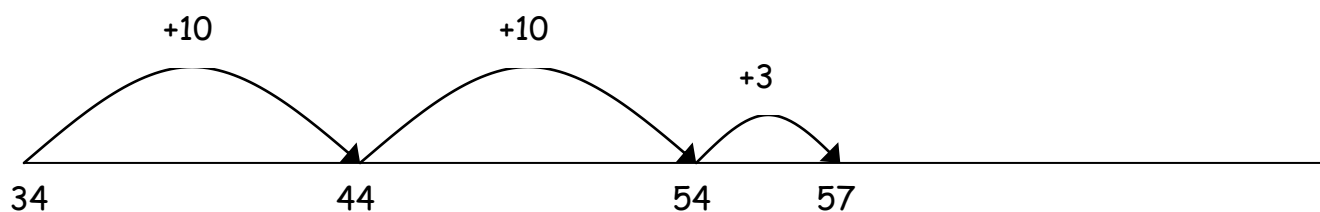
✓ Followed by adding the tens in one jump and the units in one jump.

34 + 23 = 57

$$34 \xrightarrow{+20} 54 \xrightarrow{+3} 57$$

✓   Bridging through ten can help children become more efficient.

37 + 15 = 52

$$37 \xrightarrow{+10} 47 \xrightarrow{+3} 50 \xrightarrow{+2} 52$$

Higher attaining pupils will also be able to solve calculations mentally such as:

- 36 + 53 = 89
    30 + 50 = 80
     6 + 3 = 9
    80 + 9 = 89

    The children will first use number lines and then 100squares to help solve calculation.
    Next they will use blank number lines.
    Base 10 equipment can support children who still need practical experiences.

Children continue to develop strategies for dealing with special cases, e.g.
57 + 29 by adding 30 to 57 and subtracting 1.

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

Columnar addition can be introduced at the end of Y2 when the children are ready in order to prepare for future learning in Y3. **There will be no carrying involved.**

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.
- 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 will continue to use empty number lines with increasingly large numbers, including compensation where appropriate.

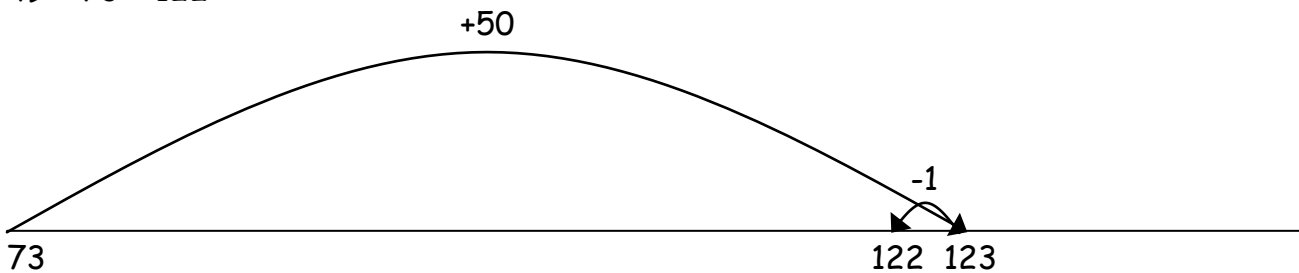✓   Count on from the largest number irrespective of the order of the calculation.

38 + 86 = 124
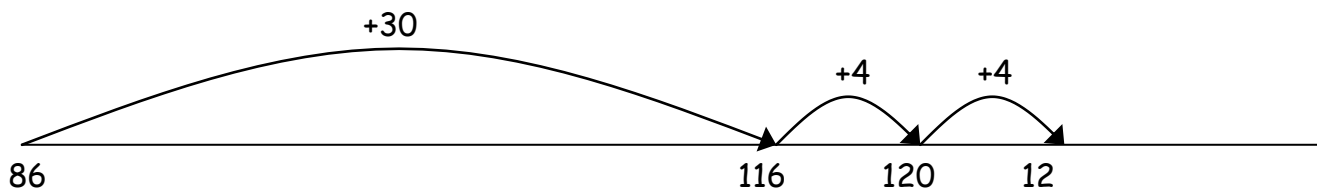
✓ Compensation

The pupils understand that 49 is nearly 50 so they can add 50 and take 1 away.

49 + 73 = 122

Pupils practise columnar addition with increasingly large numbers, up to 3 digits to become fluent (use of Base 10 materials to model practically before recording).

```
      1   3   8
  +      2₁   5
      1   6   3
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      1   5   3
  +   3₁   6   2
      5   1   5
```

Higher attaining pupils will also be able to:
- Use partitioning to mentally add two two-digit numbers including crossing the tens boundary. For example work out mentally and explain that 24 + 58 = 82 because it is 20 + 50 and 4 + 8 making 70 + 12 = 82

Y4

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.
- 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.
- estimate, compare and calculate different measures, including money in pounds and pence

Calculations must contain 4 digit numbers with totals of at least 4 digits or more (carrying included).

$$
\begin{array}{r}
4\ \ 6\ \ 2\ \ 5 \\
+\ \ \ \ \ \ 3\ \ 6\ \ 2 \\
\hline
4\ \ 9\ \ 8\ \ 7 \\
\hline
\end{array}
\qquad
\begin{array}{r}
4\ \ \ 2\ \ \ 2\ \ \ 2 \\
+\ \ \ 5_1\ \ 7_1\ \ 9\ \ \ 1 \\
\hline
1\ \ \ 0\ \ \ 0\ \ \ 1\ \ \ 3 \\
\hline
\end{array}
$$

Using similar methods, children will:
- ✓ add several numbers with different numbers of digits;
- ✓ know that the decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. £13.59 + £1.78.

Higher attaining pupils will be also be able to work out mentally that:

- 1324 + 158 = 1482 because it is 1320 + 150 = 1470 and 4 + 8 = 12, or 1470 + 12 = 1482

Y5

Pupils should be taught to:
- 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 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.
- 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.

Most pupils will be able to work out mentally and explain that:

- 1324 + 1158 = 2482 because it is 1320 + 1150 = 2470 and 4 + 8 = 12, or 2470 + 12 = 2482

Children should extend the carrying method to numbers with more than **four digits and including decimals**.

```
                              1   4   0   1  .  2
    1   3   7   5   4      +   1   2   6  .  8   5
+   1  4₁   9   2   3              1  0₁  .  7   1
    2   8   6   7   7      1   5   3   8  .  7   6
```

Using similar methods, children will:
✓ add several numbers with different numbers of digits;
✓ know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 13.2 m – 1280 cm.

Higher attaining pupils will also be able to use partitioning solve calculations such as 5.6 + 3. 7 = 5.6 + 3 + 0.7 mentally.

Pupils should be taught to:
- read, write, order and compare numbers up to 10 000 000 and determine the value of each digit
- round any whole 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.
  calculations and determine, in the context of a problem an appropriate degree of

- 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 2 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
- solve problems involving addition, subtraction, multiplication and division
- use estimation to check answers to

accuracy.

Most pupils will be able to work out mentally that 1536 + 1442 = 2978 because it is 1530 + 1440 and 6 + 2 making 2970 + 8 = 2978 or use partitioning to mentally solve calculations such as 15.6 + 33. 7.

Children should extend the carrying method to number with any number of digits.

$$
\begin{array}{r}
1\ 3\ 7\ 5\ 4 \\
+\ 1\ 4_1\ 9\ 2\ 3 \\
\hline
2\ 8\ 6\ 7\ 7 \\
\end{array}
\qquad
\begin{array}{r}
1\ 4\ 0\ 1\ .\ 2 \\
+\quad 1\ 2\ 6\ .\ 8\ 5 \\
1\ 0_1\ .\ 7\ 1 \\
\hline
1\ 5\ 3\ 8\ .\ 7\ 6 \\
\end{array}
$$

Using similar methods, children will
- add several numbers with different numbers of digits;
- know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 1401.2 + 126.85 + 10.71.

By the end of Year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Children should be encouraged to approximate their answers before calculating.
Children should be encouraged to check their answers after calculation using an appropriate strategy.
Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.