# High Firs Primary School

## Maths Workshop

YEARS 5 & 6

## National Curriculum Aims:

- To become *fluent* in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop *conceptual understanding* and the ability to recall and apply knowledge rapidly and accurately
- *To reason* mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language *can solve problems by applying* their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions

# What does Maths look like in Year 5?

To use the formal written methods for all four operations (addition, subtraction, division and multiplication)

Recognise the place value of each digit in numbers with up to 3 decimal places

Measure angles in degrees (°) and draw angles of a given size

Rapid and accurate recall of **ALL** times tables and related division facts

Secure understanding of fractions including simplifying, equivalent fractions and calculating with fractions (+ - and x by integers)

Convert between units of measure e.g. grams to kilograms

Draw upon a variety of mental maths strategies to support arithmetic skills

To solve number problems using reasoning to justify my answers and to prove and disprove

Find non-unit fractions of quantities.

# What does Maths look like in Year 6?

Recognise the place value of each digit in numbers up to 10 million, including decimal fractions

Solve problems involving ratio relationships

Algebra

Solve multi-step word problems

To consolidate the formal written methods and use alongside efficient mental strategies

Rapid and accurate recall of **ALL** times tables

Draw, compose and decompose shapes according to given properties, including dimensions, angles and area

Find equivalent fractions, decimals and percentages

Use common factors and multiples to simplify fractions

Working with numbers beyond 6 and 7 digits

Systematic and methodical workings

Draw upon a variety of mental maths strategies to support arithmetic skills

To securely use all four operations when calculating with fractions (+ - x ÷)

**At High Firs, we follow the White Rose Maths scheme.**

Notes and Guidance

## Teaching for Mastery

These overviews are designed to support a mastery approach to teaching and learning and have been designed to support the aims and objectives of the new National Curriculum.

The overviews:

- have number at their heart. A large proportion of time is spent reinforcing number to build competency
- ensure teachers stay in the required key stage and support the ideal of depth before breadth.
- ensure students have the opportunity to stay together as they work through the schemes as a whole group
- provide plenty of opportunities to build reasoning and problem solving elements into the curriculum.

## Concrete - Pictorial - Abstract

We believe that all children, when introduced to a new concept, should have the opportunity to build competency by taking this approach.

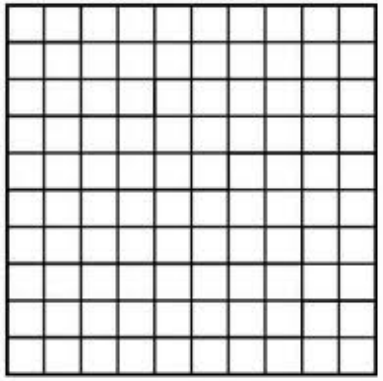
Concrete – children should have the opportunity to use concrete objects and manipulatives to help them understand what they are doing.

Pictorial – alongside this children should use pictorial representations. These representations can then be used to help reason and solve problems.

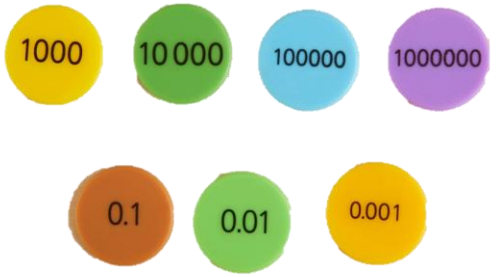
Abstract – both concrete and pictorial representations should support children's understanding of abstract methods.

# What are concrete resources?

Bead strings



100 grids




Place value counters

Multilink cubes

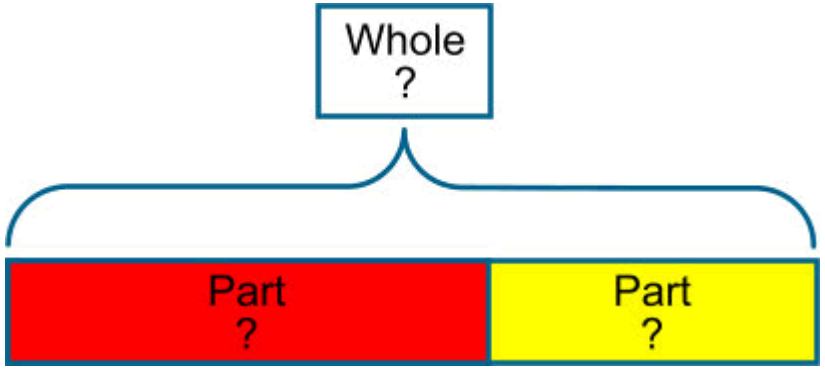
Number lines

Dienes blocks

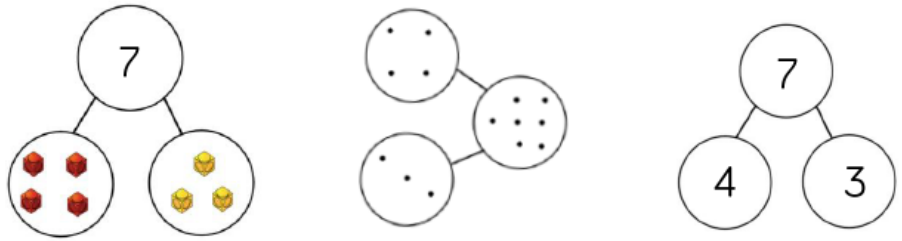
# What are pictorial representations?

Number lines

Bar model

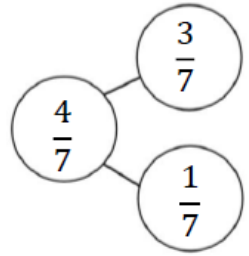



Part whole model




$7 = 4 + 3$ $\quad$ $7 - 3 = 4$

$7 = 3 + 4$ $\quad$ $7 - 4 = 3$

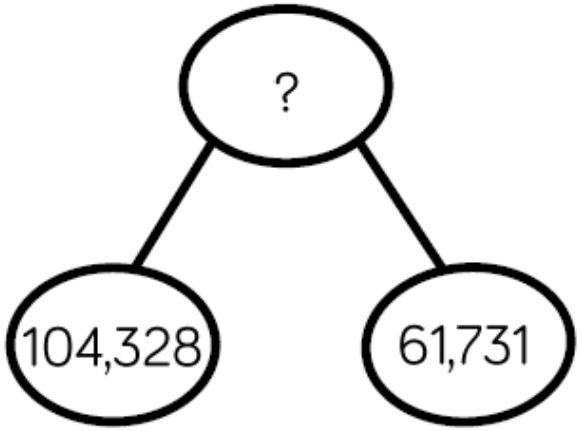



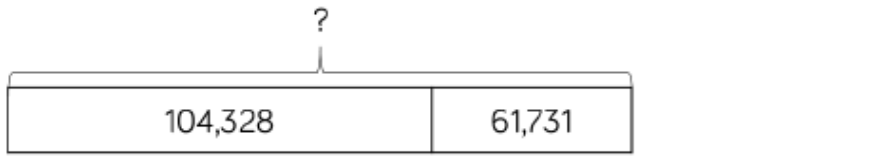

Drawing place value counters

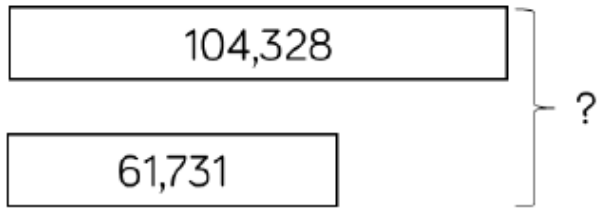
# Addition

## Skill: Add numbers with more than 4 digits

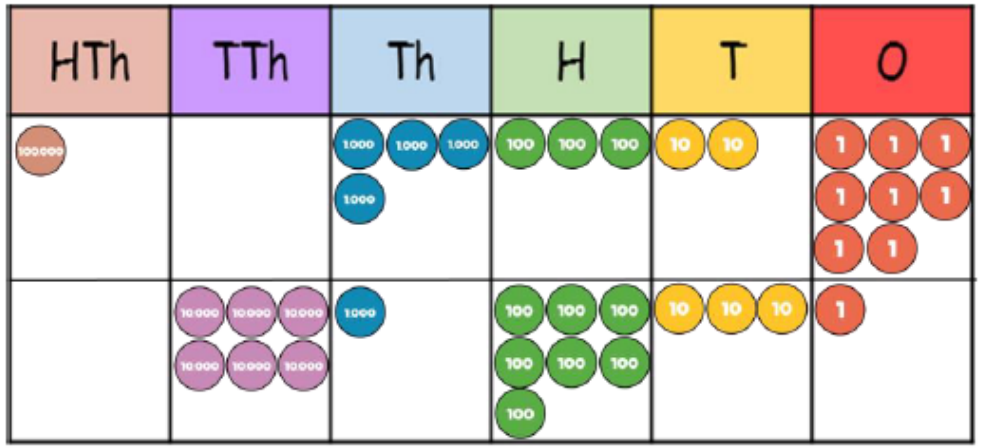
## Year: 5/6




**104,328 + 61,731 = 166,059**

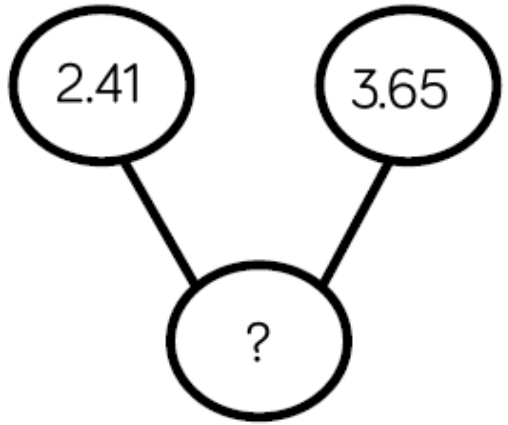
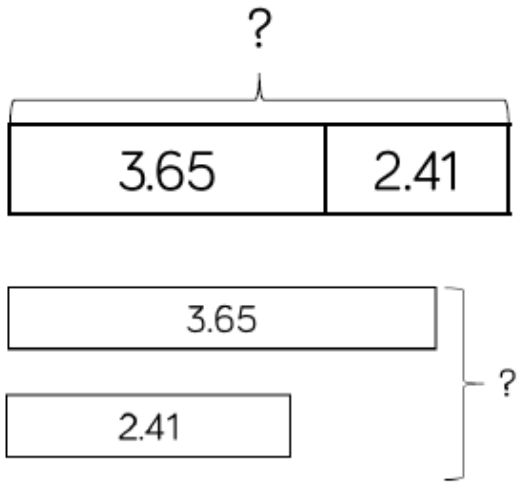
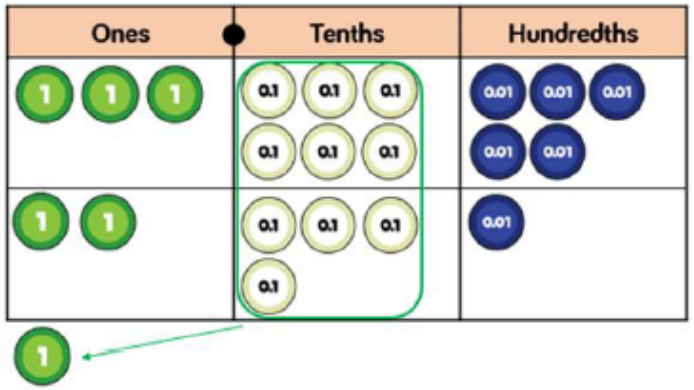
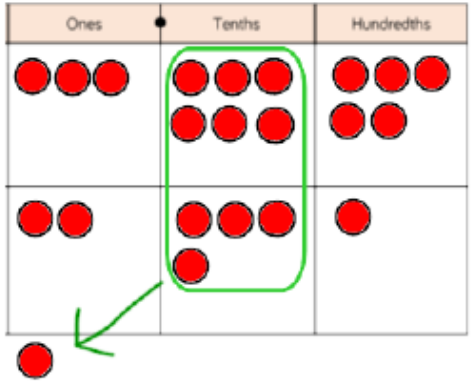



| | | | | | |
|---|---|---|---|---|---|
| 1 | 0 | 4 | 3 | 2 | 8 |
| + | 6 | 1 | 7 | 3 | 1 |
| 1 | 6 | 6 | 0 | 5 | 9 |

1

Place value counters or plain counters on a place value grid are the most effective concrete resources when adding numbers with more than 4 digits.

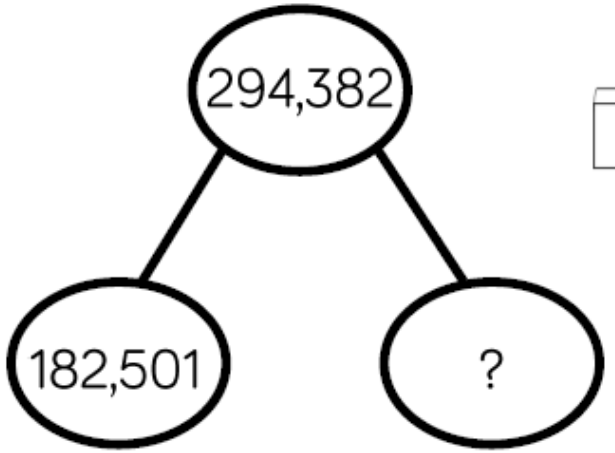
At this stage, children should be encouraged to work in the abstract, using the column method to add larger numbers efficiently.

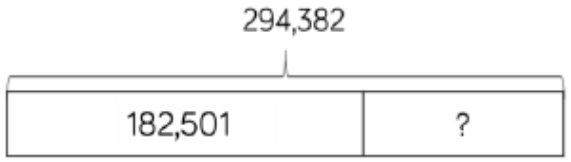
| Skill: Add with up to 3 decimal places | Year: 5 |
| --- | --- |
|  <br>  <br>$\begin{array}{r} 3.65 \\ +\ 2.41 \\ \hline 6.06 \\ \hline 1 \end{array}$<br>**$3.65 + 2.41 = 6.06$**<br>  <br>  | Place value counters and plain counters on a place value grid are the most effective manipulatives when adding decimals with 1, 2 and then 3 decimal places.<br><br>Ensure children have experience of adding decimals with a variety of decimal places. This includes putting this into context when adding money and other measures. |

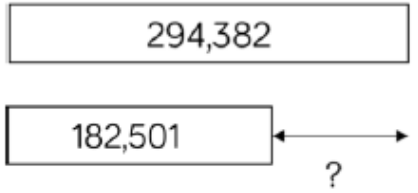
# Subtraction

## Skill: Subtract numbers with more than 4 digits

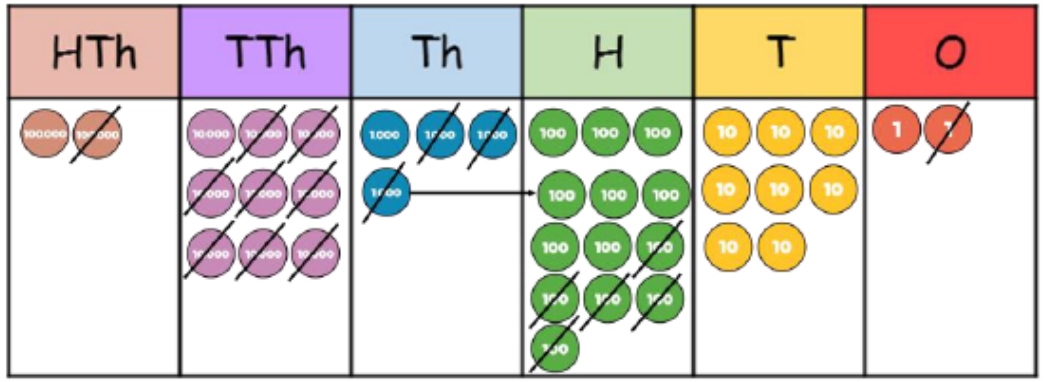
## Year: 5/6




$$294{,}382 - 182{,}501 = 111{,}881$$



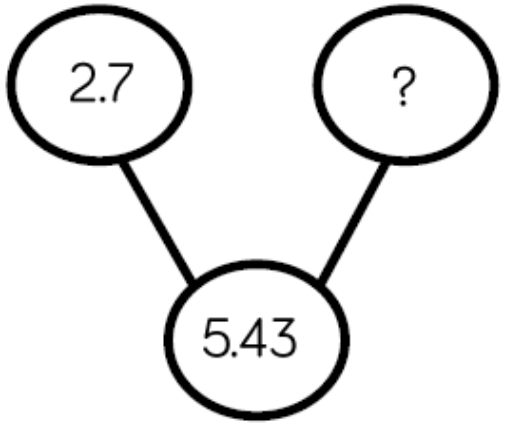

| | | | | | | |
|---|---|---|---|---|---|---|
| | 2 | 9 | $\cancel{4}^{3}$ | $^{1}3$ | 8 | 2 |
| − | 1 | 8 | 2 | 5 | 0 | 1 |
| | 1 | 1 | 1 | 8 | 8 | 1 |

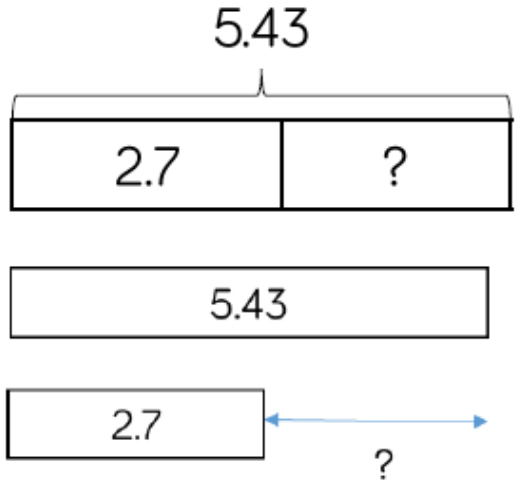
Place value counters or plain counters on a place value grid are the most effective concrete resource when subtracting numbers with more than 4 digits.

At this stage, children should be encouraged to work in the abstract, using column method to subtract larger numbers efficiently.

## Skill: Subtract with up to 3 decimal places

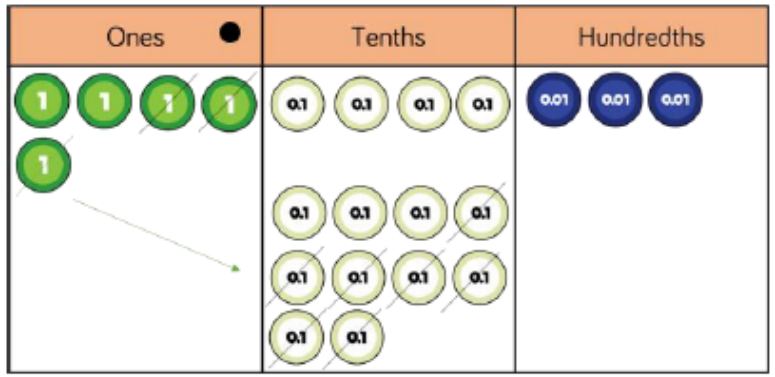
## Year: 5

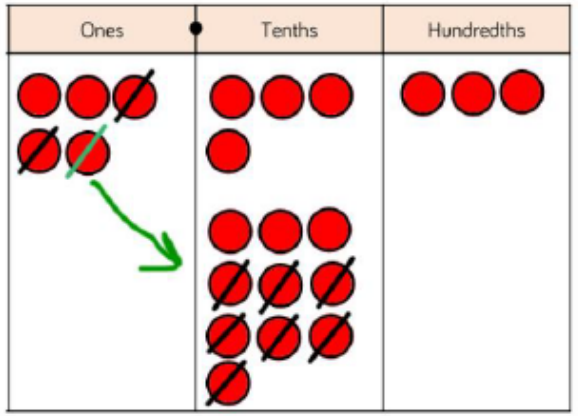



$$\begin{array}{r} {}^{4}\cancel{5}.{}^{1}43 \\ -\ 2.7 \\ \hline 2.73 \end{array}$$

$$5.43 - 2.7 = 2.73$$




Place value counters and plain counters on a place value grid are the most effective manipulative when subtracting decimals with 1, 2 and then 3 decimal places.

Ensure children have experience of subtracting decimals with a variety of decimal places. This includes putting this into context when subtracting money and other measures.

# Glossary

**Addend -** A number to be added to another.

**Aggregation -** combining two or more quantities or measures to find a total.

**Augmentation -** increasing a quantity or measure by another quantity.

**Commutative –** numbers can be added in any order.

**Complement –** in addition, a number and its complement make a total e.g. 300 is the complement to 700 to make 1,000

**Difference –** the numerical difference between two numbers is found by comparing the quantity in each group.

**Exchange –** Change a number or expression for another of an equal value.

**Minuend –** A quantity or number from which another is subtracted.

**Partitioning –** Splitting a number into its component parts.

**Reduction –** Subtraction as take away.

**Subitise –** Instantly recognise the number of objects in a small group without needing to count.

**Subtrahend -** A number to be subtracted from another.

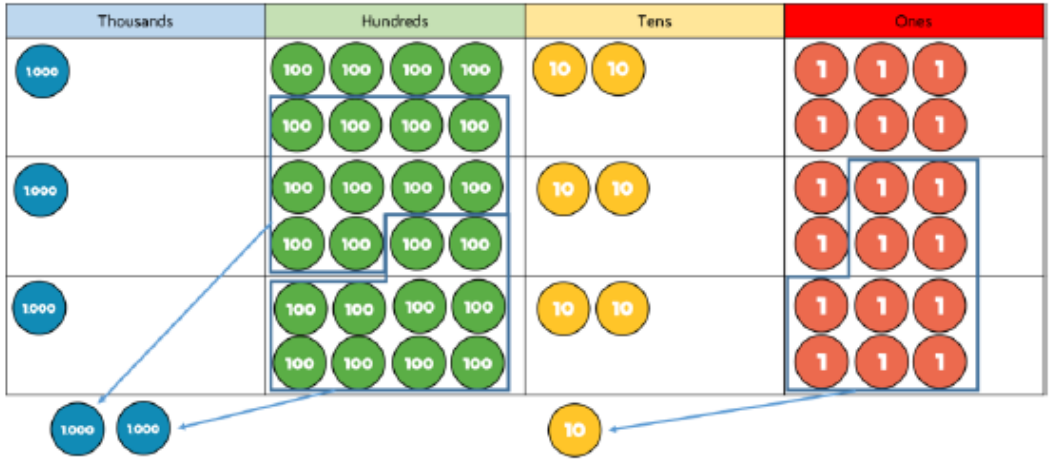
**Sum -** The result of an addition.

**Total –** The aggregate or the sum found by addition.

# Multiplication

## Skill: Multiply 4-digit numbers by 1-digit numbers

## Year: 5



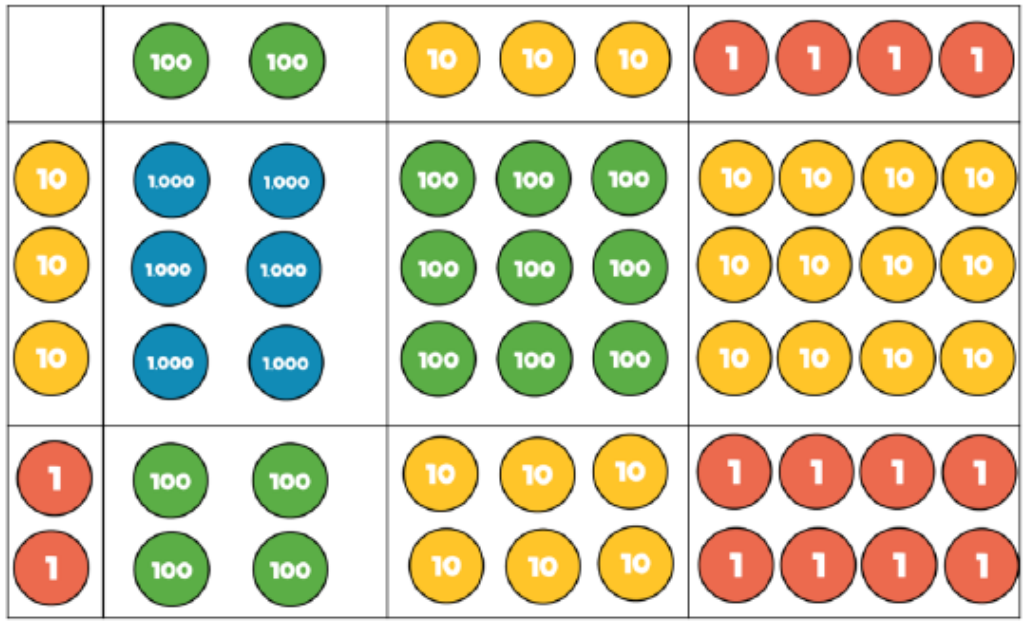

$$1{,}826 \times 3 = 5{,}478$$

| | Th | H | T | O |
|---|---|---|---|---|
| | 1 | 8 | 2 | 6 |
| × | | | | 3 |
| | 5 | 4 | 7 | 8 |
| | 2 | | 1 | |

When multiplying 4-digit numbers, place value counters are the best manipulative to use to support children in their understanding of the formal written method.
If children are multiplying larger numbers and struggling with their times tables, encourage the use of multiplication grids so children can focus on the use of the written method.

## Skill: Multiply 3-digit numbers by 2-digit numbers

## Year: 5



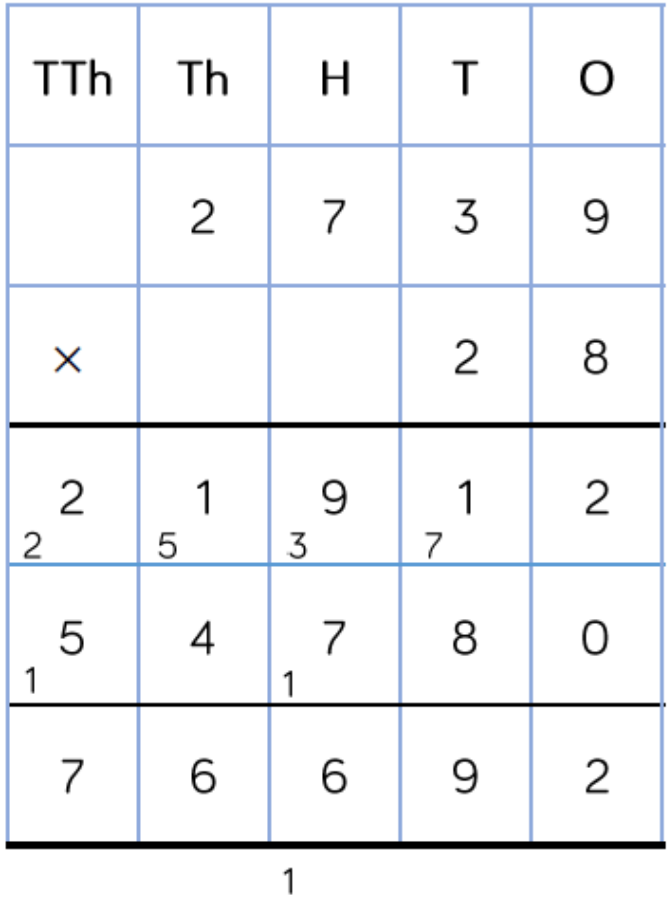

| Th | H | T | O |
|---|---|---|---|
| | 2 | 3 | 4 |
| × | | 3 | 2 |
| | 4 | 6 | 8 |
| 1 7 | 1 0 | 2 | 0 |
| 7 | 4 | 8 | 8 |

| × | 200 | 30 | 4 |
|---|---|---|---|
| 30 | 6,000 | 900 | 120 |
| 2 | 400 | 60 | 8 |

$$234 \times 32 = 7{,}488$$

Children can continue to use the area model when multiplying 3-digits by 2-digits. Place value counters become more efficient to use but Base 10 can be used to highlight the size of numbers.

Encourage children to move towards the formal written method, seeing the links with the grid method.

| Skill: Multiply 4-digit numbers by 2-digit numbers | Year: 5/6 |
|---|---|
|  | When multiplying 4-digits by 2-digits, children should be confident in the written method.<br><br>If they are still struggling with times tables, provide multiplication grids to support when they are focusing on the use of the method.<br><br>Consider where exchanged digits are placed and make sure this is consistent. |

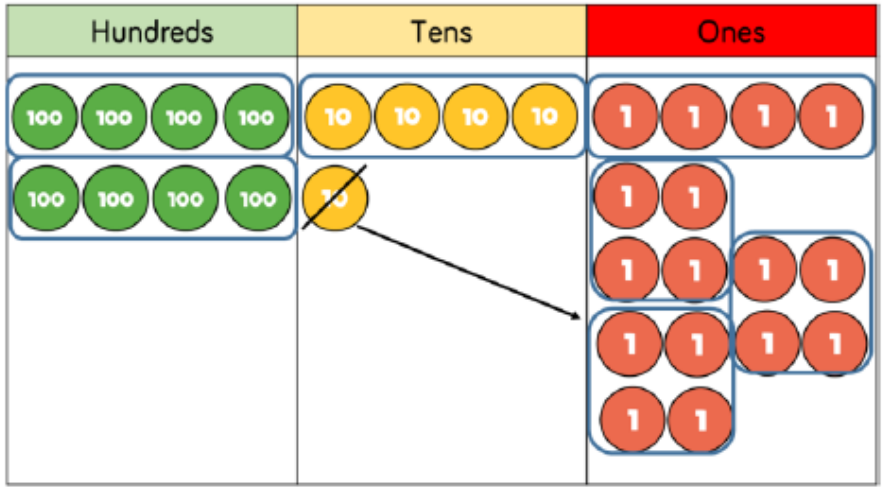


$2{,}739 \times 28 = 76{,}692$

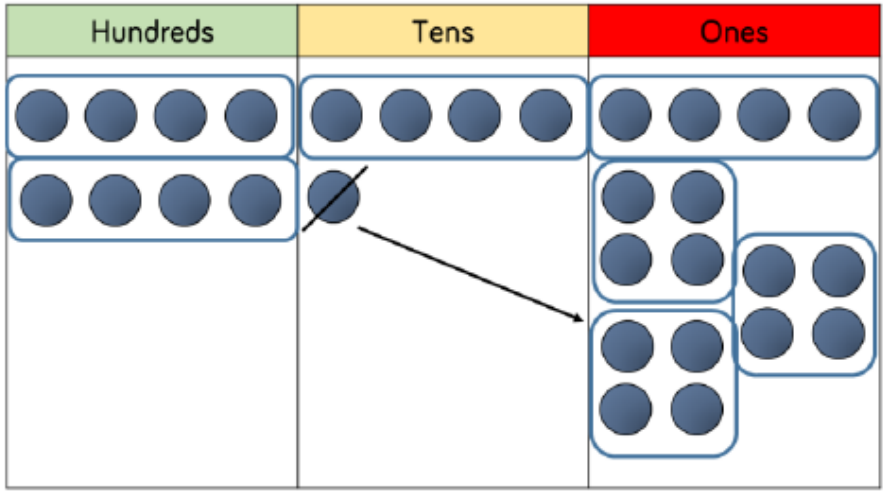
# Division

## Skill: Divide 3-digits by 1-digit (grouping)

## Year: 5




| | | | | |
|---|---|---|---|---|
| | | 2 | 1 | 4 |
| | 4 | 8 | 5 | $^{1}6$ |




$$856 \div 4 = 214$$

Children can continue to use grouping to support their understanding of short division when dividing a 3-digit number by a 1-digit number.

Place value counters or plain counters can be used on a place value grid to support this understanding. Children can also draw their own counters and group them through a more pictorial method.

| Skill: Divide multi digits by 2-digits (short division) | Year: 6 |
|---|---|

| | | 0 | 3 | 6 |
|---|---|---|---|---|
| | 12 | 4 | $4_{3}$ | $7_{2}$ |

$$432 \div 12 = 36$$

$$7{,}335 \div 15 = 489$$

| | 0 | 4 | 8 | 9 |
|---|---|---|---|---|
| 15 | 7 | $7_{3}$ | $13_{3}$ | $13_{5}$ |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 30 | 45 | 60 | 75 | 90 | 105 | 120 | 135 | 150 |

When children begin to divide up to 4-digits by 2-digits, written methods become the most accurate as concrete and pictorial representations become less effective. Children can write out multiples to support their calculations with larger remainders. Children will also solve problems with remainders where the quotient can be rounded as appropriate.

# Glossary

**Array** – An ordered collection of counters, cubes or other item in rows and columns.

**Commutative** – Numbers can be multiplied in any order.

**Dividend** – In division, the number that is divided.

**Divisor** – In division, the number by which another is divided.

**Exchange** – Change a number or expression for another of an equal value.

**Factor** – A number that multiplies with another to make a product.

**Multiplicand** – In multiplication, a number to be multiplied by another.

**Partitioning** – Splitting a number into its component parts.

**Product** – The result of multiplying one number by another.

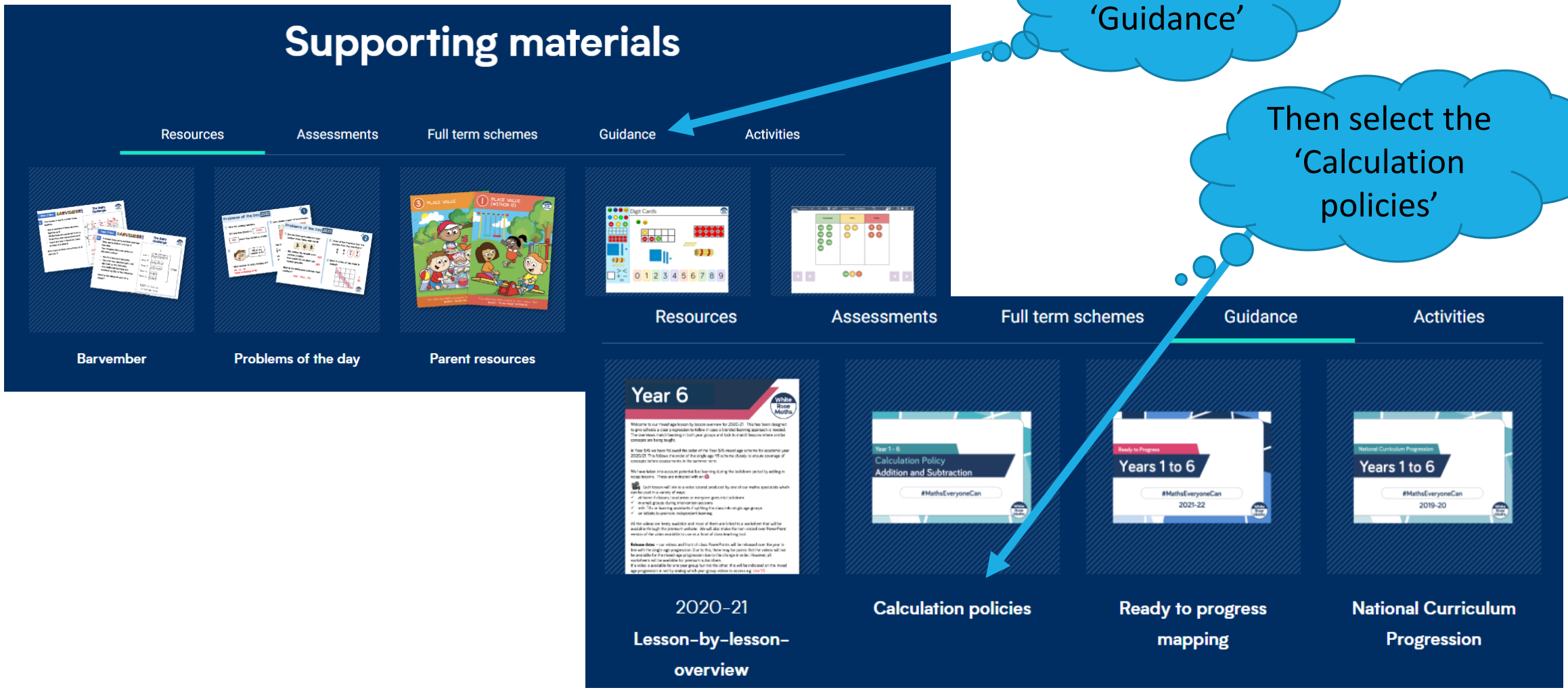
**Quotient** – The result of a division

**Remainder** – The amount left over after a division when the divisor is not a factor of the dividend.

**Scaling** – Enlarging or reducing a number by a given amount, called the scale factor

The calculation policies can be found on the White Rose Maths website.
https://whiterosemaths.com/resources?year=year-6

Scroll to the bottom:

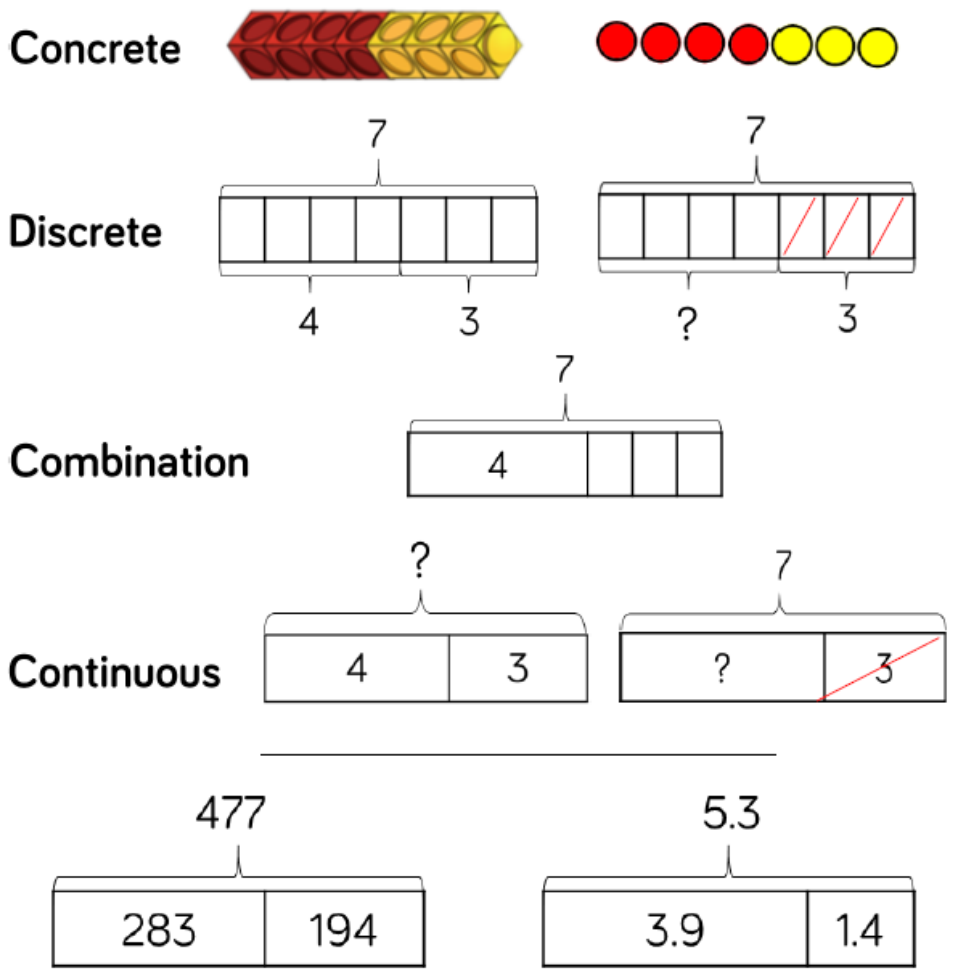



Select ‘Guidance’

Then select the ‘Calculation policies’

# Bar Models

# Bar Model (single)




## Benefits

The single bar model is another type of a part-whole model that can support children in representing calculations to help them unpick the structure.

Cubes and counters can be used in a line as a concrete representation of the bar model.

Discrete bar models are a good starting point with smaller numbers. Each box represents one whole.

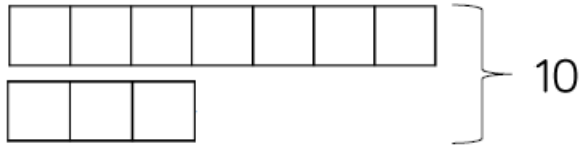
The combination bar model can support children to calculate by counting on from the larger number. It is a good stepping stone towards the continuous bar model.

Continuous bar models are useful for a range of values. Each rectangle represents a number. The question mark indicates the value to be found.

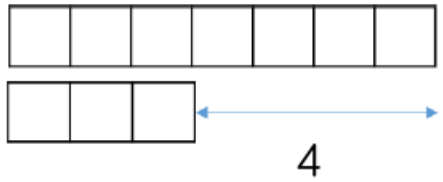
In KS2, children can use bar models to represent larger numbers, decimals and fractions.

# Bar Model (multiple)

## Discrete

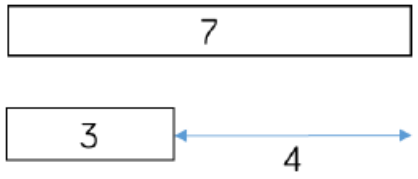



$7 + 3 = 10$

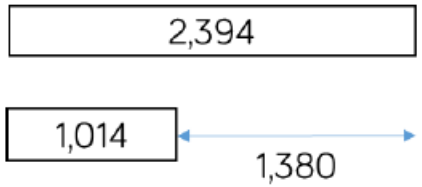



$7 - 3 = 4$

## Continuous




$7 - 3 = 4$




$2{,}394 - 1{,}014 = 1{,}380$

## Benefits

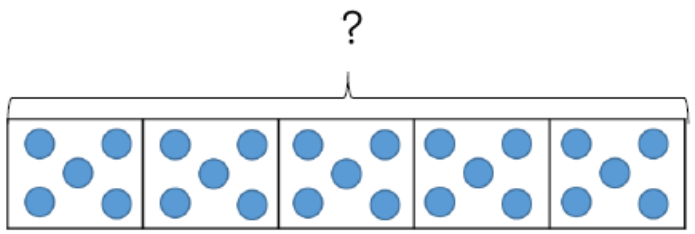
The multiple bar model is a good way to compare quantities whilst still unpicking the structure.

Two or more bars can be drawn, with a bracket labelling the whole positioned on the right hand side of the bars. Smaller numbers can be represented with a discrete bar model whilst continuous bar models are more effective for larger numbers.

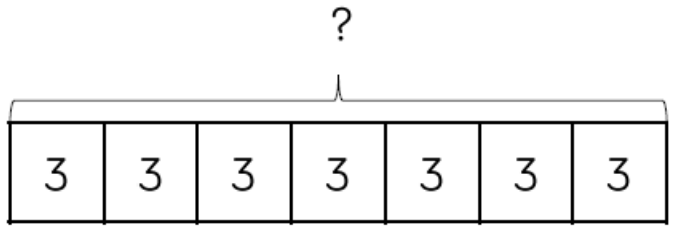
Multiple bar models can also be used to represent the difference in subtraction. An arrow can be used to model the difference.

When working with smaller numbers, children can use cubes and a discrete model to find the difference. This supports children to see how counting on can help when finding the difference.

# Bar Model

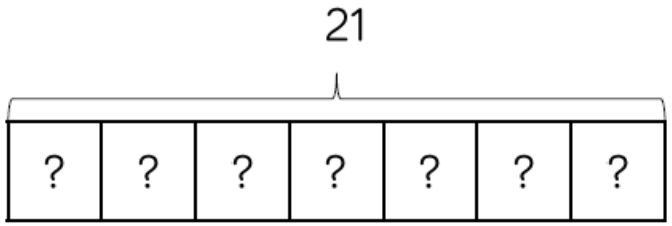



$5 \times 5 = 25$

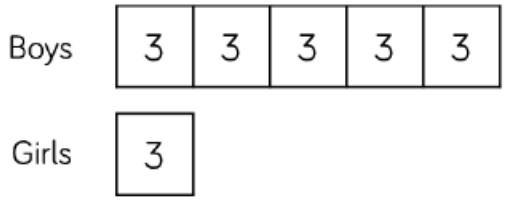



$3 \times 7 = 21$

$7 \times 3 = 21$




$21 \div 7 = 3$




## Benefits

Children can use the single bar model to represent multiplication as repeated addition. They could use counters, cubes or dots within the bar model to support calculation before moving on to placing digits into the bar model to represent the multiplication.

Division can be represented by showing the total of the bar model and then dividing the bar model into equal groups.

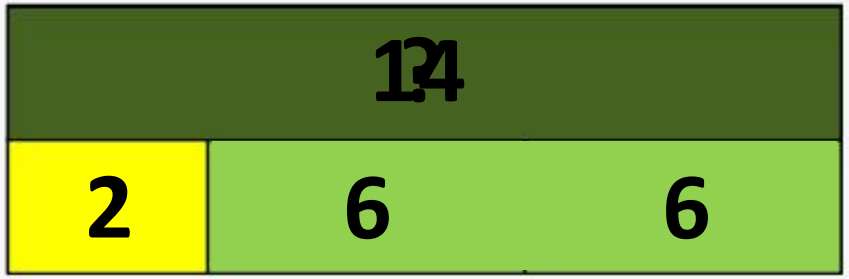
It is important when solving word problems that the bar model represents the problem.

Sometimes, children may look at scaling problems. In this case, more than one bar model is useful to represent this type of problem, e.g. There are 3 girls in a group. There are 5 times more boys than girls. How many boys are there?
The multiple bar model provides an opportunity to compare the groups.

# Solving Missing Parts or Wholes Problems

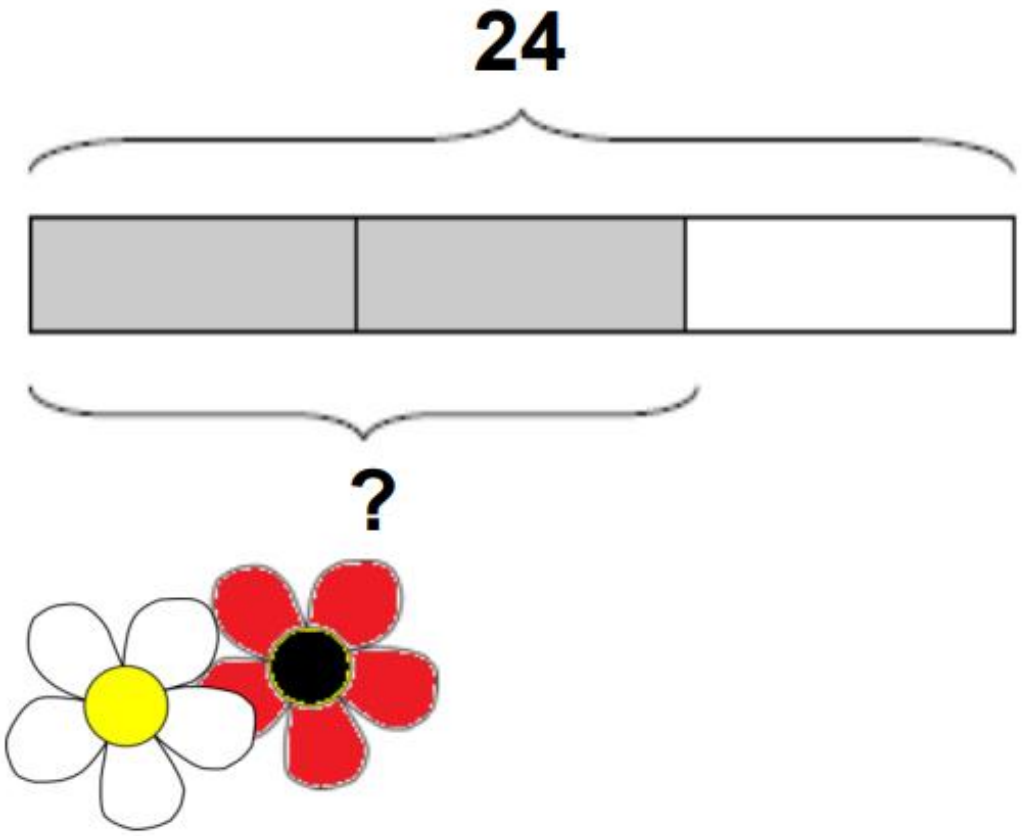
Ella has some cherries. She eats 2. Then she eats half of what is left. She now has 6. How many did she have to begin with?

- Identify the ‘knowns’ and ‘unknowns’.
- Label the ‘known’ parts and/or wholes
- Label the ‘unknown’ parts and/or wholes
- Write the number sentence/equation



# Calculating with Non-unit Fractions

George buys 24 flowers. $^2/_3$ of them are red, the rest are white.
How many white flowers did he buy?

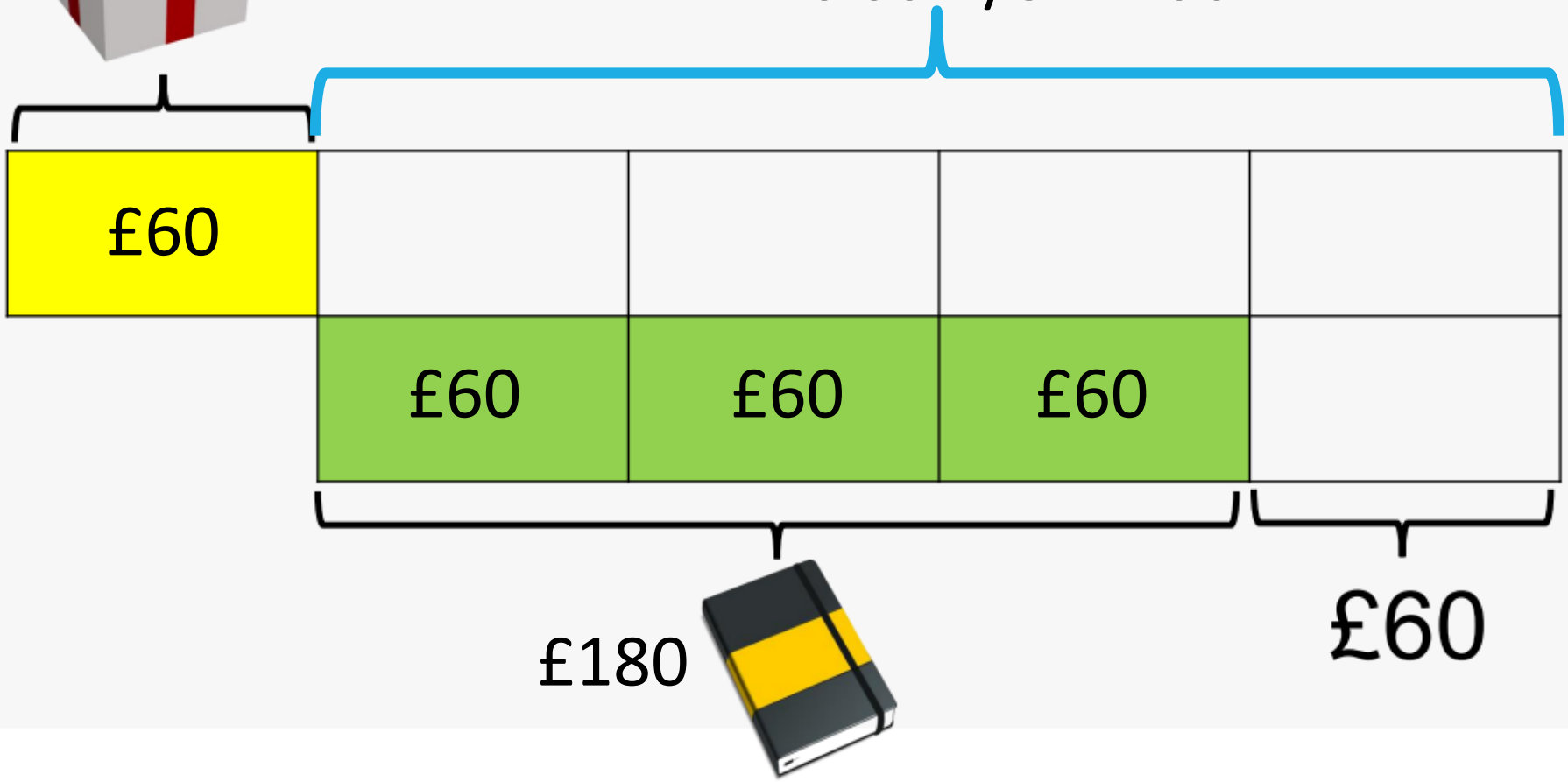



One quantity is a fraction of the other.
To find how many white flowers, we divide by 3.

| 24 | | |
|---|---|---|
| red | red | white |

Gary spent $^1/_5$ of his savings on a gift and ¾ of the remainder on a book. As a result, he had £60 left. How much was the gift?

4/5 of the original amount
= £240 so 1/5 = £60



Gary spent $^1/_5$ of his savings on a gift and $^4/_7$ of the remainder on a book. As a result, he had £60 left. How much was the gift?