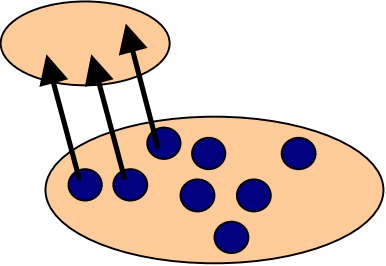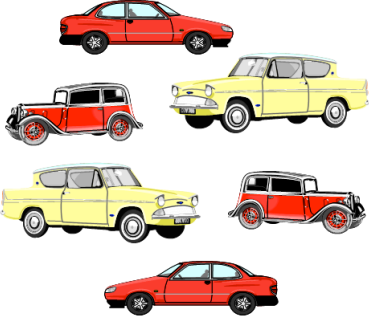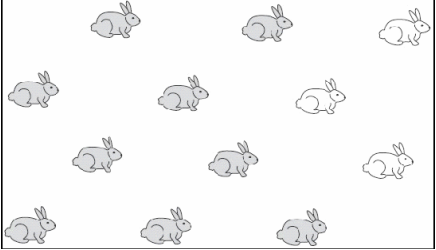# PROGRESSION THROUGH CALCULATIONS FOR SUBTRACTION
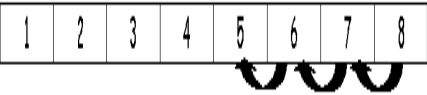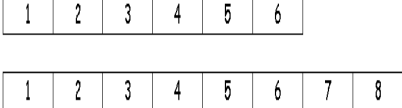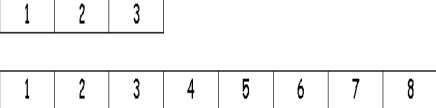
THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE BY THE END OF THE YEAR.

Foundation stage

Children are encouraged to work practically to understand the concept of subtraction as taking away, and by comparing two objects to find difference, how many more or less e.g.

There are eight biscuits on this plate. Take three of the biscuits to eat. How many biscuits are left on the plate?	*Here are six toy cars.* *How many more cars are needed to make a set of eight cars?*	*What is the difference between the number of grey rabbits and the number of white rabbits?*

Teacher *demonstrates* use of number tracks to check results of practical activities.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

| 1 | 2 | 3 | 4 | 5 | 6 |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

| 1 | 2 | 3 |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

Year 1

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.

Taking away

Children interpret subtraction as 'taking away'. They represent 'taking away' using objects and with number sentences, recognising that the number of objects remaining is the answer in a calculation such as 15 – 11 = 4. They begin to rely less on manipulating practical resources and use strategies such as counting back on a number line or software that provides images and diagrams.

15 ducks are on the pond. 11 of them go away. How many are left?
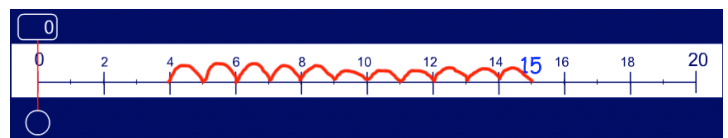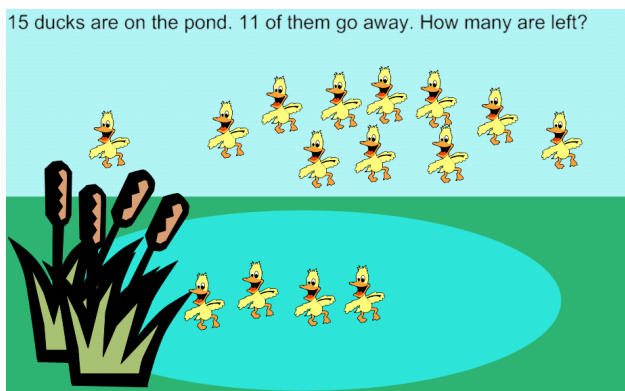
Finding the difference

Children build on their understanding of subtraction to interpret 14 – 9 as finding the difference between 14 and 9 or: 'How many more must I add to 9 to get 14?' They use a counting on strategy and record the process as steps on a number line.

14 - 9 = 5
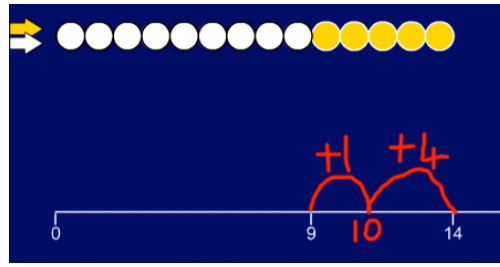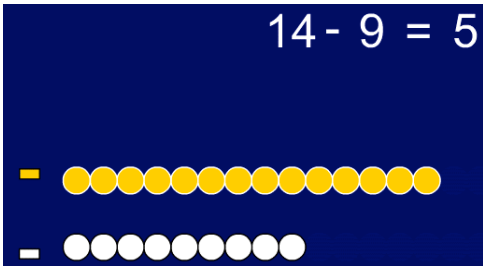
Inverse relationship

They construct sequences of calculations involving subtraction such as: 5 – 1 = 4, 6 – 2 = 4, 7 – 3 = 4 … They continue sequences such as: 12 – 0 = 12, 12 – 1 = 11, 12 – 2 = 10 … to build up patterns o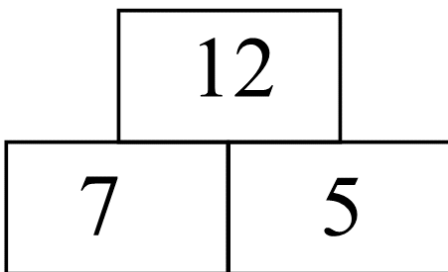f calculations that highlight the underlying process of subtraction. They begin to recognise that subtraction and addition 'undo each other'.

e.g. 7 + 5 = 12 and 12 – 7 = 5

Children apply their knowledge to problems; for example, they work out how many biscuits are left on a plate of 13 biscuits if 4 are eaten. They solve problems such as finding the biggest and smallest possible differences between a pair of numbers from the set 8, 5, 12 and 6.
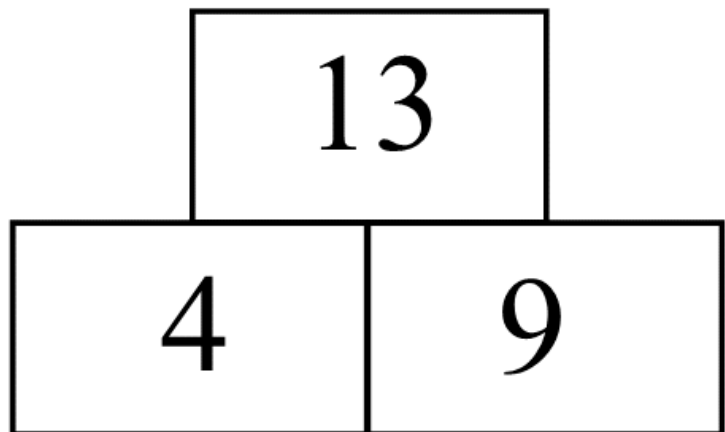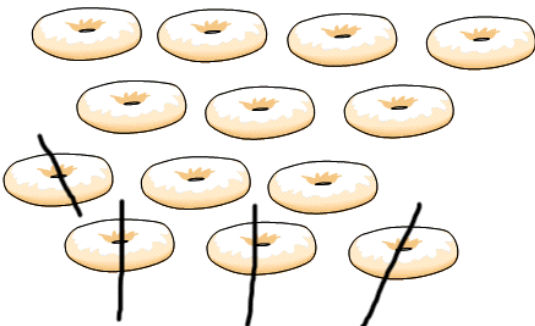
Using +/- and = signs

Children record addition and subtraction number sentences using the operation signs + and –. They generate equivalent statements using the equals sign, for example:

6 + 1 = 7; 5 + 2 = 7 …etc

8 – 1 = 7; 9 – 2 = 7 …etc

They recall the number that is 1 or 10 more or less than a given number and use this to support their calculations, for example to give answers to 12 + 1, 13 – 1 and 30 + 10 and 60 – 10.

The children are to solve missing number problems e.g. ☐-9=7

Year 2

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 use the language of subtraction accurately. They read 16 – 4 = 12 as 'sixteen minus four equals twelve'. They use their knowledge of number facts to add or subtract mentally a one digit number or a multiple of 10 to or from any two digit number. Children discuss and decide whether to: put the larger number first and count on or back; They use number lines, hundred squares and jottings to help them to carry out calculations.

Counting back

- The children will use equipment to aid their calculations, such as multi-link. Once they are confident with subtraction practically they will then use the counting back method.

- counting back in tens and ones.

- Then helping children to become more efficient by subtracting the units in one jump (by using the known fact 7 – 3 = 4).

47 – 23 = 24

```
        -3
       ⌢      -10      -10
      /  \    ⌢        ⌢
     /    \  /   \    /    \
    24    27    37        47
```
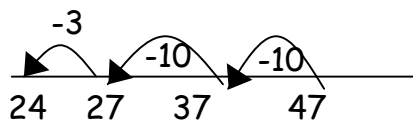
- Subtracting the tens in one jump and the units in one jump.

```
        -3        -20
       ⌢         ⌢
      /  \      /      \
     /    \    /        \
    24    27            47
```

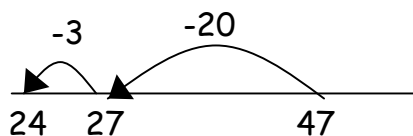- Subtracting a multiple of 10 and adjusting

78 – 19 = 59

```
                  -20
            ⌢
          /        \
         /          \
        /            \
      58   59              78
        \  /
         +1
```
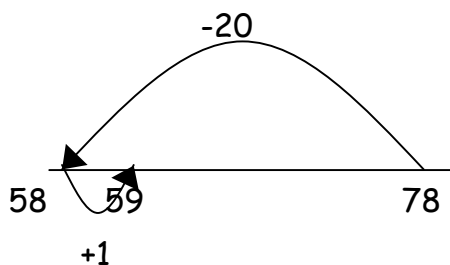
Finding the difference

e.g. *Work out the difference between 46 and 18.*

Through modelling and discussion, explore how this can represented as 46-18 and that complementary addition (counting on) can be a useful checking strategy.

Children should be encouraged to decide which strategy to use depending on the numbers involved.

Towards a standard written method (preparation for Key Stage 2)

In preparation for understanding decomposition and division strategies taught in Key Stage 2, it is important that children gain experience of partitioning beyond simple tens and ones, e.g.

$$54 = 50 + 4 \qquad 50 + 4 = 54$$
$$54 = 40 + 14 \qquad 40 + 14 = 54$$
$$54 = 30 + 24 \qquad 30 + 24 = 54$$
$$54 = 20 + 34 \qquad 20 + 34 = 54$$
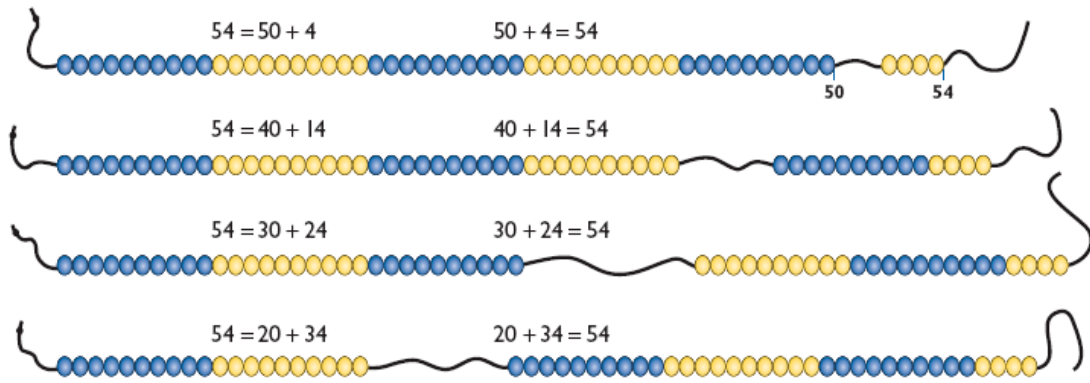
and

50 + 4 = 54
40 + 14 = 54
30 + 24 = 54 etc.

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

Inverse relationship

Children know that addition and subtraction are inverse operations and can state the subtraction calculation corresponding to a given addition calculation and vice versa. They check their answers; for example, to confirm 24 – 7 = 17, they add 17 and 7.
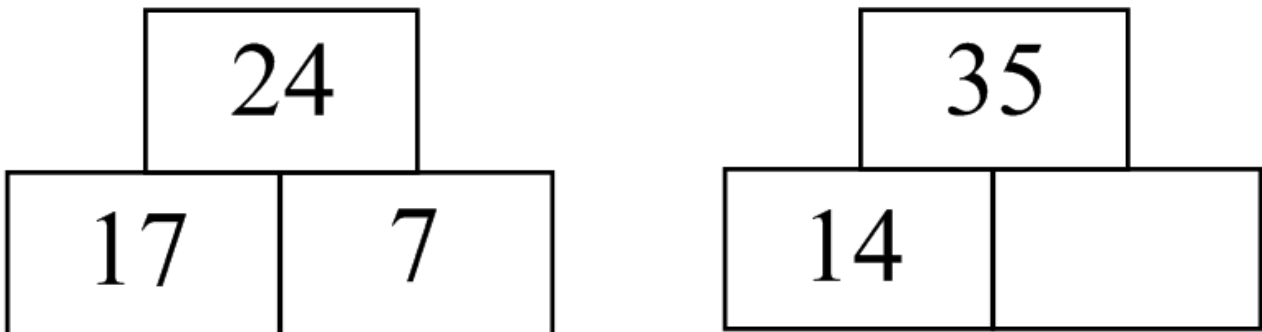
14+ □ =35. What is the missing number? How do you know? What subtraction could you do to find the answer?

Year 3

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 extend their mental calculation skills to add and subtract combinations of one-digit and two digit numbers such as: 14 – 8, 34 – 8, 34 – 18, 6 + 18, 6 + 58 and 16 + 58. In particular, they use their knowledge of addition and subtraction facts to add or subtract a two-digit number to or from any two or three-digit number, e.g. 163 + 18, 163 – 18.

Children continue to develop strategies for dealing with special cases, e.g.
57 – 29 by subtracting 30 from 57 and adding 1 or by representing the calculation as 58 – 30.

Children apply their understanding that the difference between two numbers will stay the same if both numbers are reduced or increased by the same amount, e.g.
Finding the difference between 147 and 138 is the same as finding the difference between 47 and 38 or the difference between 49 and 40.

Children develop and use written methods to add and subtract two-digit and three-digit numbers. For calculations involving subtraction, children can use a number line, subtracting the number that they are taking away in convenient and partitioned steps. The written method adopted should support the mental method used.

Towards a standard written method

During work on place value children need to continue to develop their understanding of partitioning beyond hundreds, tens and ones, e.g.

325 can be partitioned in a variety of ways, such as
325 = 300 + 20 + 5,   300 + 10 + 15,   200 + 110 + 15… etc

A useful visual image*:*


```
 325
-164
```
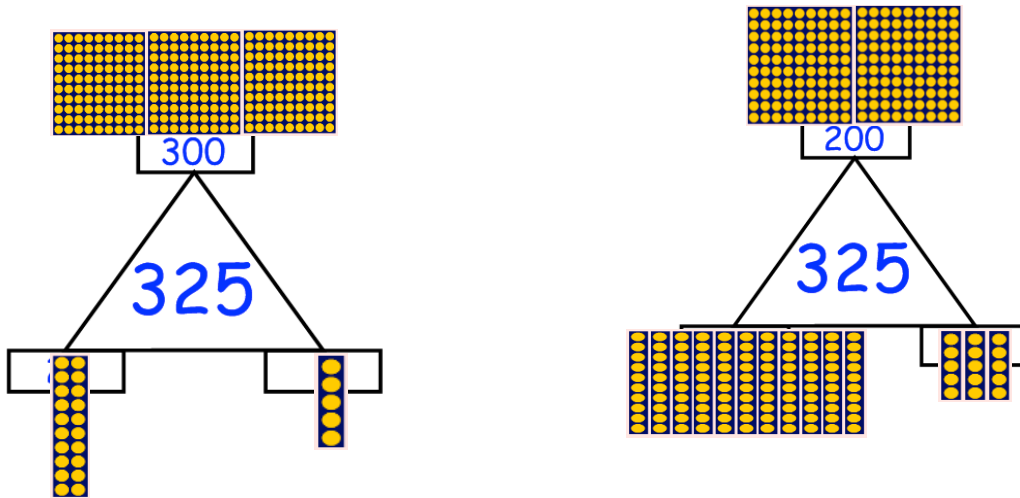
```
 300  20    5
-100  60    4
 100  60    1
```

<u>Becomes</u>

```
 200  120    5
-100   60    4
 100   60    1
```

Then

100+60+1=161

Pupils practice using columnar subtraction with increasingly large numbers up to 3 digits to become fluent. Use of Dienes/Base 10 materials to model.

```
    7   ¹
    8̸   8
-   3   9
  ─────────
    4   9
```

```
            4   ¹
        8   5̸   1
    -   3   3   9
      ─────────────
        5   1   2
```

Year 4

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

Children develop and use written methods to add and subtract up to four-digit numbers. For calculations involving subtraction, children can use a number line, subtracting the number that they are taking away in convenient and partitioned steps.

```
              4
                    ¹
      1   8   5̶   1
  -       3   3   9
      ─────────────
      1   5   1   2
```

This method needs to be applied to two-step problems (AT1).
Eg A boy had £10.35 to spend at the sweet shop. He buys some chocolate for £2.20 and some lollipops for £5.85. How much change will he receive?

Year 5

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.

Children continue to check a calculation to see if they can carry out it out mentally. They bridge through the landmarks of multiples of 1, 10, 100 and 1000 when they add and subtract mentally and make jottings. They calculate mentally with two-digit decimals; for example, they relate 9.5 – 3.7 to the whole-number calculation 95 – 37 = 58, giving the answer 5.8.

Formal written method

Children draw on their knowledge of number facts and place value. They use efficient written methods to add and subtract whole numbers of four or more digits and decimals with at least two places. They record the calculations succinctly, embedding the processes of partitioning and exchange in the presentation.

$$
\begin{array}{r}
{}^{1}\ \ {}_{1}\\
7\,\cancel{2}.5\,7\\
-\,4\,5.7\,2\\
\hline
2\,6.8\,5
\end{array}
\qquad
\begin{array}{r}
{}^{1}\\
\mathbf{7\ 2}\ {}_{1}\\
9\,\cancel{8}\,\cancel{3}\,1\\
-\,3\,6\,4\,2\\
\hline
6\,1\,8\,9
\end{array}
$$

This method needs to be applied to multi-step (more than two) problems (AT1).

- 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

Year 6

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 calculations and determine, in the context of a problem an appropriate degree of accuracy.
- use negative numbers in context, and calculate intervals across zero
- solve number and practical problems that involve all of the above.

Children continue to check a calculation to see if they can carry out it out mentally. They bridge through the landmarks of multiples of 1, 10, 100 and 1000 when they add and subtract mentally and make jottings. They calculate mentally with two-digit decimals; for example, they relate 9.55 – 3.71 giving the answer 5.84.

Formal written method

Children draw on their knowledge of number facts and place value to refine their use of expanded methods. They use efficient written methods to add and subtract whole numbers of four or more digits and decimals with at least two places. They begin to record the calculations more succinctly, embedding the processes of partitioning and exchange in the presentation.

Children should:
✓ be able to subtract numbers with different numbers of digits;
✓ be able to subtract two or more decimals with up to three digits and either one or two decimal places;

By the end of Year 6, children will have developed 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.