MATHS FORENSICS
CASE FILE WORKSHEET · GCSE

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

CASE FILE SERIES · NUMBER

PERCENTAGES

Multipliers do the heavy lifting. Secure percentage change, extend to reverse percentages and compound growth, then master the multi-step problems examiners love.

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

Name _____ Class _____ Date _____

CASE BRIEFING

WHAT YOU NEED TO KNOW

A **multiplier** turns any percentage change into one calculation. Increase by 15%: × 1.15. Decrease by 15%: × 0.85.

Percentage change = change ÷ original × 100. **Reverse percentage**: divide by the multiplier to get back to the original. **Compound change**: multiply by the multiplier once for every year, so original × multiplier^n.

1. Decide: percentage of, change, reverse, or repeated change?
2. Write the multiplier (100% ± the change, as a decimal).
3. Multiply, divide, or use a power.
4. Check: does the answer make sense? A price after an increase should be bigger.

WORKED EXAMPLE **After a 20% price rise, a forensic camera costs £96. What was the price before the rise?**

SOLUTION

1 A 20% rise means the new price is 120% of the original: multiplier 1.2.
2 Original × 1.2 = £96.
3 Original = £96 ÷ 1.2 = £80.
4 Check: £80 × 1.2 = £96 ✓

✓ **£80**

KNOWLEDGE CHECK

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

Securing
Percentages of amounts, increase, decrease, percentage change.
Secured ☐

Extending
Reverse percentages, compound interest, depreciation, and tampered evidence.
Secured ☐

Mastery
Repeated change, unknown rates and comparisons.
Secured ☐

SECURING

The method, step by step. Show every line.

1 Find 35% of £240. [2]

£ _____

2 Increase £64 by 15%. [2]

£ _____

3 A laptop's price falls from £450 to £378. Work out the percentage decrease. [3]

% _____

FORENSIC TIP Divide by the **original** amount, not the new one.

4 Write 18 out of 75 as a percentage. [2]

% _____

5 An evidence store holds 1250 items. 8% are fingerprint samples. How many items are not fingerprint samples? [2]

Answer _____

EXTENDING

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

6 A coat costs £56 in a sale with 30% off. What was its price before the sale? [3]

£ _____

FORENSIC TIP Don't add 30% of £56 back on. The 30% was taken off the **original** price, so divide by 0.7.

7 £2000 is invested at 3% compound interest per year. Work out its value after 4 years. [3]

£ _____

8 A car bought for £18,000 loses 15% of its value each year. Work out its value after 3 years. [3]

£ _____

9 A town's population is 12,000 after a 25% increase. What was it before? [2]

Answer _____

10 Ben was asked to find the value of £80 after 3 years at 5% compound interest. Find his mistake and give the correct value. [2]

TAMPERED EVIDENCE · FIND THE MISTAKE

5% × 3 years = 15%
£80 × 1.15 = £92
Answer: £92

Correct value £ _____

MASTERY No hints. Plan before you calculate.

11 A price is increased by 20%, then the new price is decreased by 20%. Find the overall percentage change. [2]

Overall change _____

12 A colony of bacteria grows by x% each day. It grows from 5000 to 5618 in 2 days. Find x. [3]

x = _____

13 An amount is invested at 4% compound interest. After 3 years it is worth £5624.32. How much was invested? [3]

£ _____

14 A jacket costs £120. Shop A takes 25% off, then a further 10% off the reduced price. Shop B takes 33% off.
Which shop is cheaper, and by how much? [4]

Shop ___ by _____

FORENSIC TIP 25% then 10% is **not** 35% off. Multiply the multipliers: 0.75 × 0.9 = 0.675, which is 32.5% off.

15 A painting gains 10% in value each year. After how many whole years will its value first be more than double what it is now? [3]

years _____

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

0.35 × 240.

✓ **£84**

Q2 SECURING

64 × 1.15.

✓ **£73.60**

Q3 SECURING

Change £72. 72 ÷ 450 × 100.

✓ **16%**

Q4 SECURING

18 ÷ 75 × 100.

✓ **24%**

Q5 SECURING

92% of 1250, or 1250 − 100.

✓ **1150**

Q6 EXTENDING

Sale price is 70%: 56 ÷ 0.7.

✓ **£80**

Q7 EXTENDING

$2000 \times 1.03^4 = 2251.0176...$

✓ **£2251.02**

Q8 EXTENDING

18000×0.85^3.

✓ **£11,054.25**

Q9 EXTENDING

12000 ÷ 1.25.

✓ **9,600**

Q10 EXTENDING

He used simple interest (5% × 3). Compound: $80 \times 1.05^3 = 92.61$.

✓ **£92.61**

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-PCT

Mark your evidence

Level	Marks	My score	Secured? (every mark)
Securing	11		☐
Extending	13		☐
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: PERCENTAGES

In this case file you've learned to:

- Use a multiplier for any percentage increase or decrease.
- Work out a percentage change, dividing by the original amount.
- Undo a percentage change by dividing by the multiplier.
- Model compound growth and depreciation with powers.
- Combine several changes by multiplying their multipliers.

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