



# Percentage change

There are two methods that can be used to increase or decrease an amount by a percentage.

## Method 1

Work out 26% of £280:

$$\frac{26}{100} \times £280 = £72.80$$

Subtract the decrease:

$$£280 - £72.80 = £207.20$$

£280

26% OFF

## Method 2

Use a multiplier:

$$100\% + 30\% = 130\%$$

$$\frac{130}{100} = 1.3$$

So the multiplier for a 30% increase is 1.3:

$$400\text{ g} \times 1.3 = 520\text{ g}$$



## Worked example

Target grade **4**

For the 2014/2015 season a football club charged £550 for a top-price season ticket.

For the 2015/2016 season the club increased its season ticket prices by 6.2%.

It offered supporters a 10% discount on the new price if they bought their season tickets before the end of June.

Calculate the price of a season ticket bought before the end of June. **(3 marks)**

$$550 \times 1.062 = 584.1$$

$$584.1 \times 0.9 = 525.69$$

The discounted price is £525.69

## Examiners' report

Read the question carefully – there are two steps in the working:

### 6.2% increase

The multiplier is  $\frac{100 + 6.2}{100} = 1.062$

### 10% decrease

The multiplier is  $\frac{100 - 10}{100} = 0.9$

This is a calculator question. Don't attempt complex calculations on Papers 2 and 3 without using your calculator!

Real students have struggled with questions like this in recent exams – **be prepared!**



## Calculating a percentage increase or decrease

Work out the amount of the increase or decrease

Was £60  
Now £39

Write this as a percentage of the original amount

$$60 - 39 = 21$$

$$\frac{21}{60} \times 100 = 35\%$$

This is a 35% decrease.

For a reminder about writing one quantity as a percentage of another, have a look at page 59.

A question might ask you to calculate a percentage profit or loss rather than an increase or decrease.

## Now try this

Target grade **4**

1 A TV originally cost £520.

In a sale it was priced at £340.

What was the percentage reduction in the price?

Give your answer to 1 decimal place. **(3 marks)**

Reduction means decrease. Work out the decrease as a percentage of the original price.

Target grade **5**

2 Johan publishes a monthly poetry magazine. In March he printed 1400 copies of his magazine. In April he increased his print run by 15%.

It costs Johan £800 plus 75p per copy to print his magazine. He sells each issue for £1.99.

Assuming Johan sells every copy that he prints, calculate his percentage profit in April. **(4 marks)**



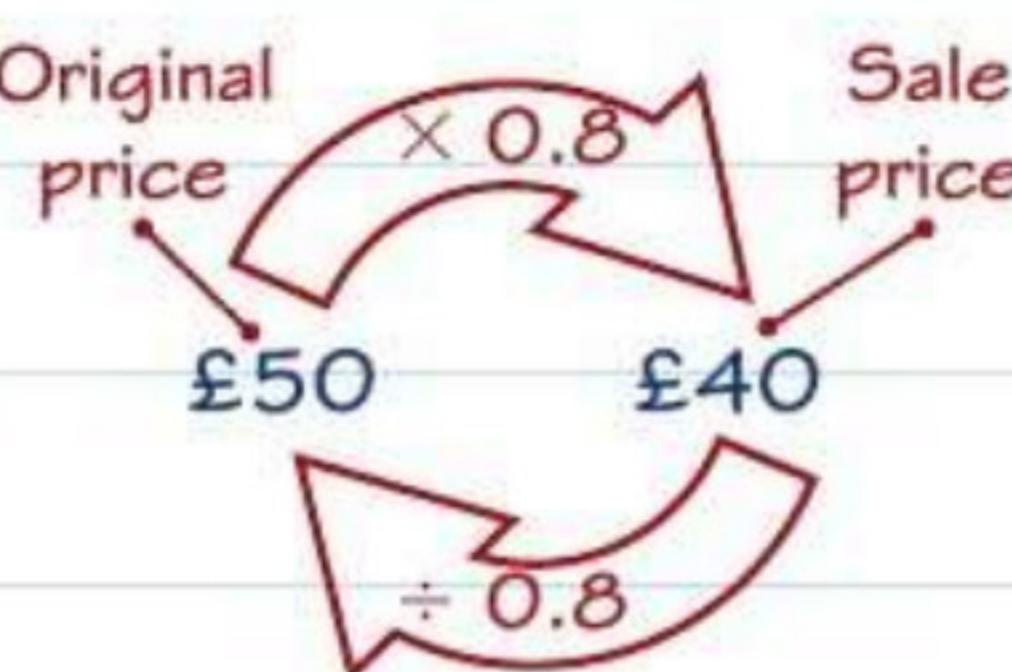
# Reverse percentages

In some questions you are given an amount **after** a percentage change, and you have to find the **original amount**. To answer questions like this you need to be really confident with **percentage change**. Revise it on page 62.

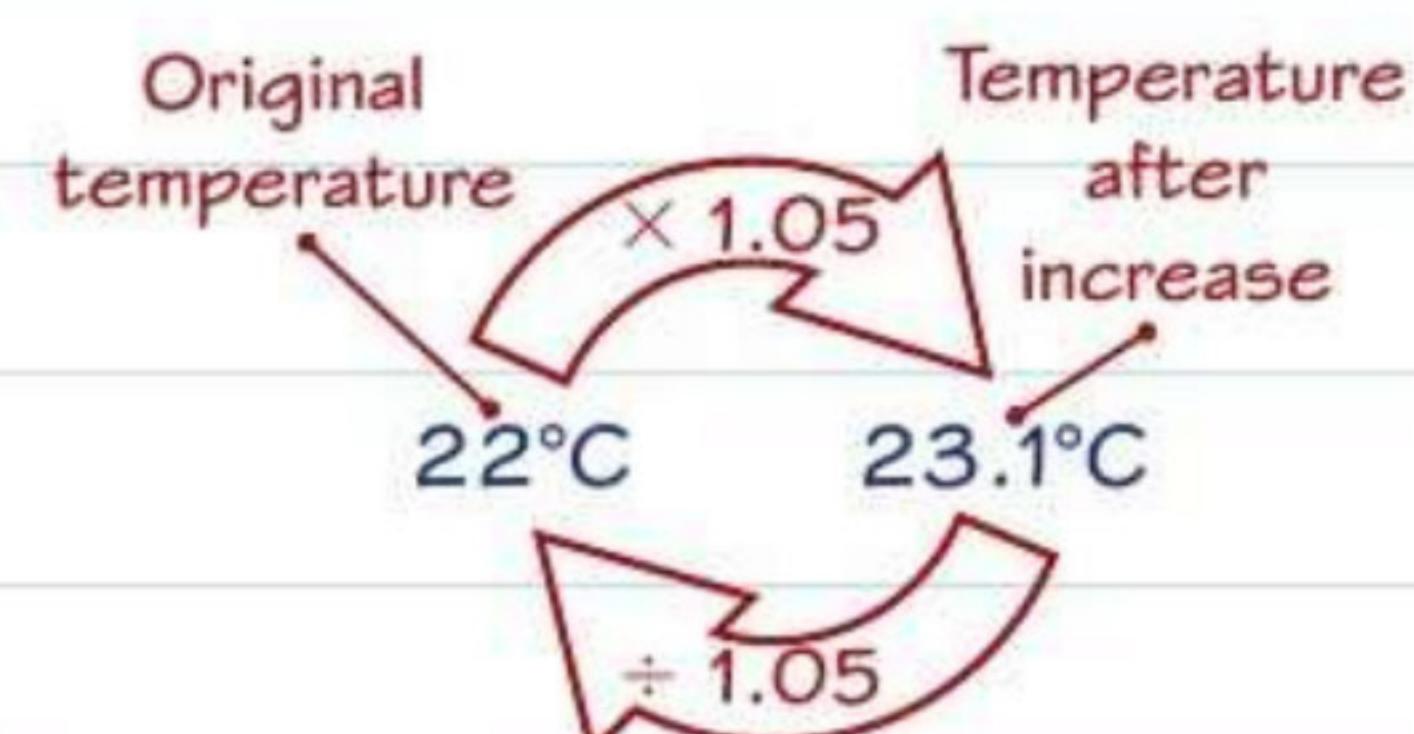
## Using a multiplier

You can use a multiplier to calculate a percentage increase or decrease. If you are given the **final amount** and you need to find the **original amount**, you can **divide by the multiplier**. Here are two examples:

**1** A sweater is **reduced in price** by 20% in a sale.



**2** The average temperature **increases** by 5%.



## Worked example

Target grade **5**

In a sale, normal prices are reduced by 15%. The sale price of a pair of trainers is £75.65. Work out the normal price of the trainers. (3 marks)

$$100\% - 15\% = 85\%$$

$$\frac{85}{100} = 0.85$$

$$75.65 \div 0.85 = 89$$

The original price was £89

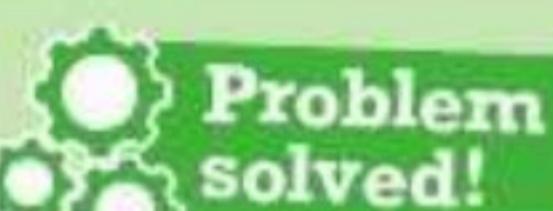
Read percentages questions carefully so you know what information you have been given. This question tells you the price **after** the percentage decrease, so you need to use **reverse percentages**. To find the multiplier for a 15% decrease:

1. Subtract 15% from 100%
2. Divide by 100 to convert to a multiplier.

You need to **divide** by the multiplier to find the original price.

### Check it!

Reduce £89 by 15%:  $89 \times 0.15 = £13.35$   
 $89 - 13.35 = £75.65 \checkmark$



Plan your answer before you start. You will need to do **two separate calculations** to find both original heights. Then you need to compare the original heights and **write a conclusion**.

## Examiners' report

Always carry out a **common sense check** on your calculations. The heights in 2013 should be **less** than the heights in 2014.

Real students have struggled with questions like this in recent exams – **be prepared!**



## Worked example

Target grade **5**

Amy and Paul measure their heights each year. This table shows their heights in 2014.

	Height in 2014 (cm)	Percentage increase since 2013
Paul	154	10%
Amy	150.8	4%

Who was taller in 2013? Give reasons for your answer. (4 marks)

$$\text{Paul's original height} = 154 \div 1.1 = 140 \text{ cm}$$

$$\text{Amy's original height} = 150.8 \div 1.04 = 145 \text{ cm}$$

In 2013 Amy was taller than Paul by 5 cm.

## Now try this

Target grade **5**

1 Hannah buys a pair of shoes in a sale where all the items are marked '40% off'. She pays £27 for the shoes. What price were the shoes originally? (3 marks)

2 Jared bought a house in 2010.

By 2012 his house had increased in value by 8%. The new value of Jared's house was £237 600. How much did Jared pay for his house? (3 marks)

Worked solution video

