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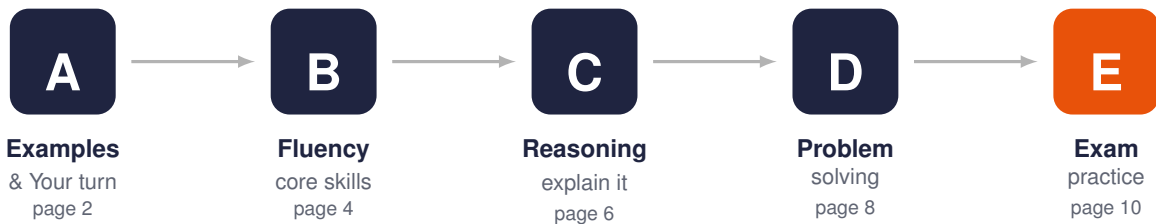
GCSE MATHEMATICS • RATIO & PROPORTION

Percentage Change

Worksheet

Pearson Edexcel GCSE (1MA1) & International GCSE (4MA1) • Calculator only where shown

Free Percentage Change worksheet for GCSE and iGCSE Maths, with full worked solutions



Tap a section to jump straight to it

By the end of this worksheet you can: work out a percentage increase or decrease, and a percentage profit or loss • always divide by the original • find the original first when only the change is given • *Higher:* find the percentage change in an area, a unit price or a time, and turn a percentage change into an equation.

Which questions are for me?

FOUNDATION Everyone starts here. These skills appear on both tiers.

HIGHER The same skills where Higher papers use them: changes to areas and unit prices, inverse changes, and percentage change inside an equation. Grades 6 to 9.

Every section has both, clearly labelled. Questions get harder as you go, and every skill in Sections A to D is needed in Section E.

Track your progress

Section	B	C	D	E
Foundation marks	23	10	13	21
Higher marks	16	14	16	14
My score				

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A**Worked examples & Your turn**

Read each example carefully. Cover it up, then answer the question beside it using the same method.

FOUNDATION*Everyone starts here***Worked example A1**

A price rises from £40 to £46

Work out the percentage increase.

*Find the change, then divide by the **original**.*

$$46 - 40 = 6 \quad \frac{6}{40} \times 100 = 15$$

15%

Your turn A1

A plant grows from 25 cm to 32 cm.

Work out the percentage increase in its height.

Worked example A2

A laptop was £650. It is now £520

Work out the percentage decrease.

The original is £650, the old price. Do not divide by £520

$$650 - 520 = 130 \quad \frac{130}{650} \times 100 = 20$$

20%

Your turn A2

The value of a car falls from £8000 to £6000

Work out the percentage decrease.

Worked example A3

Ana buys a bike for £250. She sells it for £205

Work out her percentage loss.

For profit or loss, the original is what she paid.

$$\text{Loss} = 250 - 205 = 45 \quad \frac{45}{250} \times 100 = 18$$

18% loss

Your turn A3

Ben buys a phone for £80. He sells it for £98

Work out his percentage profit.



HIGHER*Higher strategies: these are new ways of thinking, not longer sums***Worked example A4: multiply the multipliers**

A rectangle's length increases by 10% and its width decreases by 10%. Find the percentage change in its area.

$$\text{Area} = \text{length} \times \text{width}: 1.1 \times 0.9 = 0.99$$

decrease of 1%

Your turn A4

A rectangle's length increases by 20% and its width increases by 5%. Find the percentage change in its area.

Worked example A5: the change in a unit price

A pack of 6 rolls cost £4.50. It now has 5 rolls and costs £4.00

Find the percentage change in the price of one roll.

Compare the price of 1 roll, not the pack.

$$450 \div 6 = 75p \quad 400 \div 5 = 80p$$

$$\frac{5}{75} \times 100 = 6.66\dots$$

increase of 6.7%

Your turn A5

A 750 ml bottle cost £2.40. It now holds 600 ml and costs £2.04

Find the percentage change in the price of 1 ml.

Worked example A6: an inverse change

A car travels the same journey 25% faster. Find the percentage change in the time taken.

$$\text{Time} = \text{distance} \div \text{speed}: 1 \div 1.25 = 0.8$$

decrease of 20%

Your turn A6

The number of workers on a job increases by 60%. They all work at the same rate. Find the percentage change in the time the job takes.

Worked example A7: percentage to equation

Each side of a square increases by 2 cm. The area increases by 21%. Find the original length of a side.

$$\text{Area} \times 1.21 \text{ means } \text{side} \times \sqrt{1.21} = 1.1$$

$$s + 2 = 1.1s \quad \text{so} \quad 0.1s = 2$$

$s = 20 \text{ cm}$

Your turn A7

A positive number is increased by 6. Its square increases by 44%. Find the number.



B**Fluency**

Each question is a designed sequence. From one part to the next, ask yourself: what changed, and what did it do to the answer?

FOUNDATION*Everyone starts here*

B1 Work out the percentage increase from

(a) 40 to 50

(b) 50 to 60

(c) 80 to 200

(d) 2.5 to 3.4

[4 marks]

B2 Work out the percentage decrease from

(a) 50 to 40

(b) 80 to 68

(c) 400 to 250

(d) 2500 to 2400

[4 marks]

B3 Work out the percentage profit or loss. Say which it is.

(a) cost £30, sold for £36

(b) cost £45, sold for £36

(c) cost £12, sold for £27

(d) cost £64, sold for £56

[4 marks]

B4 A quantity is multiplied by each number below. Write down the percentage change.

(a) $\times 1.35$

(b) $\times 0.92$

(c) $\times 2.4$

(d) $\times 0.6$

[4 marks]

B5 Work out the percentage change. Say whether it is an increase or a decrease.

(a) 45 minutes to 1 hour

(b) 750 ml to 1.2 litres

(c) 2 m to 85 cm

[3 marks]

B6 Work out the percentage change in each case.

(a) A price rises by £15 to £75

(b) A price falls by £12 to £48

(c) A price rises to £84, which is £12 more.

(d) A mass falls by 0.3 kg to 2.7 kg

[4 marks]



HIGHER*Higher tier only*

B7 Work out the percentage change in the area or volume.

- (a) The length and the width of a rectangle both increase by 10%
- (b) The length of a rectangle increases by 20% and its width decreases by 20%
- (c) Every edge of a cube increases by 10%
- (d) The radius of a circle decreases by 30%

[4 marks]

B8 Work out the percentage change in the second quantity. The other quantities stay the same.

- (a) Speed increases by 50%. Time for a journey?
- (b) Speed decreases by 20%. Time for a journey?
- (c) The number of workers increases by 20%. Time for a job?
- (d) The price per kilogram increases by 100%. Mass you can buy for £10?

[4 marks]

B9 Work out the percentage change in the price of one item, or of 1 g or 1 kg.

- (a) 10 for £4 becomes 8 for £4
- (b) 500 g for £2 becomes 400 g for £1.80
- (c) 6 for £3 becomes 8 for £4.40
- (d) 1 kg for £5 becomes 1.25 kg for £5.50

[4 marks]

B10 Work out the percentage change from

- (a) x to $1.3x$
- (b) $4x$ to $5x$
- (c) $5x$ to $4x$
- (d) x^2 to $(1.2x)^2$

[4 marks]



C**Reasoning**

Show your working and explain your thinking. A correct answer without a reason does not score full marks.

FOUNDATION

Everyone starts here

C1 A price rises from £40 to £50

Kim writes $50 - 40 = 10$ $\frac{10}{50} \times 100 = 20$ so the increase is 20%

(a) Explain Kim's mistake. (b) Work out the correct percentage increase. [2 marks]

C2 The pass rate for a test rises from 40% to 50%

Ali says, "The pass rate has increased by 10%."

Explain why Ali is wrong, and work out the percentage increase in the pass rate. [2 marks]

C3 (a) Explain why a price cannot decrease by 120%

(b) A price rises from £30 to £75. Show that this is an increase of 150% [3 marks]

C4 Shop A increases the price of a book from £12 to £15

Shop B increases the price of a game from £25 to £30

Ben says, "Shop B's price went up by more, so Shop B has the bigger percentage increase."

Is Ben correct? You must show your working. [3 marks]



HIGHER*Higher tier only*

- C5** A rectangle can be changed in one of two ways.
Change 1: the length increases by 30% and the width stays the same.
Change 2: the length and the width both increase by 15%
Which change gives the greater increase in area? You must show your working. [3 marks]
- C6** The time taken for a journey is reduced by 25%. The distance stays the same.
Show that the average speed increases by $33\frac{1}{3}\%$ [3 marks]
- C7** a and b are positive numbers and $a < b$
Prove that the percentage increase from a to b is always greater than the percentage decrease from b to a [3 marks]
- C8** A shop reduces all of its prices by $p\%$. As a result, the number of items it sells increases by $2p\%$
The total amount of money the shop takes increases by 8%
(a) Show that $p^2 - 50p + 400 = 0$
(b) Find the two possible values of p [5 marks]



D**Problem solving**

You decide the method. Read the whole question first, and show every step.

FOUNDATION

Everyone starts here

- D1** Jo saves £40 in January. In February she saves £12 more than in January.
In March she saves 25% less than in February.
Work out the percentage change in the amount Jo saves from January to March. [3 marks]
- D2** Kai's phone contract costs £25 per month for 24 months.
A new contract costs £18 per month for 24 months, plus a single payment of £120 at the start.
Work out the percentage saving if Kai chooses the new contract. [4 marks]
- D3** A train journey used to take 2 hours 40 minutes. A new line reduces the time to 2 hours 12 minutes.
Work out the percentage decrease in the journey time. [3 marks]
- D4** A rectangular lawn is 12 m long and 8 m wide. A path 1 m wide is laid along one long side, inside the lawn.

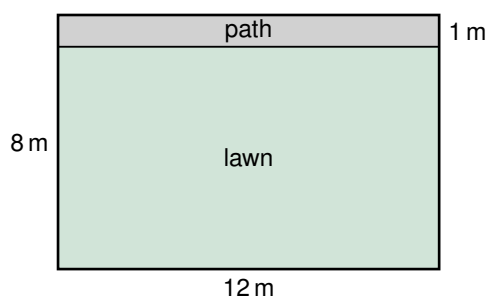


Diagram NOT accurately drawn

Work out the percentage decrease in the area of the lawn.

[3 marks]



HIGHER*Higher tier only*

- D5** The mean of 8 numbers is 50
Two more numbers are added. The mean of all 10 numbers is 10% greater than before.
Work out the mean of the two numbers that were added. [3 marks]
- D6** (*calculator*) Fuel costs £1.40 per litre and Amy's car uses 8 litres per 100 km.
One year later, fuel costs £1.50 per litre and Amy's new car uses 6.5 litres per 100 km.
Amy drives 450 km each month. Work out the percentage change in her monthly fuel cost. Give your answer to 1 decimal place. [4 marks]
- D7** A shop sells mugs. The cost price of a mug increases by 10%, but the shop keeps the same selling price.
The profit on each mug falls from £8 to £5
Work out the cost price of a mug before the increase. [4 marks]
- D8** The base of a rectangle increases by $x\%$ and its height decreases by $x\%$
The area of the rectangle decreases by 4%. The perimeter of the rectangle decreases by 5%
Find the value of x and the ratio base : height of the original rectangle. [5 marks]



**Exam practice**

Exam-style questions. Write your answers in the spaces. Aim for about one minute per mark.

FOUNDATION*Foundation and Higher crossover*

- E1** (a) The price of a sandwich increases from £3.20 to £3.60

Work out the percentage increase.

..... %

(2)

- (b) The value of a car falls from £12 500 to £9750

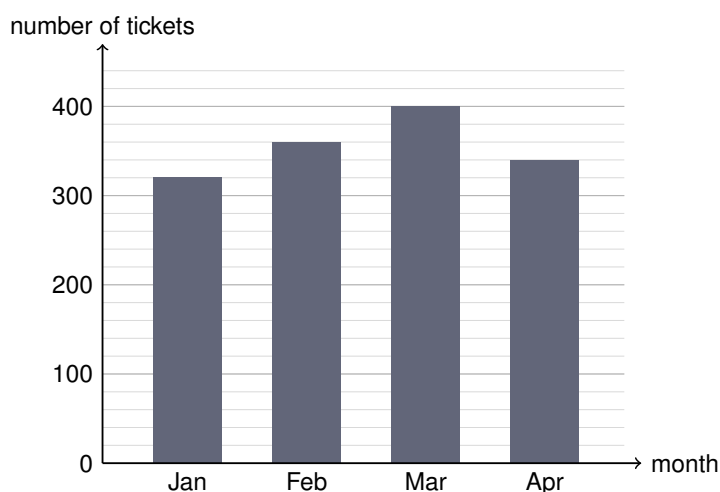
Work out the percentage decrease.

..... %

(2)

(Total for Question E1 is 4 marks)

- E2** The bar chart shows the number of tickets a cinema sold each month.



Work out the percentage decrease in the number of tickets sold from March to April.

..... %

(Total for Question E2 is 3 marks)



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E3 A club had 160 members in 2024 and 200 members in 2025

(a) Work out the percentage increase in the number of members.

..... %

(2)

(b) The number of members increases by the same percentage from 2025 to 2026

Work out the number of members in 2026

.....

(2)

(Total for Question E3 is 4 marks)

E4 The price of a toy falls from £50 to £40. Later it rises from £40 back to £50

Sam says, "The price fell by 20% and then rose by 20%."

Is Sam correct? You **must** show your working.

(Total for Question E4 is 3 marks)

E5 Oli buys a bike for £240. He sells it for £204

Work out his percentage loss.

..... %

(Total for Question E5 is 3 marks)



- E6** Jo gets a pay rise of 12%. She now earns £2240 per month.
Before the pay rise, Lee earned the same amount as Jo. Lee gets a pay rise of £250 per month.
Who got the greater percentage pay rise? You **must** show your working.

.....
(Total for Question E6 is 4 marks)

HIGHER*Higher tier only*

- E7** The length of a rectangle increases by 20%. The width of the rectangle decreases by 15%
Work out the percentage change in the area of the rectangle.

.....
(Total for Question E7 is 3 marks)

- E8** (*calculator*) A chocolate bar used to weigh 200 g and cost £1.60
The bar now weighs 180 g and costs £1.62
Work out the percentage increase in the price per gram.

..... %
(Total for Question E8 is 3 marks)



- E9** A theatre reduces the price of its tickets. With the same amount of money, a school can now buy 20% more tickets than before.

Work out the percentage reduction in the price of a ticket.

..... %

(Total for Question E9 is 3 marks)

- E10** The length of a rectangle is twice its width.

The length and the width are each increased by 2 cm. The area of the rectangle increases by 68%

Work out the width of the original rectangle.

..... cm

(Total for Question E10 is 5 marks)

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