

Worked Practice

GAC Mathematics

Extra practice: four questions with worked answers

This pack adds practice to three units of GAC004 Mathematics I. It covers arithmetic review (sheet 1.1), introductory algebra (sheet 1.2) and geometry (sheet 1.4). The questions practise basic arithmetic, algebraic methods and plane geometry. Use this pack beside the GAC004 handout and its practice sheets.

It is original practice material. It does not change your centre's assessment brief, and it is not an official paper.

Answer the questions in “Practice questions” first. Write your full method. Then compare your method with each worked answer, not only your final number. A clear, stated method shows your reasoning better than a long report.

Each answer shows the same structure: what is known, why the rule applies, the rule in symbols, then the numbers. One calculation stage sits on each line. The check at the end is part of the answer, so run it yourself on a fresh copy.

Question	Sheet	What it practises
Q1	1.1	Two price changes in a row
Q2	1.1	Undo one increase
Q3	1.2	Divide by a negative number
Q4	1.4	From lengths to areas

Practice questions

Answer these first. Do not look ahead.

Q1. A price of 200 units rises by 10%, then falls by 10%.

- Find the final price.
- Explain why the final price is not 200 units.

Q2. After a 20% increase, a figure is 84. Find the original figure.

Q3. Solve $9 - 2x \leq 3$. Show your solution on a **number line**.

Q4. Two **similar** models have a **length ratio** of 3 : 5. The smaller model has **surface area** 36 cm^2 . Find the larger surface area.

Worked answers

Answer to Q1: each change uses the current price

Known: $P_0 = 200$ units, rise $r = 10\%$, fall $r = 10\%$. Each **percentage** uses the current price. So apply a **multiplier** at each stage.

The increase **equation** , in symbols:

$$P_{new} = P_{old}(1 + r/100)$$

$$P_1 = P_0(1 + r/100) = 200(1 + 10/100) = 220$$

The decrease, in symbols:

$$P_{new} = P_{old}(1 - r/100)$$

$$P_2 = P_1(1 - r/100) = 220(1 - 10/100) = 198$$

The final price is **198** units.

Why is it not 200? The two multipliers form one combined multiplier:

$$\frac{P_2}{P_0} = (1 + r/100)(1 - r/100)$$

$$\frac{P_2}{P_0} = (1 + r/100)(1 - r/100) = (1 + 10/100)(1 - 10/100) = 0.99$$

So the final price keeps 99% of the starting price. The overall loss is 1%, not zero.

The rise and the fall also started from different amounts:

$$\Delta_{rise} = P_1 - P_0 = 220 - 200 = 20$$

$$\Delta_{fall} = P_1 - P_2 = 220 - 198 = 22$$

10% of 220 is larger than 10% of 200. The fall removes more than the rise added.

Check: the overall loss is 1% of the starting price.

$$1 - 0.99 = 0.01$$

$$P_0 \times 0.01 = 200 \times 0.01 = 2$$

$$P_0 - P_2 = 200 - 198 = 2$$

Both give 2 units, so the two checks agree.

Answer to Q2: undo the increase by dividing

Known: new figure $N = 84$, increase $r = 20\%$. The increase multiplied the original figure by $1 + r/100$. To reverse a percentage change, divide by this multiplier. Never subtract the same percentage back.

The increase equation, in symbols:

$$N = P_0(1 + r/100)$$

Rearrange for the original figure:

$$P_0 = \frac{N}{1 + r/100}$$

Substitute:

$$P_0 = \frac{N}{1 + r/100} = \frac{84}{1 + 20/100}$$

Work out the multiplier:

$$1 + \frac{r}{100} = 1 + \frac{20}{100} = 1.2$$

Divide:

$$P_0 = \frac{N}{1 + r/100} = \frac{84}{1.2} = 70$$

The original figure is **70**.

Reverse check: run the increase forward again.

$$N = P_0(1 + r/100) = 70(1 + 20/100) = 84$$

The original 70 returns the stated 84, so the answer is correct.

The trap: subtracting 20% of the new figure.

$$84 - 84 \times 0.20 = 67.2$$

That is wrong. The increase was calculated on 70, not on 84.

Answer to Q3: solve, then check both sides

Known: the **inequality** $9 - 2x \leq 3$. Solve it like an equation. Dividing by a negative number **reverses** the inequality sign.

Subtract 9 from both sides:

$$9 - 2x \leq 3$$

$$-2x \leq 3 - 9$$

$$-2x \leq -6$$

Divide both sides by -2 , and reverse the sign:

$$x \geq \frac{-6}{-2} = 3$$

The solution is $x \geq 3$.

Boundary check: at $x = 3$ the two sides are equal.

$$9 - 2x = 9 - 2(3) = 9 - 6 = 3$$

So 3 is included. On the number line, mark a **closed circle** at 3 and shade to the right.

Inside check: $x = 4$.

$$9 - 2x = 9 - 2(4) = 9 - 8 = 1 \leq 3$$

True.

Outside check: $x = 2$.

$$9 - 2x = 9 - 2(2) = 9 - 4 = 5 > 3$$

False. Both checks agree with $x \geq 3$.

Answer to Q4: from lengths to areas

Known: length ratio $3 : 5$; smaller surface area $A_s = 36 \text{ cm}^2$. Let k be the **scale factor** from a smaller length L_s to the matching larger length L_L . Each area is a product of two lengths. So areas scale as the **square** of k .

The general relation between the two areas:

$$\frac{A_L}{A_s} = k^2$$

The length ratio gives the scale factor:

$$k = \frac{L_L}{L_s} = \frac{5}{3}$$

The area ratio:

$$\frac{A_L}{A_s} = k^2 = \left(\frac{5}{3}\right)^2 = \frac{25}{9}$$

Rearrange for the larger area:

$$A_L = A_s k^2$$

Substitute:

$$A_L = A_s k^2 = 36 \times \frac{25}{9} = 100$$

The larger surface area is **100** cm^2 .

Ratio check:

$$\frac{A_L}{A_s} = \frac{100}{36} = \frac{25}{9}$$

$$k^2 = \left(\frac{5}{3}\right)^2 = \frac{25}{9}$$

The area ratio $25 : 9$ is the square of the length ratio $5 : 3$. Only areas scale by $\frac{25}{9}$. A length scales by $k = \frac{5}{3}$.

What to do next

- Try the matching exercises on practice sheets 1.1, 1.2 and 1.4.
- Run every check yourself on a fresh copy.
- Record the step where your method differed, then try a new question.

A stated method with a check shows your reasoning clearly. A bare number does not.