MATHS FORENSICS
CASE FILE WORKSHEET · GCSE

MF-CF-NUM-RATIO
GCSE HIGHER · ABOUT 50 MINUTES

CASE FILE SERIES · NUMBER

RATIO

Parts, shares and differences. Secure the method, extend it to hidden totals and linked ratios, then master the changing-ratio problems that decide grade 8 and 9.

SECURING · GRADES 4–5 | EXTENDING · GRADES 6–7 | MASTERY · GRADES 8–9

Name _____ Class _____ Date _____

CASE BRIEFING

WHAT YOU NEED TO KNOW

A ratio compares quantities of the **same kind**, in the **same units**. 3 : 5 means for every 3 of the first there are 5 of the second: 8 **parts** altogether.

Almost every ratio question comes down to finding the value of **one part**. Work out how many parts you know about, and what they're worth.

1. Add the numbers in the ratio to find the total number of parts.
2. Divide the amount you know by the number of parts it covers: that's one part.
3. Multiply one part by each number in the ratio.
4. Check: the shares add up to the total.

WORKED EXAMPLE **Two suspects split £27,000 in the ratio 4 : 5. How much does each receive?**

SOLUTION

1 4 + 5 = 9 parts altogether.
2 £27,000 ÷ 9 = £3,000 for one part.
3 Suspect 1: 4 × £3,000 = £12,000. Suspect 2: 5 × £3,000 = £15,000.
4 Check: £12,000 + £15,000 = £27,000 ✓

✓ **£12,000 and £15,000**

KNOWLEDGE CHECK

Use your investigative skills to solve each case. Show full working: the method marks are where most students lose out.

Securing
Sharing an amount, simplifying, scaling.
Secured ☐

Extending
Differences, linked ratios, and one piece of tampered evidence.
Secured ☐

Mastery
Ratios that change, and ratio with algebra.
Secured ☐

SECURING

The method, step by step. Show every line.

1 Share £84 in the ratio 3 : 4. [2]

£ ___ and £ _____

2 Share 270 g in the ratio 2 : 3 : 4. [2]

Three amounts _____

3 Evidence bags are red or blue in the ratio 5 : 3. There are 40 red bags. How many blue bags are there? [2]

Answer _____

4 Write 45 cm : 1.5 m as a ratio in its simplest form. [2]

Answer _____

FORENSIC TIP Change to the **same units** before you simplify. 45 : 1.5 is a common wrong start.

5 A team of 36 is split into analysts and officers in the ratio 4 : 5. How many more officers are there than analysts? [3]

Answer _____

EXTENDING

A step is hidden, or there's a context to unpick. One piece of tampered evidence.

6 The ratio of boys to girls in a club is 3 : 5. There are 18 more girls than boys. How many members are there? [3]

Answer _____

FORENSIC TIP The **difference** between two shares is also a number of parts: here 5 − 3 = 2 parts.

7 $a : b = 3 : 4$ and $b : c = 6 : 5$. [2]

Find $a : b : c$ in its simplest form.

$a : b : c =$ _____

8 A recipe for 4 people uses 300 g of flour and 2 eggs. How much of each is needed for 10 people? [2]

Flour ___ g Eggs _____

9 Concrete is cement and sand in the ratio 2 : 7. What fraction of the concrete is sand? [2]

Answer _____

10 Jo was asked to share £60 in the ratio 2 : 3. Find her mistake and give the correct shares. [2]

TAMPERED EVIDENCE · FIND THE MISTAKE

£60 ÷ 2 = £30
£60 ÷ 3 = £20
Answer: £30 and £20

Correct shares _____

MASTERY No hints. Plan before you calculate.

11 The ratio of Tom's money to Sam's money is 3 : 5. [4]

Tom gives Sam £10. Now the ratio is 1 : 3.

How much money did Tom have at the start?

£ _____

FORENSIC TIP Give each person an amount in terms of x, change both amounts, then write the new ratio as an equation.

12 Solve $(x + 3) : (x - 1) = 7 : 3$. [3]

x = _____

13 A bag holds 40 counters. Red to green is 3 : 5. [3]

How many green counters must be added so the ratio of red to green becomes 1 : 3?

Answer _____

14 Purple paint is red and blue mixed in the ratio 2 : 3. [3]

Lara has 500 ml of red and 900 ml of blue. What is the most purple paint she can make?

ml _____

15 The areas of two squares are in the ratio 4 : 9. Find the ratio of their perimeters. Explain your answer. [2]

Ratio _____

KNOWLEDGE CHECK: SOLUTIONS

Check your method as well as your answer. In the exam, an answer with no working usually earns the final mark at most.

Q1 SECURING

7 parts, £12 a part.

✓ **£36 and £48**

Q2 SECURING

9 parts, 30 g a part.

✓ **60 g, 90 g and 120 g**

Q3 SECURING

5 parts = 40, so one part = 8; blue = 3 × 8.

✓ **24**

Q4 SECURING

45 cm : 150 cm, then divide by 15.

✓ **3 : 10**

Q5 SECURING

9 parts, 4 a part: 16 analysts, 20 officers.

✓ **4**

Q6 EXTENDING

Difference 2 parts = 18, one part 9, total 8 parts = 72.

✓ **72**

Q7 EXTENDING

Make *b* the same: 3 : 4 = 9 : 12 and 6 : 5 = 12 : 10.

✓ **9 : 12 : 10**

Q8 EXTENDING

Scale by 10 ÷ 4 = 2.5.

✓ **750 g flour and 5 eggs**

Q9 EXTENDING

9 parts altogether, 7 of them sand.

✓ **7/9**

Q10 EXTENDING

She divided by each number in the ratio, not by 5 parts. One part is £12.

✓ **£24 and £36**

Mastery solutions are in the Lab. Grades 8 and 9 are won on method, so a bare answer won't tell you much. Photograph or write your Mastery working in **Forensic Marking** and get it marked mark by mark, with the full solution and the mistake behind every lost mark. Your first marked question is free.

lab.mathsforensics.com/written/?sheet=CF-NUM-RATIO

Mark your evidence

Level	Marks	My score	Secured? (every mark)
Securing	11		☐
Extending	11		☐
Mastery	15		☐

R · Reading
Misread or missed part of the question

M · Method
Didn't know how to do it

A · Accuracy
Knew how, slipped in the working

Write R, M or A next to every mark you lost. Mostly R or A? The fix is technique, not more practice of the topic.

CASE CLOSED: RATIO

In this case file you've learned to:

- Share an amount in a ratio, and find one part from any information you're given.
- Use the difference between shares as a number of parts.
- Link two ratios by making the shared term the same.
- Turn a changing ratio into an equation and solve it.
- Spot when a ratio has to be simplified, scaled or converted first.

Because every case comes down to one principle: numbers don't lie.

YOUR NEXT ASSIGNMENT

Practise every GCSE topic in the Lab

New numbers every time, feedback that names the mistake behind each wrong answer, and handwritten working marked like an examiner. Start free.

https://www.mathsforensics.com/the-lab