**Policy Name:** Written Calculation Methods Guide
**Last Review Date: October 2026**
**Next Review Date: September 2027**

# Written Calculation Methods Guide

## Purpose

This guide sets out our agreed approach to written calculation and key mathematical methods.

Its purpose is to create greater consistency across centres while recognising that students may arrive with different experiences, different levels of confidence and different established methods.

Where a student already has a secure and successful method, they should be supported to continue using it.

# Our approach is:

## Preserve. Repair. Teach.

**Preserve** a method that already works.

**Repair** an established method where only minor errors or misconceptions are present.

**Teach** a new method where the student does not currently have a secure approach.

Preferred methods within this guide are intended primarily for situations where a student does not already have a secure method in place.

The aim is to give every student a method they understand, trust and can use successfully.

## The Role of Assessment

Students complete a low-stakes monthly numeracy sheet covering all four operations. Carefully scaffolded GCSE-style questions provide regular practice while building familiarity and confidence. The assessment is intended to inform teaching, not serve as a formal test.

Results allow staff to track progress and identify gaps, errors and misconceptions that require further teaching or support.

Before introducing a new method, staff should establish:

- what the student already knows
- which parts of their existing approach are secure
- where misconceptions occur
- whether the difficulty is conceptual, procedural or organisational
- whether a new method is genuinely required

## Confidence matters

Many students arrive at APC with negative experiences of mathematics and low confidence in their ability.

Successful use of a particular method can help rebuild confidence and provide a foundation for deeper mathematical understanding.

Students should experience achievable steps of progress while developing secure mathematical knowledge and skills, using a CPA approach where appropriate to make the mathematics visible and accessible.

Our small class sizes allow us to respond closely to individual needs and prioritise building confidence alongside mathematical understanding.

## Understanding should remain visible

Students should develop an understanding of what they are doing and why. A clear procedure can sometimes provide an accessible starting point, allowing students to experience success and build confidence before developing a deeper understanding of the underlying mathematics.

Place value, scaling, equal groups and other underlying structures should be made visible through diagrams, squared paper and practical representations where useful. These should remain available to support understanding, even once fluency is secure.

## Avoid unnecessary cognitive load

Students should not be expected to learn several methods for the same calculation without a clear benefit. Once a student has an accurate, sufficiently efficient method they understand and can use independently, the priority should be to develop fluency through repeated practice.
Use effective methods that give students reliable access to mathematics. Deeper conceptual understanding can then be developed from a position of success and confidence.

# Mathematical Language

Consistent mathematical language helps prevent misconceptions caused by everyday phrases. Staff should aim to use this language when teaching mathematical methods.

| Use | Rather than |
|---|---|
| groups of | lots of |
| exchange | borrow |
| ones | units |
| is equal to | makes/gives |
| estimate | guess |
| approximately | about |
| greater than | bigger than |
| frequency | how often it happens |

Examples:
*Exchange one ten for ten ones*
rather than:
*Borrow one from the tens*

*Four groups of six*
rather than:
*Four lots of six*

*Make a reasoned estimate based on the information available*
rather than:
*Have a guess*
An estimate should be based on known information or sensible rounding, rather than being a random guess.

*8 is greater than 5*
rather than:
*8 is bigger than 5*
“Greater than” refers specifically to numerical value. “Bigger than” can refer to physical size, including the size of the number written on the page, such as its font size.

The language used should help explain the mathematics being taught rather than simply describe what to write next.

Staff should use precise mathematical language when teaching, while remaining sensitive to language that students already understand and use confidently.

# The Four Operations

## Addition

Preferred method: Formal column addition with carrying

Formal column addition is the preferred written method for students. The emphasis should be on place value. Squared paper can be used where it helps students maintain accurate place-value alignment.

Students should:

- Align digits according to place value
- Begin with the smallest place value
- Carry when a place-value column reaches ten or more
- Record carries clearly

Teaching should progress naturally through:

- Calculations without carrying
- Single carries
- Multiple carries
- Adding multiple terms
- Larger numbers
- Decimals
- Money

## Mental strategies

Mental calculation strategies should continue to be developed alongside written methods. Where appropriate, students should be encouraged to use strategies such as bridging through multiples of 10 or 100, partitioning, adjusting to a nearby multiple and using doubles or near doubles.

For example:

- **Bridging:** 38 + 7 = 38 + 2 + 5 = 45
- **Partitioning:** 34 + 25 = 34 + 20 + 5 = 59
- **Near doubles:** 7 + 8 can be approached as 7 + 7 + 1 = 15
- **Adjusting:** 39 + 27 can be approached as 40 + 27 − 1 = 66

The aim is for students to recognise when a mental strategy is efficient and when a written method provides greater accuracy or support.

## Subtraction

Preferred method: Formal column subtraction with exchange

Formal column subtraction is the preferred written method where no secure existing method is established. The language of **exchange** should be used consistently.

For example:
*Exchange one ten for ten ones*
rather than:
*Borrow one from the tens*

Students should:

- Align digits according to place value
- Begin with the smallest place value
- Exchange between place-value columns where necessary
- Record exchanges clearly

Teaching should include:

- Calculations without exchanging
- Single exchanges
- Multiple exchanges
- Calculations involving zero
- Larger numbers
- Decimals
- Money

## Mental strategies

Mental calculation strategies should be developed alongside written methods. Where appropriate, students should be encouraged to use strategies such as:

- **Counting on:** 52 − 48 = 48 + 4
- **Partitioning:** 74 − 23 = 74 − 20 − 3
- **Adjusting:** 52 − 19 = 52 − 20 + 1
- **Bridging:** 52 − 8 = 52 − 2 − 6
- **Known facts:** 80 − 40, using knowledge of 8 – 4

Students should be encouraged to recognise when a mental strategy is efficient and when a written method provides greater accuracy or support.

## Multiplication

Three written methods are recognised.

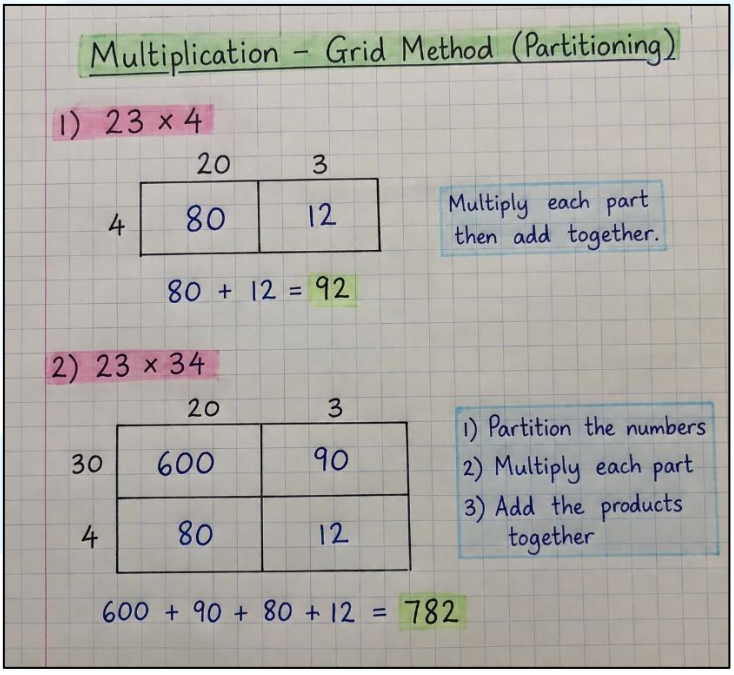
### 1. Grid method / partitioning method

This is the preferred starting method when teaching multiplication as a new written method, particularly where place value and partitioning need to be made visible.

The grid method is prioritised because it:

- makes place value visible
- reinforces partitioning
- supports understanding of multiplication
- can be modelled clearly on squared paper
- allows misconceptions to be identified easily
- provides a clear structure for multi-digit multiplication

For example:



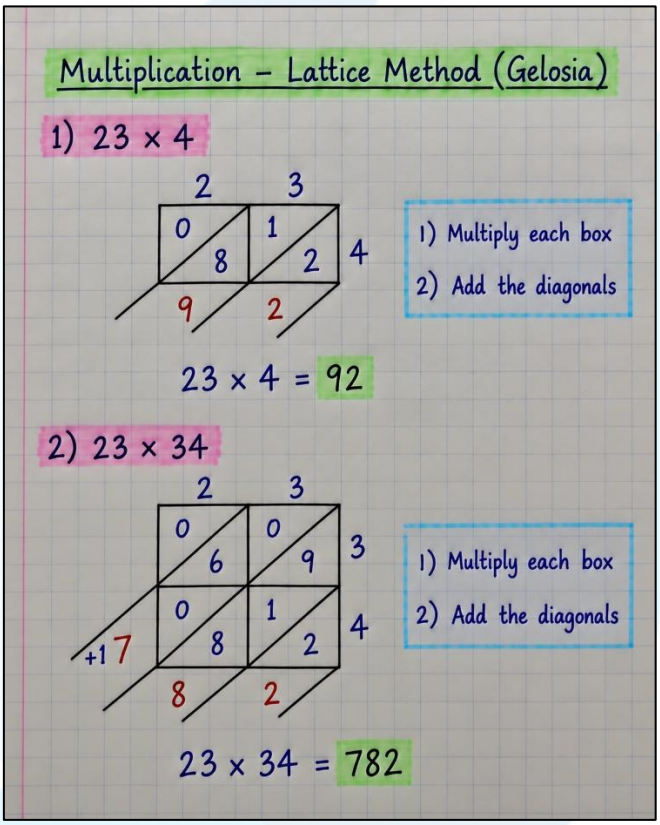

The layout should remain clear and spacious, particularly for students who find organisation difficult. This method can initially be explored using rectangles on squared paper. Students divide a larger rectangle into smaller, more manageable sections, such as splitting 13 into 10 and 3, helping them discover efficient partitions and see how a multiplication calculation can be broken into simpler parts.

**2. Lattice multiplication / Gelosia method**

Lattice multiplication is an accepted alternative in our secondary centres.

It can be particularly effective for students who:

- struggle to organise traditional written multiplication
- need a highly structured method
- lack confidence with multiplication
- benefit from a method that produces early success

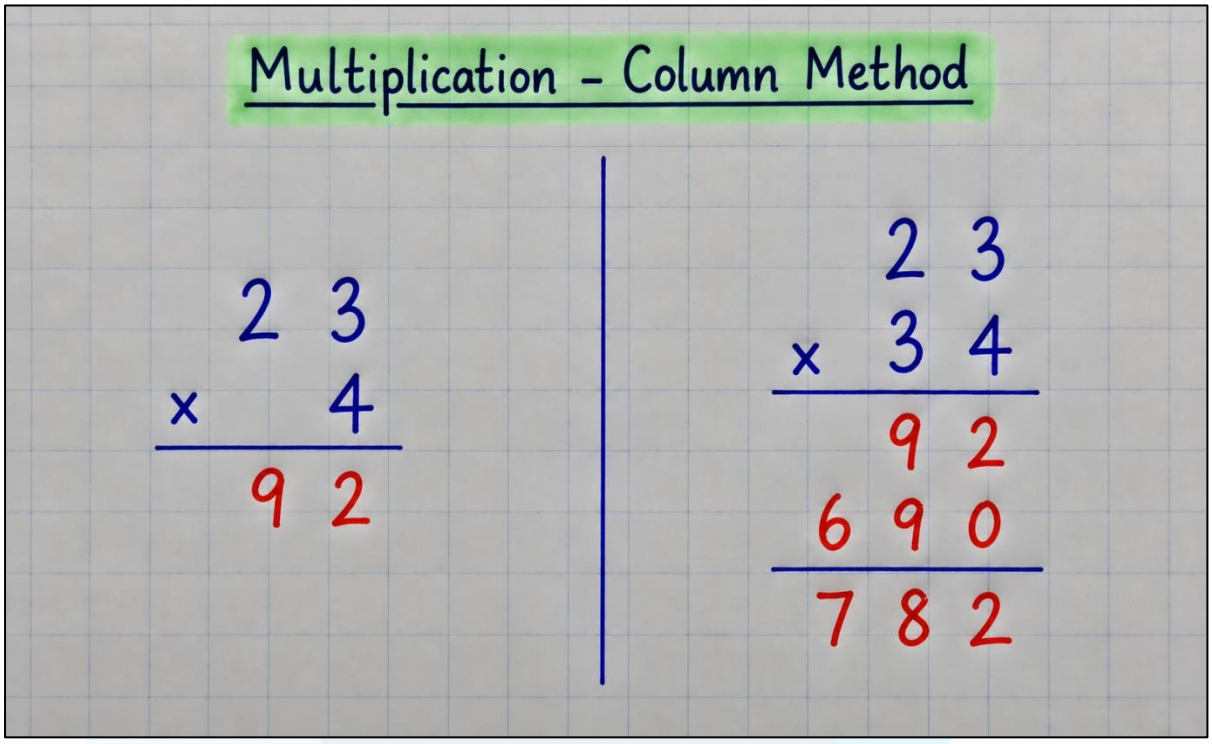



For some students, Lattice/Gelosia can provide an accessible and reassuring approach to multiplication. The experience of success can be valuable in building confidence and engagement. For example, for a student approaching GCSEs who does not yet have a secure written method for multiplication, this structured method can be learned relatively quickly, giving them an immediate opportunity to develop confidence and fluency.

Where the method is used, teachers should gradually connect the procedure back to place value and multiplication knowledge rather than leaving it as an unexplained routine.

### 3. Formal column multiplication

Formal column multiplication is an important part of the KS2 curriculum and a valid written method.




When students arrive at APC confident and secure in this method, we will support them in continuing to use it. Where minor errors occur, we will seek to repair the existing method rather than replace it.
However, column multiplication is not our preferred starting point, because its procedural nature can encourage students to follow steps without fully understanding the mathematics behind them. Its layout can also be confusing, particularly alongside column addition, and can make place value less visible.

## Mental strategies

Mental calculation strategies should be developed alongside written methods. Where appropriate, students should be encouraged to use strategies such as:

- **Partitioning:** 6 × 23 = 6 × 20 + 6 × 3
- **Known facts:** using 6 × 4 to work out 6 × 40
- **Doubling and halving:** 4 × 25 = 2 × 50 = 100
- **Adjusting:** 6 × 29 = 6 × 30 – 6

Students should be encouraged to recognise when a mental strategy is efficient and when a written method provides greater accuracy or support.

## Division

Preferred method: Bus Stop

The Bus Stop method is the preferred written method for division.

Students should be encouraged to connect the method to known multiplication facts, place value and the meaning of the calculation. Squared paper may be used to support layout and organisation.

Teaching should be carefully scaffolded, progressing through:

- Division with no remainders
- Division requiring a carry
- Division with remainders
- Division involving zeros
- Larger numbers
- Division involving decimals

Where multiplication recall presents a barrier, appropriate scaffolding should be provided, such as listing multiples of the divisor. The aim is for students to develop a method they understand and can reproduce independently.

## Mental strategies

Mental calculation strategies should be developed alongside written methods. Where appropriate, students should be encouraged to use strategies such as:

- **Known facts:** 42 ÷ 6, using knowledge of 6 × 7
- **Related facts:** 420 ÷ 6, using knowledge that 42 ÷ 6 = 7
- **Partitioning:** 84 ÷ 4 = (80 ÷ 4) + (4 ÷ 4)
- **Equivalent calculations:** 380 ÷ 16 = 190 ÷ 8 = 95 ÷ 4
- **Fractions:** recognising division as a fraction and simplifying to create an equivalent, easier calculation

Students should be encouraged to recognise when a mental strategy is efficient and when a written method provides greater accuracy or support.

# Order of Operations

## BIDMAS

BIDMAS is our preferred mnemonic for order of operations.

Students should understand:

- Brackets
- Indices
- Division and Multiplication
- Addition and Subtraction

Students should be explicitly taught that multiplication and division have equal priority, so calculations are completed from left to right. The same applies to addition and subtraction.

Where helpful, students may be encouraged to place brackets around calculations or underline the part of a calculation that should be completed first. This can support students in identifying and following the order of operations.

For example: **6 + 4 × 3**
A student could underline 4 × 3 or rewrite it as: **6 + (4 × 3)**

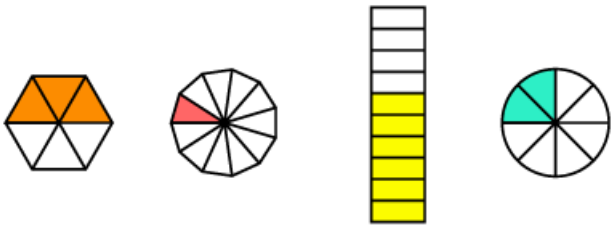
BIDMAS should be taught as a memory aid rather than as six separate steps.

Staff should also recognise alternatives such as BODMAS, PEMDAS and BEDMAS. Where a student is already familiar with a different mnemonic, there is no need to replace it, provided they understand the underlying order of operations.

# Fractions

## Foundations and Representation

Students should first develop a secure conceptual understanding of fractions as parts of a whole. Visual and practical representations should be used wherever they help students understand the mathematics, including fraction circles, bars, partitioned shapes, arrays, pizzas and manipulatives such as blocks or counters.



A whole is divided into equal parts, with the denominator describing the number of equal parts and the numerator describing how many parts are being considered. Students should develop an understanding of equivalent fractions through visual representations before moving to formal procedures.

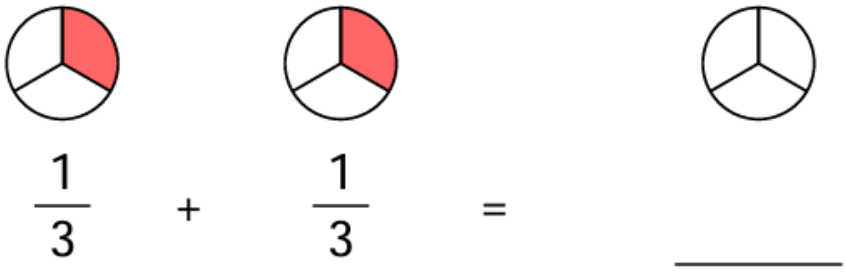
Teaching should develop progressively through:

- Fractions as parts of a whole
- Recognising and representing fractions
- Equivalent fractions
- Comparing fractions
- Adding and subtracting fractions with the same denominator
- Adding and subtracting fractions with different denominators
- Mixed numbers and improper fractions
- Multiplying and dividing fractions

Visual representations should be used alongside formal notation and procedures where they help students understand the mathematics. The aim is for students to understand the meaning of a fraction before manipulating it procedurally.

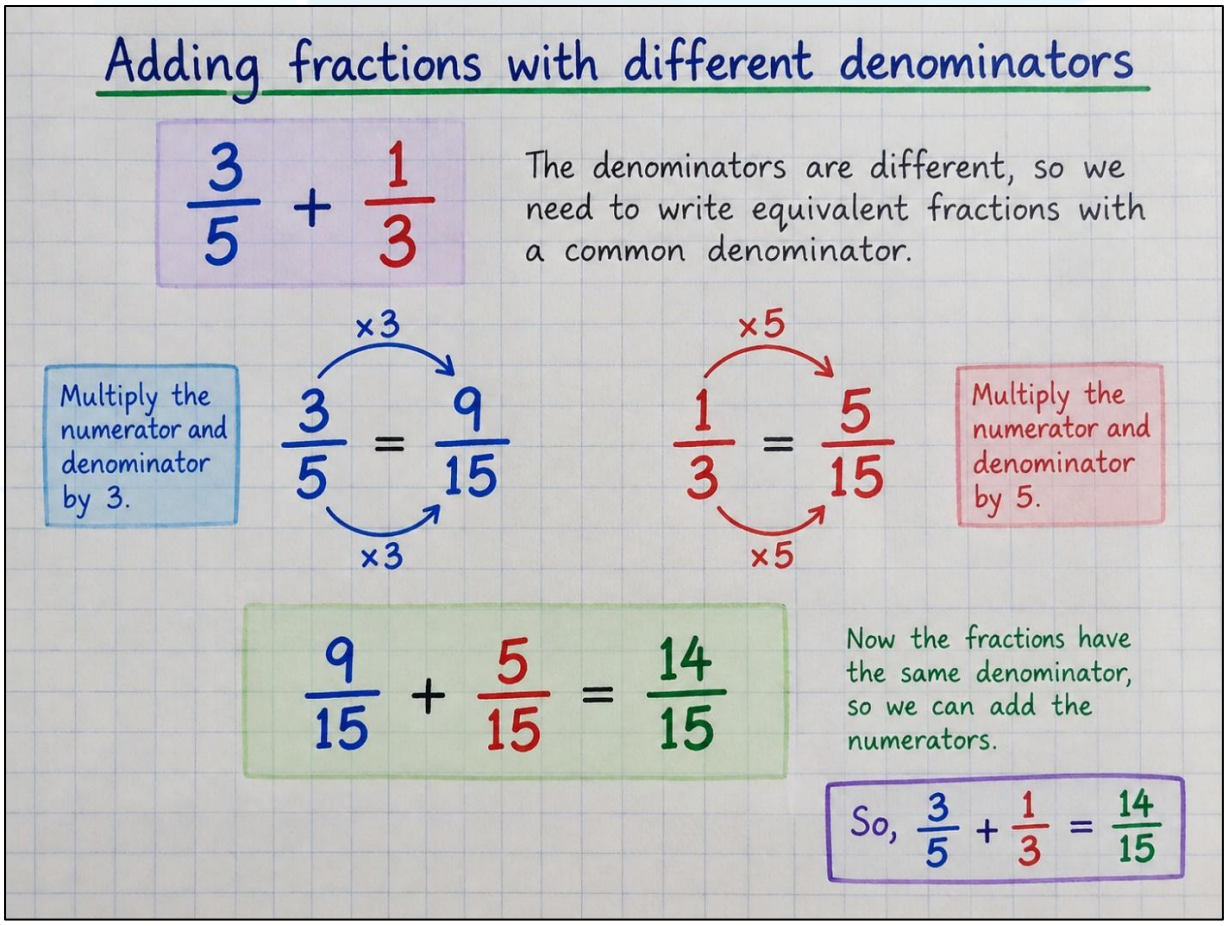
## Adding/Subtracting Fractions

Visual aids can show that, when adding or subtracting fractions with the same denominator, the denominator stays the same.



$\frac{1}{3} + \frac{1}{3} = ____$

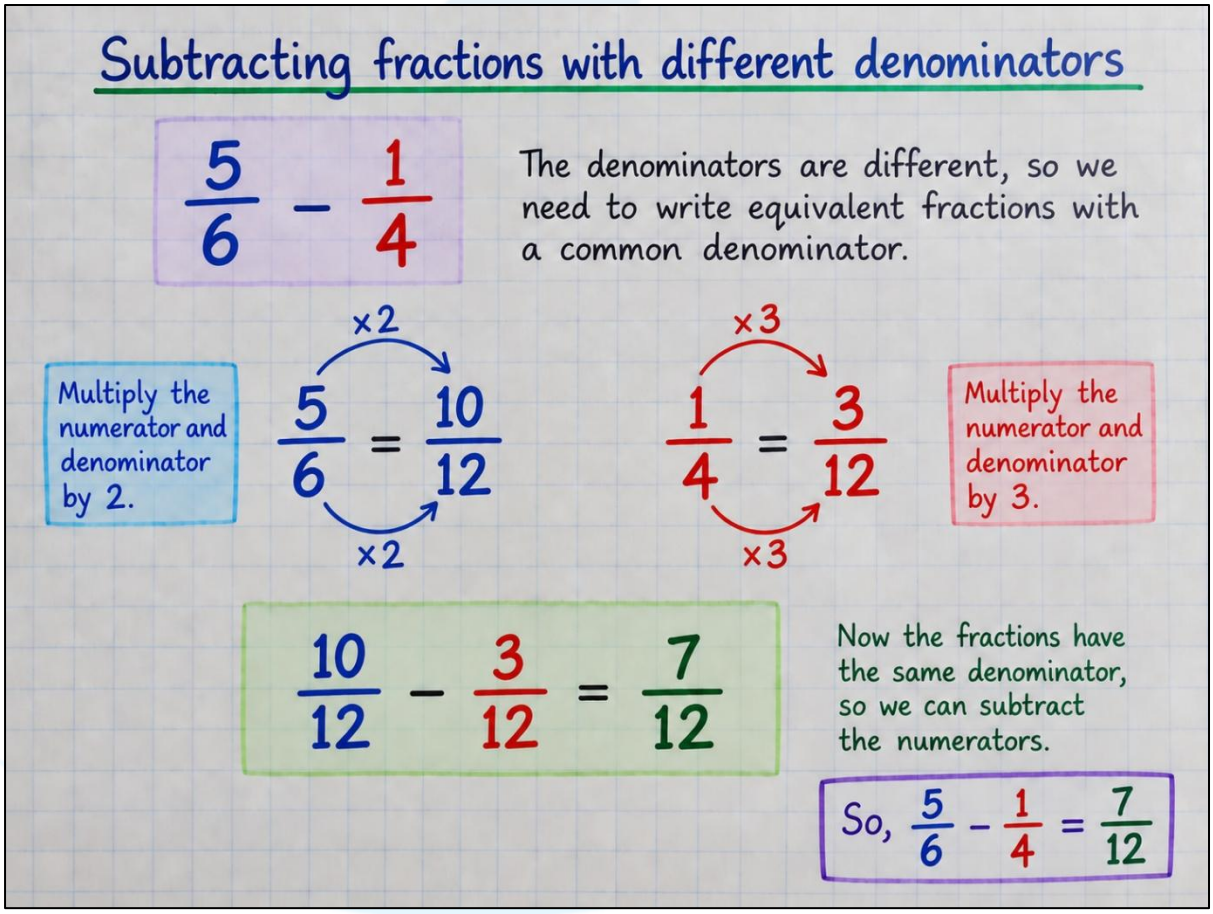
When adding or subtracting fractions with different denominators, fractions should be rewritten using equivalent denominators. The original fractions should remain visible.



Arrows or similar notation should show the same scale factor being applied to both numerator and denominator, reinforcing that the fraction's value remains unchanged.

Staff should recognise that students may already be familiar with step-by-step routines, such as the butterfly method or cross multiplication. These should not be the starting point for teaching at APC but may be supported where a student already uses them successfully.

When subtracting fractions, we follow a similar process if there are different denominators.




For fractions with the same denominator, the denominator remains unchanged and the numerators are subtracted.

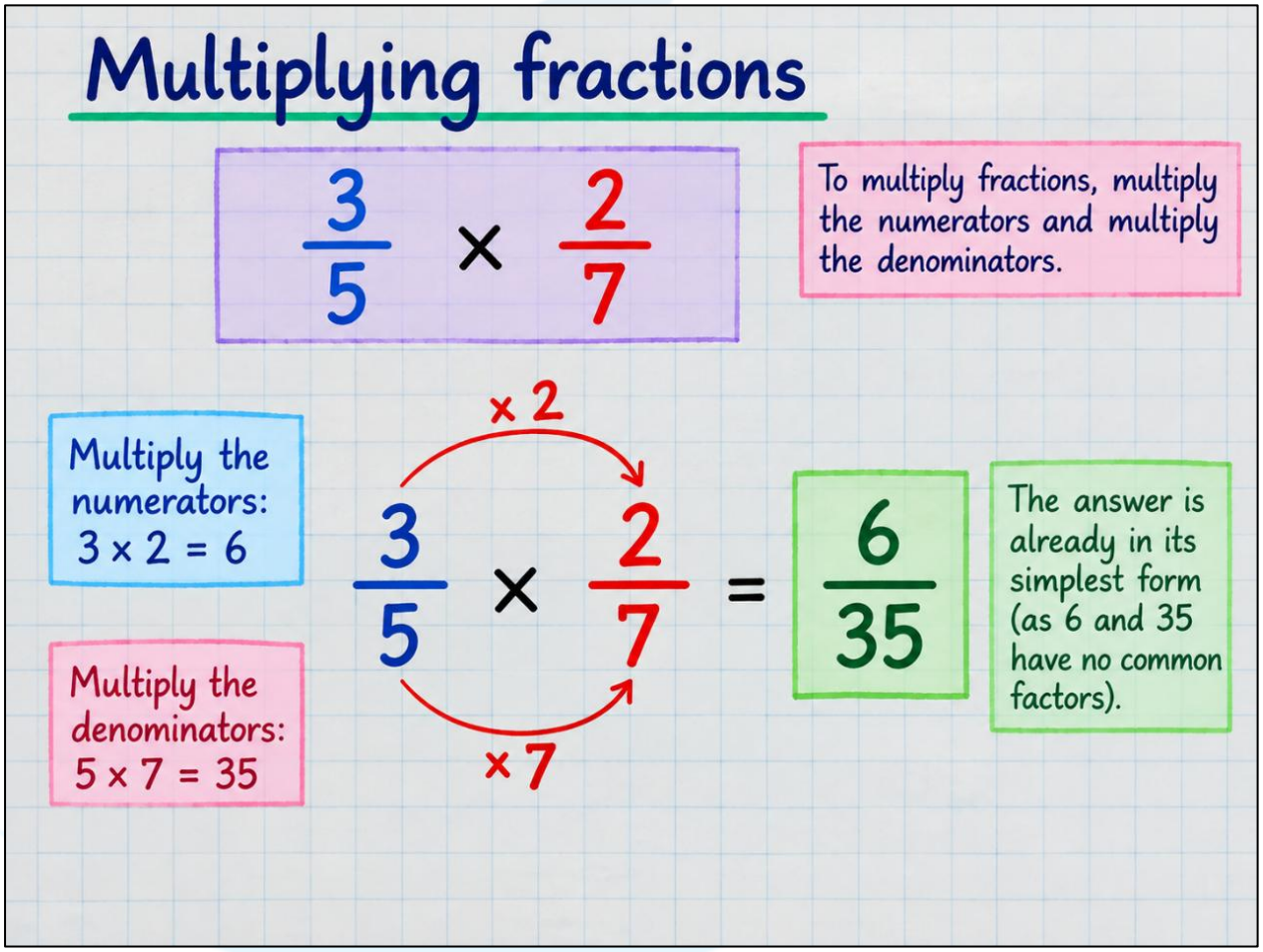
*Avoid simply teaching: "Make the bottom numbers the same."*

Students should understand how and why equivalent denominators have been created.

## Multiplying Fractions

When multiplying fractions, students should develop an understanding of multiplication as finding a fraction of a quantity or fraction.

Concrete and visual representations should be used where helpful, such as folding paper, fraction strips, fraction circles, arrays and shaded grids.




Students should first explore the relationship between the numerator and denominator before moving to the formal procedure of multiplying numerators and denominators.

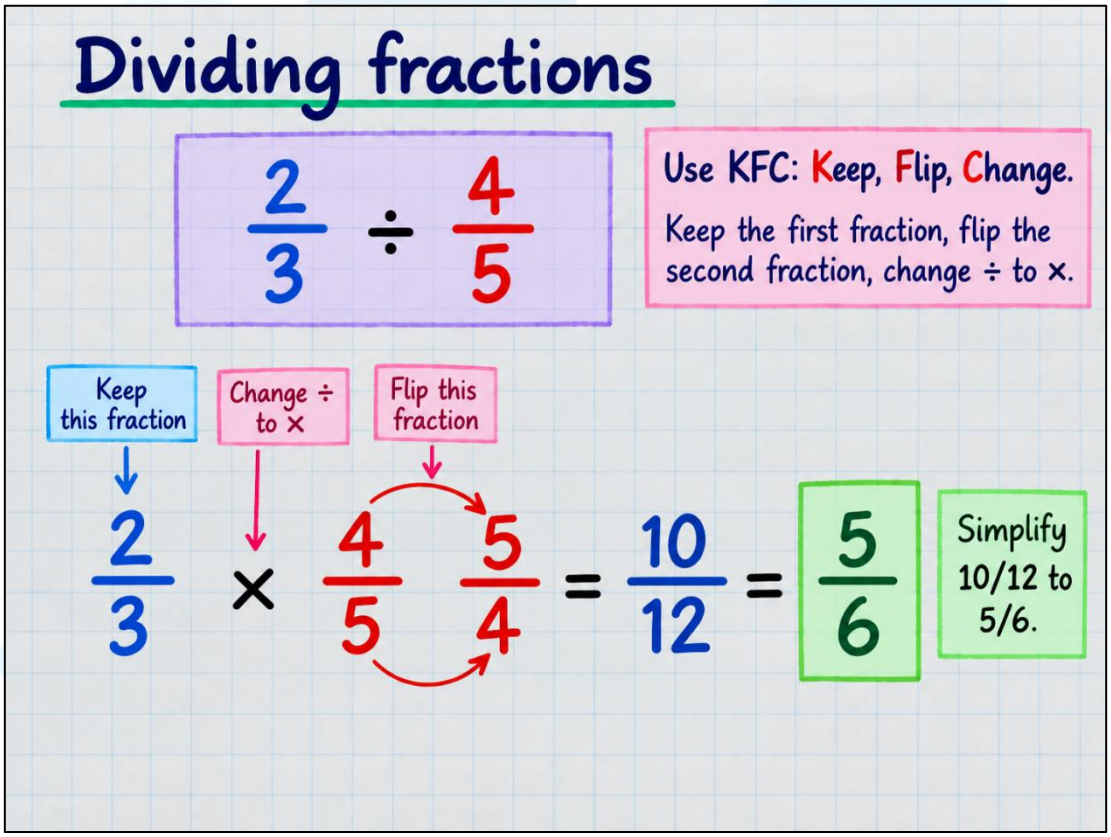
## Dividing fractions

Preferred memory aid: Keep Flip Change (KFC)

Keep, Flip, Change

'KFC' may be used as a memory aid once students understand the operation being represented. Staff should recognise that, while it can be a useful and memorable shortcut, teaching it in isolation can hinder deeper mathematical understanding.

Many students arrive already familiar with KFC, so it can be built upon rather than dismissed. However, it should not replace opportunities to explore why dividing by a fraction is equivalent to multiplying by its reciprocal.




KFC can provide a memorable procedure and support procedural confidence. However, students should develop an understanding of fraction division first, using visual representations where helpful to explore why multiplying by the reciprocal works.

The memory aid should reinforce understanding, not replace it.

# Negative Numbers

Preferred representation: Vertical number line

A vertical number line is the preferred visual representation when teaching addition and subtraction with negative numbers. However, staff should recognise the value of horizontal number lines and support students who are already more familiar or confident with this representation.

**Addition and subtraction**

Addition and subtraction should initially be represented as movement on the number line:

- Moving upwards represents an increase in value.
- Moving downwards represents a decrease in value.
- The direction of movement should be linked explicitly to whether a positive or negative number is being added or subtracted.
- Crossing zero should be explicitly modelled and practised.
- Subtracting a negative should be explored through movement on the number line before introducing rules or shortcuts.

The aim is for students to understand the effect of adding or subtracting a positive or negative number before relying on memorised rules.

**Multiplication and division**

Multiplication and division with negative numbers should be taught separately from addition and subtraction. The sign relationships are more consistent and can be generalised across calculations.

Students should develop fluency with:

- Positive × positive = positive
- Positive × negative = negative
- Negative × positive = negative
- Negative × negative = positive

The same rules apply to division.

Students should be encouraged to recognise patterns in known calculations before relying on the rules as memorised facts.

# Percentages

Preferred method: Building-block percentages

Students should initially calculate percentages by using familiar percentage building blocks. Core building blocks include:

50% = half

25% = quarter

10% = divide by 10

5% = half of 10%

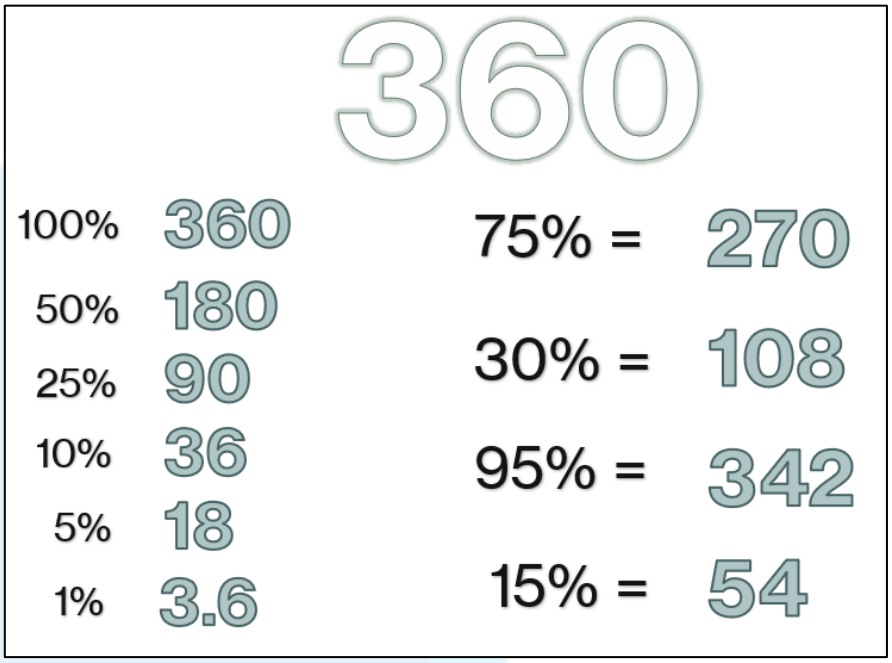
1% = divide by 100

These can then be combined.

75% = 50% + 25%

30% = 10% + 10% + 10%

95% = 100% - 5%




This method allows students to see where their answer has come from and reduces reliance on memorised calculator procedures.

## Language

**Per cent = Per hundred** should be used regularly.

Students should understand percentage as a number of parts for every hundred, rather than viewing the percentage symbol as an isolated procedure.

**Progression**

Where greater support is needed, students can find 1% by dividing by 100 and scale from there.

More secure students should progress towards decimal multipliers as an efficient method for calculating percentages, including percentage increases and decreases.

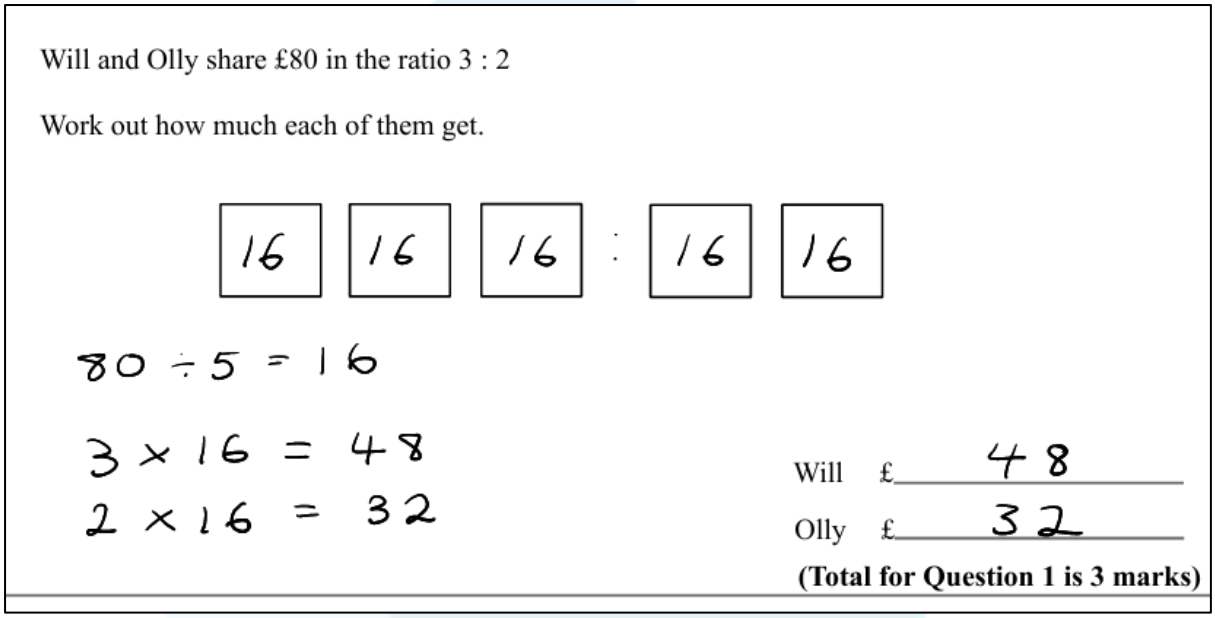
# Ratio

Preferred representation: Equal-part diagrams, including ratio circles and bar models

Concrete: Where appropriate, ratio should initially be introduced through concrete objects or practical contexts, grouping items into equal-sized parts.

Pictorial: Ratio should then be represented using equal-part diagrams.

For example:




Abstract: The equal-part diagram should be used alongside calculations, including for more abstract problems, to maintain a clear visual representation of the ratio. Students should be encouraged to draw or refer to a diagram whenever it supports understanding.

The diagram should remain available for as long as it supports understanding. Students should not be expected to abandon a secure pictorial method in favour of a more abstract approach.

**Key structure**

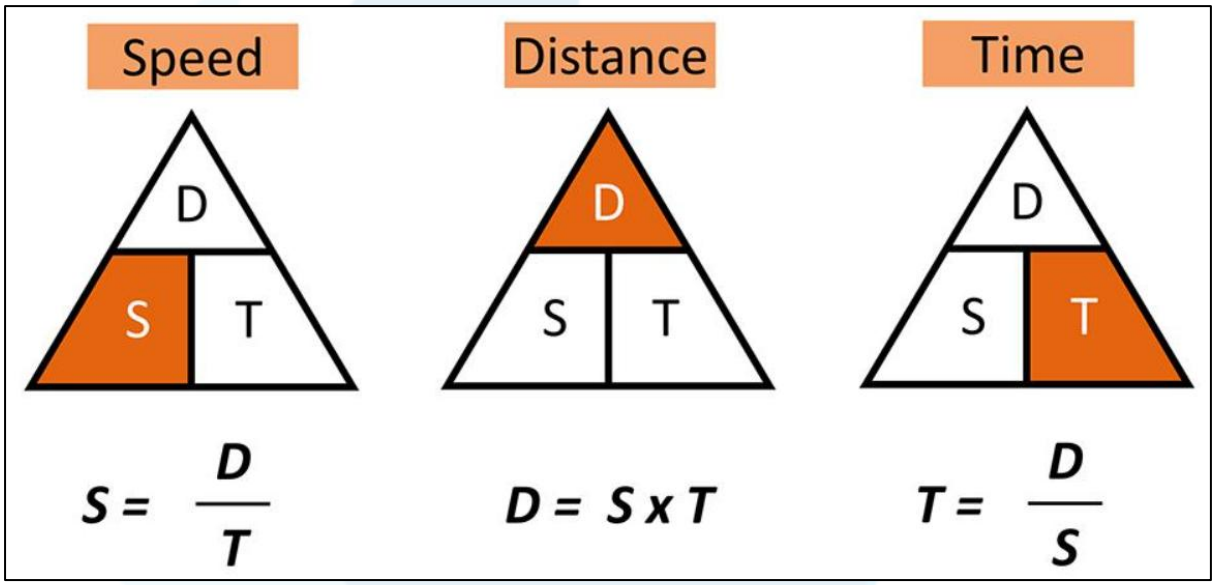
- Model the total number of parts
- Find the value of one part
- Scale to the required number of parts
- Use the diagram to check whether the answer is reasonable

# Formula Triangles

Formula triangles can provide a useful visual scaffold for students working with relationships between three quantities, particularly speed, distance and time. They should support understanding of the relationship rather than replace it.

For example, the speed, distance and time triangle can be used to identify the required calculation:

- Cover speed to find distance divided by time
- Cover distance to find speed multiplied by time
- Cover time to find distance divided by speed




Students should:

- Identify what each letter represents
- Understand the relationship between the quantities
- Recognise when to multiply and when to divide
- Use appropriate units
- Apply the relationship to contextual problems

Many students are already familiar with formula triangles from their previous schools. Where they use them successfully, this should be preserved.

Teaching should ensure students understand the relationship between the quantities rather than relying solely on the triangle to identify the operation. This should include linking the triangle to the underlying formula and understanding why multiplication or division is required.

# The Unitary Method

The unitary method involves finding the value of one unit before calculating the value of the required number of units. It can support understanding of multiplicative relationships across a range of topics.

For example:

Theresa bought 5 theatre tickets for £60
Work out the cost of 9 theatre tickets.




8 bananas cost £4
Work out the cost of 5 bananas.




Students should:

- Identify what one unit represents
- Calculate the value of one unit
- Scale up or down to find the required quantity
- Maintain the relationship between quantities
- Include appropriate units

Teaching should include:

- Money and quantities
- Ratio and proportion
- Rates and compound measures
- Percentages, including finding 1%
- Scaling up and down
- Problems involving non-integer values

The unit method should be developed alongside other approaches to multiplicative reasoning. Finding one unit can provide a clear and accessible route to a solution, but it is not always the most efficient method. Students should be encouraged to recognise when it is appropriate and to understand why the relationship works.

## Final Principles

When supporting written calculation, it is useful to come back to six simple questions:

**1. Does the student already have a method that works?**
If yes, preserve it.

**2. Is the method nearly secure?**
If yes, repair it rather than replace it.

**3. Does the student need a new method?**
If yes, teach the preferred approach in this guide.

**4. Can we make the mathematics more visible?**
Use a CPA approach where appropriate, moving between concrete materials, pictorial representations and abstract calculations. Squared paper, number lines, diagrams and other representations can help make the mathematics clearer and reduce cognitive load.

**5. Is the student experiencing success?**
Developing confidence in learners is our priority. Sometimes, comfort may be what a student needs before they are ready to take on greater challenge.
Small successes can rebuild confidence, re-engage students and create a foundation for further learning.
For a student who is feeling particularly anxious, a low-challenge task they can complete confidently, followed by genuine praise and recognition, can be an important first step towards re-engaging with learning.

**6. Can the student use the method independently?**
The aim is not simply to complete a calculation with support, but to develop an approach the student understands, remembers and can use independently.

## Our Aim

We are not trying to make every student calculate in exactly the same way.

We want every student to develop the understanding, confidence and independence to calculate successfully. They should understand why their approach works, trust themselves to use it and be able to apply it independently.