

# GCSE Maths – Ratio, Proportion and Rates of Change

## Percentage Change

### Worksheet

NOTES



SOLUTIONS



This worksheet will show you how to work out different types of percentage change questions. Each section contains a **worked example**, a **question with hints** and then **questions for you to work through** on your own.

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## Section A

### Worked Example

**Increase 75 by 24%.**

**Step 1:** Interpret an increase of 24% as a decimal multiplier.

*An increase of 24% is 124% of the original value. So, the decimal multiplier is:*

$$124 \div 100 = 1.24$$

**Step 2:** Multiply the decimal multiplier by the original value.

$$1.24 \times 75 = \mathbf{93}$$

### Guided Example

**Decrease the number 140 by 46%.**

**Step 1:** Interpret a decrease of 46% as a decimal multiplier.

**Step 2:** Multiply the starting value by the decimal multiplier.





## Section B

### Worked Example

**Ingredients for one batch of cakes costs £2.56. Katy makes 4 batches and sells each batch for £5. Work out how much profit Katy makes as a percentage change.**

**Step 1:** Calculate how much Katy spent on ingredients.

*Multiply the cost per batch by the number of batches she bought ingredients for.*

$$4 \times £2.56 = £10.24$$

**Step 2:** Calculate how much money she made from selling the cakes and find the difference between this and the money spent.

$$\begin{aligned} 4 \times £5 &= £20 \\ £20 - £10.24 &= £9.76 \end{aligned}$$

**Step 3:** Substitute the difference and money spent into the formula for percentage change and solve.

$$\text{Percentage Change} = \frac{\text{Change}}{\text{Original}} \times 100$$

$$\text{Percentage Change} = \frac{£9.76}{£10.24} \times 100$$

$$\text{Percentage Change} = \mathbf{95\%} \text{ (to the nearest percent)}$$

*Alternatively, you could solve this problem by basing the calculation off the prices of one batch only. Since the answer is a percentage, and not the actual profit, the percentage change will be the same.*

$$\text{Percentage Change} = \frac{\text{Change}}{\text{Original}} \times 100$$

$$\text{Percentage Change} = \frac{£5 - £2.56}{£2.56} \times 100 = \frac{£2.44}{£2.56} \times 100$$

$$= \mathbf{95\%} \text{ (to the nearest percent)}$$



### Guided Example

An art gallery contains 45 paintings. After an exhibition, paintings are bought and sold, and it now contains 38 items. Calculate the percentage change in the number of paintings in the gallery, giving your answer to the nearest percent.

**Step 1:** Find the difference between the number of paintings in the gallery after and before the exhibition.

**Step 2:** Substitute the change in number of paintings, and the original number of paintings, into the formula for percentage change.

**Step 3:** Solve the equation, and round the percentage change to the nearest whole number.





## Section C

### Worked Example

The population in a small village is depleting. Over the last year, it has experienced a 15% decrease and now has 340 residents. How many people lived in the town one year ago?

**Step 1:** Substitute the values given into the equation for percentage decrease to form an equation.

*Let the population of the town one year ago be  $x$ .*

$$\text{Percentage Decrease} = \frac{\text{Old} - \text{New}}{\text{Original}} \times 100$$
$$15 = \frac{x - 340}{x} \times 100$$

**Step 2:** Solve the equation, by collecting the  $x$  terms on one side.

$$0.15 = \frac{x - 340}{x}$$
$$0.15x = x - 340$$
$$0.85x = 340$$
$$x = 400$$

*The population of the town one year ago was 400.*

### Guided Example

A farmer is monitoring his population of chickens and calculates that every year, the number of chickens increases by approximately 30%. At the start of 2008, he forgot to count the number of chickens but in 2009 he found that there were 156. Estimate the number of chickens at the start of 2008.

**Step 1:** Substitute the values we have for the percentage increase and the number of chickens into the formula for percentage increase.

**Step 2:** Solve the equation by collecting the coefficients of  $x$  onto one side.



### Now it's your turn!

If you get stuck, look back at the worked and guided examples.

8. A pair of headphones are in a sale where everything is 40% off. The sale price of the headphones is £54. What was the original full price of the headphones?
  
9. A carrot patch starts with 200 carrots. A farmer discovers that every week, pests consume 5% of his produce. How many carrots does the farmer have after two weeks, and what is the percentage change compared to the original amount?
  
10. Pamela buys an old car for £1000. After fixing the engine and exhaust, the car increases in value by 110%. Once she has painted the exterior and fitted new seats, it appreciates in value by a further 60%. How much can she sell the car for now?
  
11. A brand of orange juice develops a special edition of its best-selling juice bottle. Is buying the new bottle more cost-effective? Explain your answer.

Classic

£1.99

special edition  
40% extra juice!

£2.99

