Nebula

where stars are born

Old Catton Junior School

Calculations Policy

Old Catton C of E Junior School

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The aim of this policy is to ensure consistency of mathematics methods and teaching throughout the school. It gives an overview of the strategies used in our school to teach to the year group objectives in the 2014 Primary Mathematics Curriculum.

Children should be able to problem solve effectively and select an efficient method of their choice that is appropriate to the task. This includes practical, mental and formal written methods. They are encouraged to decide upon the best way to try and solve a problem then use the appropriate method to do so.

Overall aims by the end of KS2:

Have a secure understanding and knowledge of number facts and be able to select and use any of the four operations appropriately.

Use their knowledge to carry out calculations mentally and to apply appropriate strategies when calculating with multi-digit numbers.

Make use of diagrams, informal notes and jottings to record their thought processes when there is more information than can be kept in their heads.

Fluency, reasoning and problem solving to be securely embedded into all aspects of mathematics.

*NB: The term **'ones'** is used throughout the school as a place value column heading in preference to 'units' or 'singles'.*

Addition

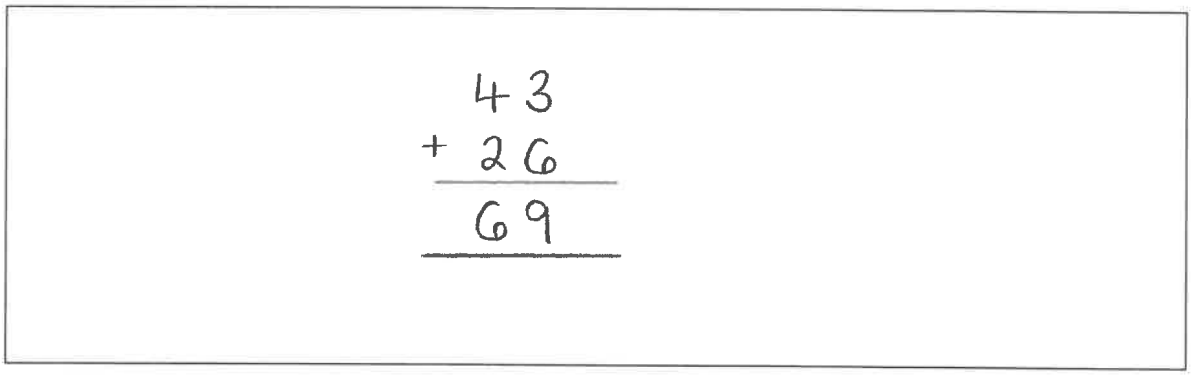
The number line in Year 3 should be used only to facilitate conceptual understanding of addition and to demonstrate the process of adding mentally.

Also, understanding of place value of digits and partitioning of 2 or 3 digit numbers are crucial early concepts to be reinforced.

Column addition method

Method used from Year 3 to Year 6.

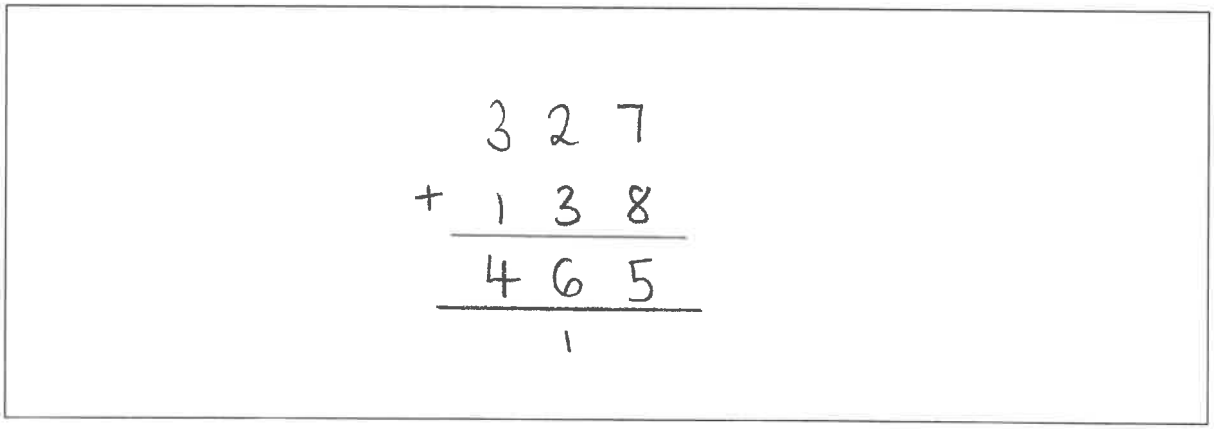
This is introduced in Year 3 when a secure understanding of digit place value has been established. Initially in Year 3 it should be taught using numbers that do not require any 'carrying' to the next column.



Concrete, practical resources (e.g. Deines) should be used to display the method visually and ensure the children's conceptual understanding.

Year 3/4

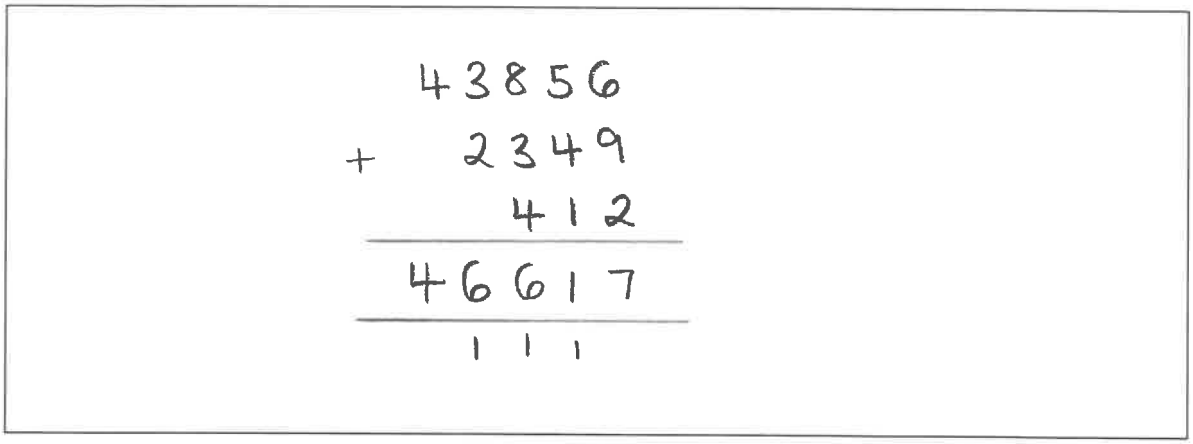
Once children are secure with this initial concept, they can begin to be taught calculations which involve the sum of two digits being larger than nine using the method of 'carrying' to the next place value column.



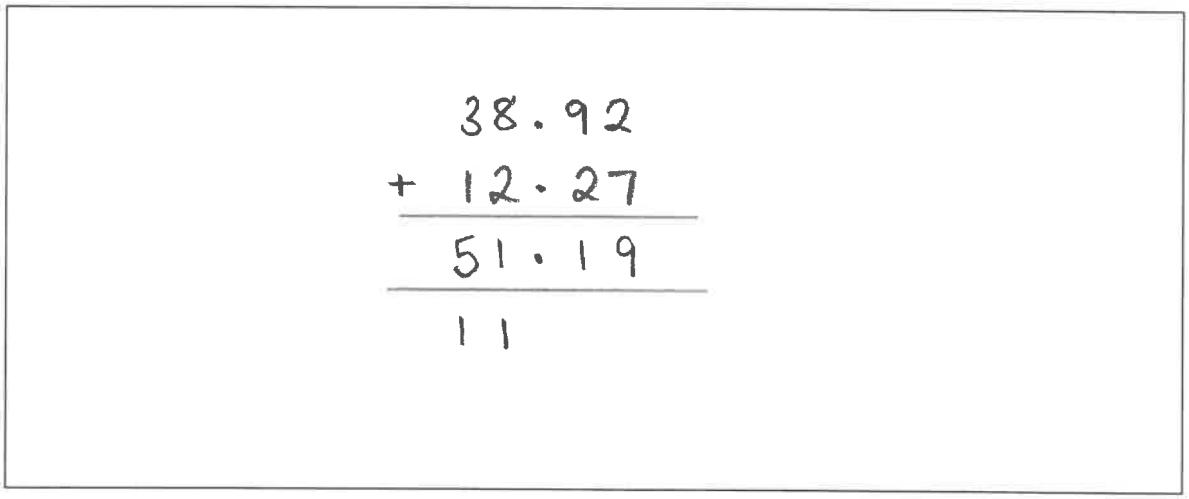
The concept of ten ones becoming one ten in the next column or ten hundreds becoming one thousand should again be introduced visually using concrete, physical resources.

In Years 5 and 6 the same method can be used to solve more complicated additions:

To add multiple numbers:



Or for decimal numbers:



It is essential at all times that children understand the VALUE of all digits in the calculation, and how the method works.

They are simply adding each place value column in turn. The children should be able to clearly explain their working.

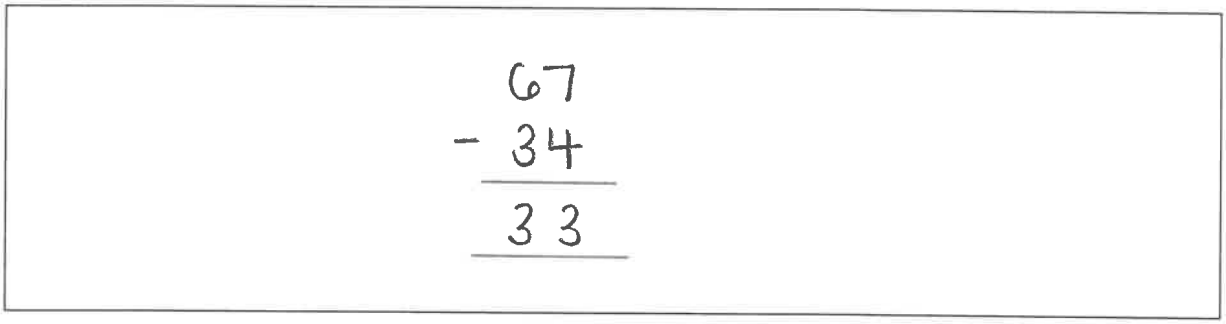
Subtraction

The number line, or 'counting on', method should only be used in Year 3 to facilitate a conceptual understanding of 'finding the difference' between two numbers and to enhance mental subtraction calculations.

Column Subtraction

Method used from Year 3 to Year 6.

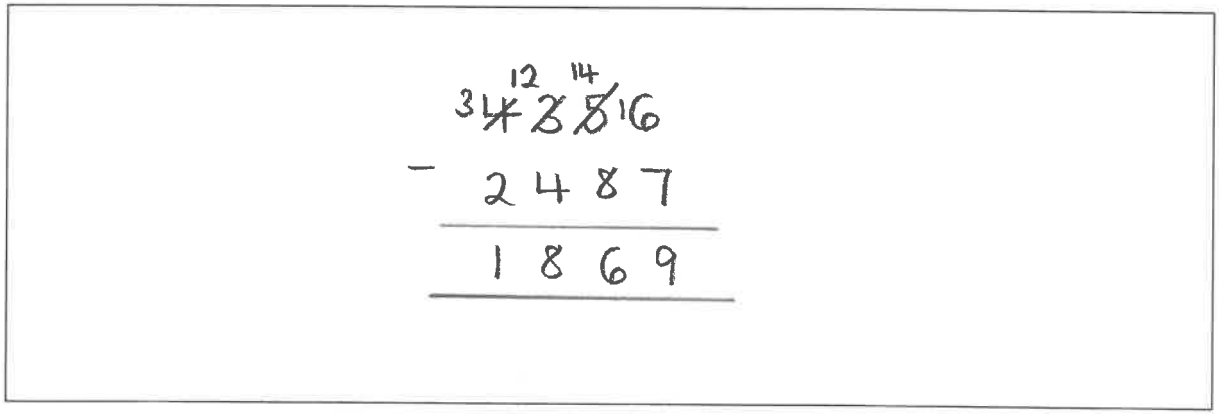
This is introduced in Year 3 when a secure understanding of digit place value has been established. Initially in Year 3 it should be taught using numbers with a higher digit on top in each place value column to introduce the method simply.



Concrete resources can be used to clearly demonstrate what is being represented by the calculation. ***It is important for the children to understand and articulate that the 6 - 3 = 3 is actually 60 - 30 = 30. Their understanding of digit value is crucial.***

Decomposition

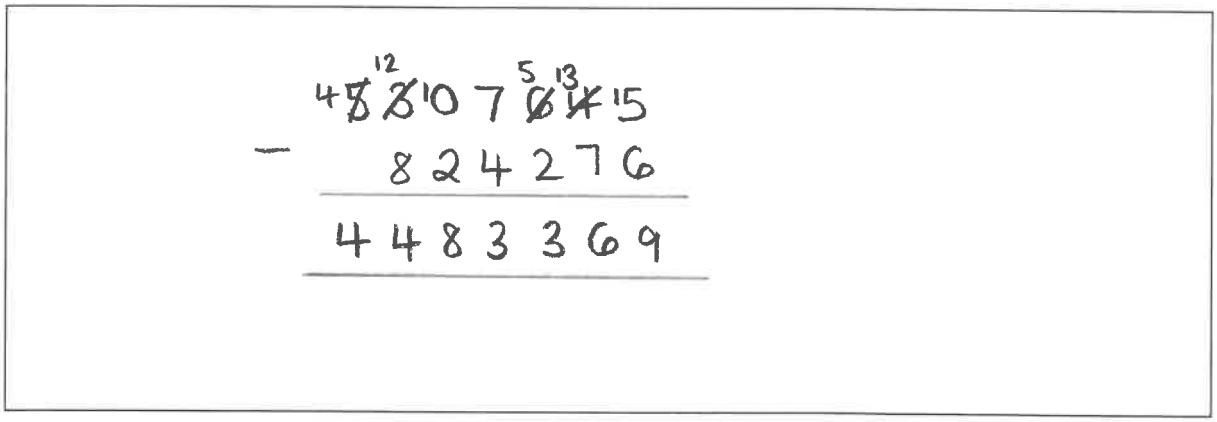
Once secure, children are then introduced to the concept of 'decomposition' whereby numbers can be 'exchanged' across place value columns.



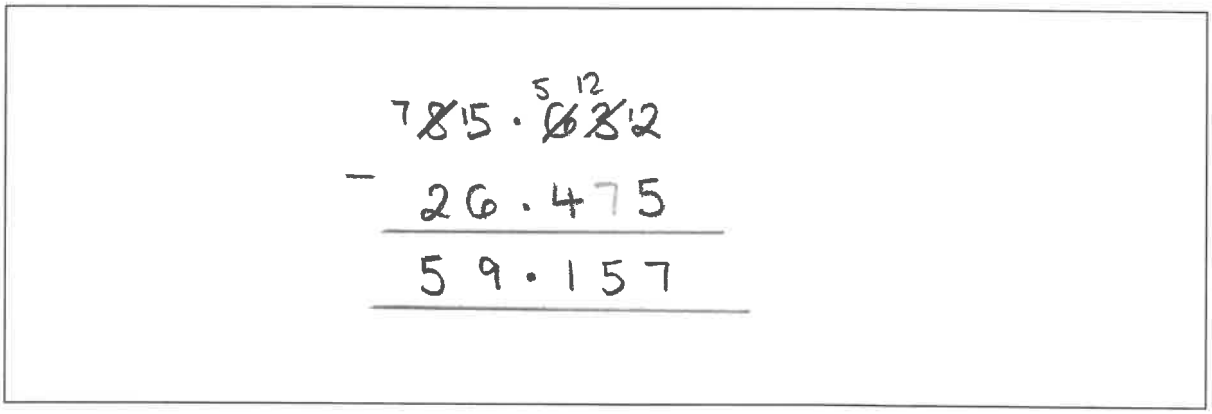
In the above example, it is important they understand one 'ten' has been *exchanged* for ten ones because they have an equivalent value. *Concrete resources should be used to demonstrate to children what has happened and WHY the method works.*

Year 5 and 6

The method is widened to include larger numbers:



And also decimals:



Once again, the importance of understanding the place value (e.g. tenths, hundredths) and ability to articulate WHY the method works are crucial.

Multiplication

A secure understanding of times table facts is the basis for all multiplication methods used and therefore an essential requirement. Times table facts are a focus in Years 3 and 4 in order to enable children to know them by heart and by able to apply them confidently by the end of Year 4.

Year 3

Children use their knowledge of times table facts and place value to carry out simple multiplications using distributive law.

$43 \times 7 = (40 \times 7) + (3 \times 7)$

$40 \times 7 = 280$

$3 \times 7 = 21$

$280 + 21 = 301$

Arrays and physical resource should be used in Year 3 to demonstrate visually the process of multiplication and to link it conceptually to repeated addition.

Year 4

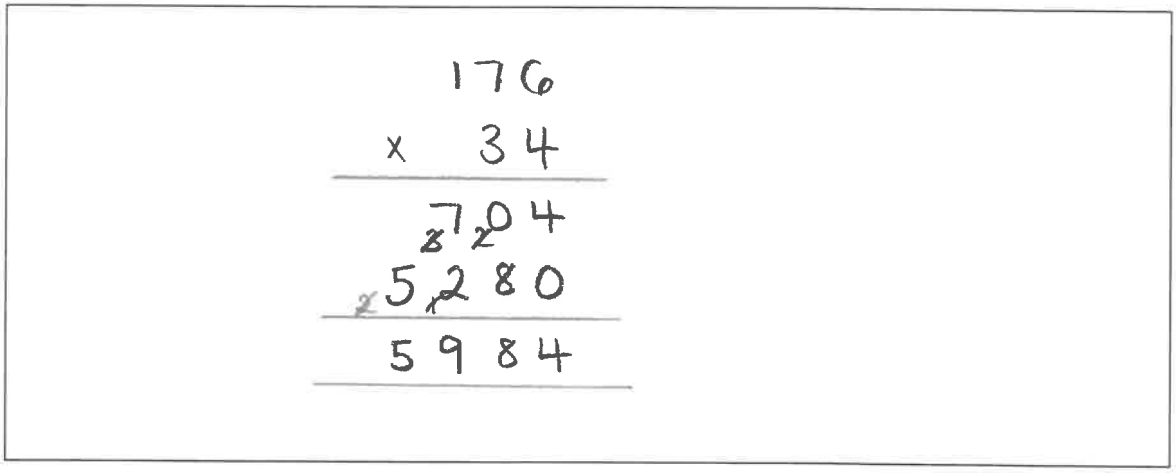
Children begin to multiply 2 digit numbers by a 1 digit number using short multiplication.

$$\begin{array}{r} 46 \\ \times \quad 7 \\ \hline 322 \\ \hline 4 \end{array}$$

Children should understand why the small digit is placed in the next column: it represents 40 so has been placed in the tens column and added to the other tens in that column.

Year 5

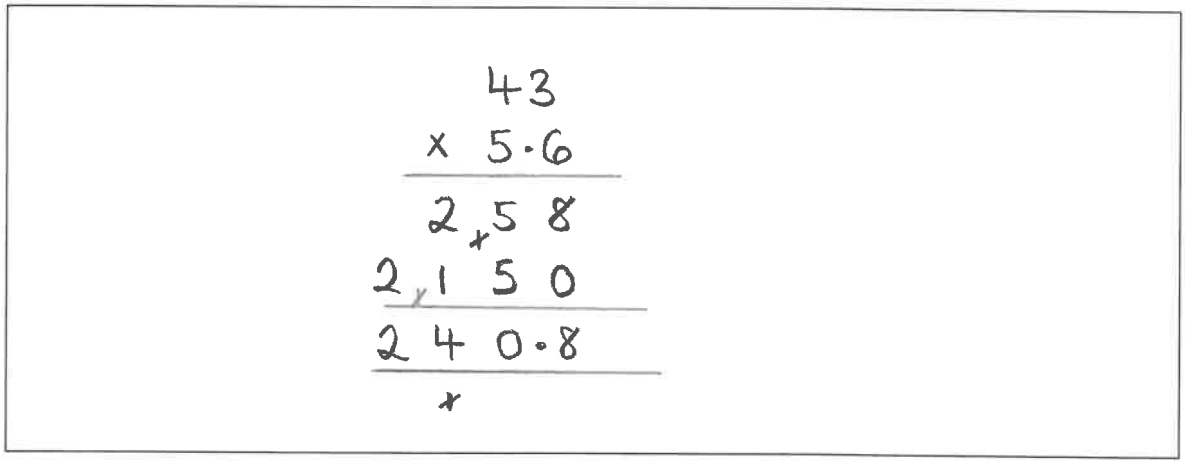
Children move on to multiplying 3 and 4 digit numbers by a 2 digit number using column (long) multiplication.



Children should understand that it is 176 x 4 and 176 x 30. The 3 is worth 30 therefore the answer will be ten times bigger so a zero is put into the units column as a placeholder Principles of column addition apply when calculating a final answer.

Year 6

Understanding of place value and multiplying/dividing by 10, 100, 1000 is used to calculate multiplications involving decimals.



'Multiplying out' the decimal in the question (x 10 to make 43 x 56) then dividing answer by 10 to put the decimal back in.

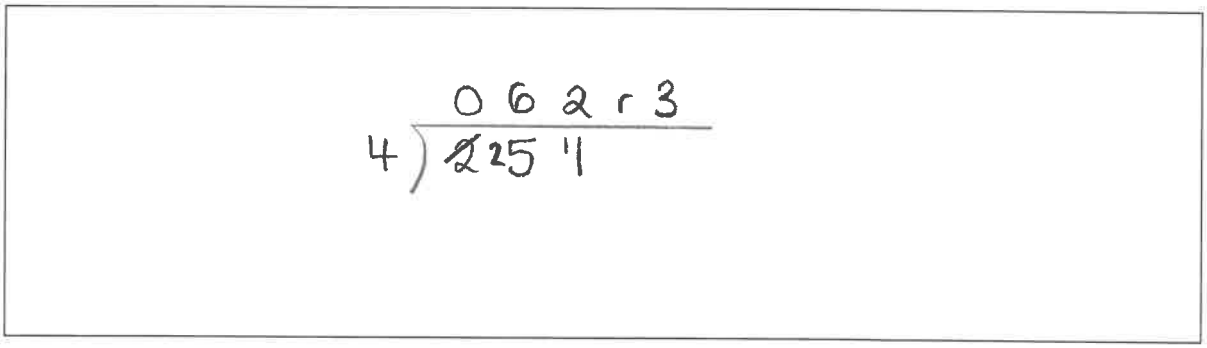
Division

In Year 3 children may use number lines or physical resources to represent grouping and sharing to ensure their conceptual understanding of what division actually means. In this way they can be introduced to the concept of remainders:

22 coins are shared between 4 people = Four groups of five with two left over.

Short Division (Bus Stop)

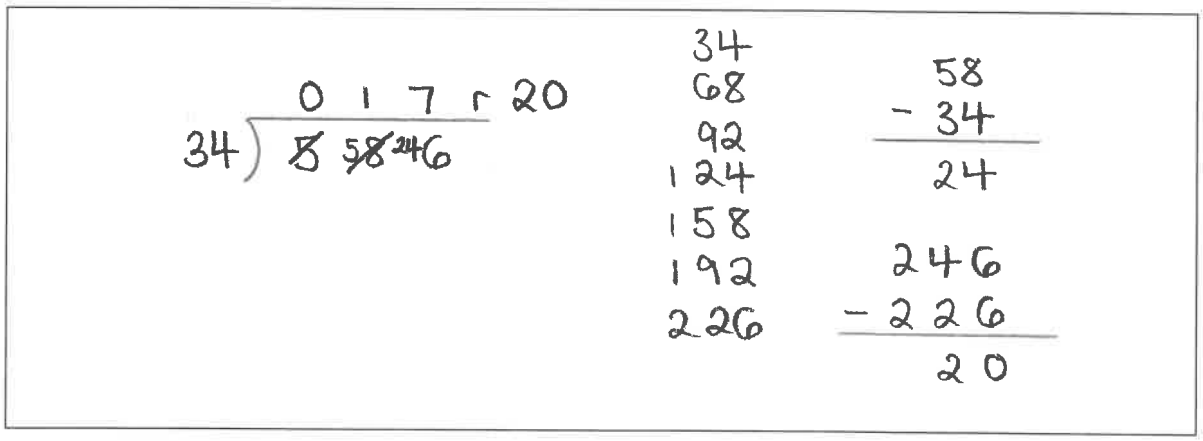
Once their conceptual understanding of what division actually means has developed, this method is introduced from Year 3 up to Year 6.



As children progress, they should be able to interpret remainders as fractions or as a decimal.

$$62\frac{3}{4} = 62.75$$

In Year 6, children will need to be able to divide by a 2 digit number. This can either be calculated using the short division algorithm, as above or by using the long division algorithm as shown in the following examples.



Jotting down tables, estimates and multiplications in a right hand column are all techniques that can be used to assist in dividing by larger numbers in circumstances where the children do not know their times tables.

3834 ÷ 18 =

```
      0 2 1 3
18 ) 3 8 3 4
    - 3 6 ↓  |      (2 x 18)
        ¹2 ¹3 |
        1 8   ↓     (1 x 18)
        0 5   4
          5   4     (3 x 18)
          0   0
```