

Simple and Compound Interest

Solutions

For AQA GCSE Mathematics (8300) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (2 marks)

£2000 is invested for 4 years.
Simple interest is paid at 3% per year.
Work out the total interest paid.

Simple interest is the same amount every year.

Interest for one year: 3% of 2000 = $0.03 \times 2000 = 60$

Interest for 4 years: $4 \times 60 = 240$

Answer: £240

Tip: The question asks for the **interest**, not the total amount in the account (£2240).

Marks: 1 mark for 60. 1 mark for 240.

2 (1 mark)

An amount is invested for 3 years at 4% compound interest per year.
Circle the number the amount is multiplied by to find its value after 3 years.

Options: 1.04×3 , 1.12, 1.04^3 , 0.04^3

Each year the amount goes up by 4%, so multiply by 1.04

This happens 3 times: $\times 1.04 \times 1.04 \times 1.04$

$1.04 \times 1.04 \times 1.04 = 1.04^3$

Answer: 1.04^3

3 (3 marks)

£5000 is invested for 3 years at 2% compound interest per year.
Work out the value of the investment at the end of 3 years.

A 2% increase each year means multiply by 1.02 each year.

For 3 years, multiply by 1.02^3

$$5000 \times 1.02^3 = 5306.04$$

Answer: £5306.04

Tip: Compound interest is **not** the same each year. Using $3 \times 2\% = 6\%$ (£5300) is simple interest, which is wrong here.

Marks: 1 mark for using 1.02. 1 mark for 5000×1.02^3 . 1 mark for 5306.04.

4 (3 marks)

Tia buys an e-bike for £1600
Its value depreciates by 12% each year.
Work out the value of the e-bike after 3 years.

Depreciates means the value goes down.

A 12% decrease each year means multiply by $1 - 0.12 = 0.88$ each year.

For 3 years: 1600×0.88^3

$$1600 \times 0.681472 = 1090.3552$$

Round to the nearest penny.

Answer: £1090.36

Tip: Do not take off $3 \times 12\% = 36\%$ in one go. That gives £1024, which is wrong: each year's 12% is of the new, lower value.

Marks: 1 mark for using 0.88. 1 mark for $\times 0.88^3$ (or three correct years). 1 mark for 1090.36.

5 (4 marks)

Nadia puts £2400 in an account that pays 3% simple interest per year.

Owen puts £2300 in an account that pays 3.5% compound interest per year.

After 4 years, who has more money in their account, and by how much?

You must show your working.

Nadia (simple interest):

$$\text{One year: } 3\% \text{ of } 2400 = 0.03 \times 2400 = 72$$

$$\text{Four years: } 4 \times 72 = 288$$

Nadia has $2400 + 288 = 2688$ pounds.

Owen (compound interest):

$$2300 \times 1.035^4 = 2639.30 \text{ (to the nearest penny)}$$

$$2688 - 2639.30 = 48.70$$

Answer: Nadia, by £48.70

Tip: Read which type of interest each person gets. Simple interest is the same amount every year; compound interest is worked out on the new total each year.

Marks: 1 mark for 288 or 2688. 1 mark for 2300×1.035^4 . 1 mark for 2639.30. 1 mark for Nadia by £48.70.

6 (1 mark)

A phone loses 20% of its value each year.

Ben says,

‘After 5 years the phone will be worth nothing, because $5 \times 20\% = 100\%$ ’

Explain why Ben is wrong.

Each year the phone loses 20% of its value at the **start of that year**.

This value gets smaller every year, so each 20% is a smaller amount.

After 5 years it is worth $0.8^5 = 0.32768$ of its original value.

That is about 33%, not 0%.

Answer: Each 20% is of a smaller value, so it never reaches zero

7 (3 marks)

£4000 is invested at 5% compound interest per year.

After how many years will the investment first be worth more than £5000?

Each year multiply by 1.05

Try different numbers of years:

After 4 years: $4000 \times 1.05^4 = 4862.03$ (not enough)

After 5 years: $4000 \times 1.05^5 = 5105.13$ (more than £5000)

Answer: 5 years

Marks: 1 mark for 4000×1.05^n (or going year by year). 1 mark for checking 4 years and 5 years. 1 mark for 5.

8 (3 marks)

A museum had 250 000 visitors this year.

The number of visitors is expected to rise by 6% each year.

Work out the expected number of visitors in 3 years' time.

You must show your working.

A 6% increase each year means multiply by $1 + 0.06 = 1.06$ each year.

For 3 years: $250\,000 \times 1.06^3$

$$250\,000 \times 1.191016 = 297\,754$$

Answer: 297 754

Tip: Do not add $3 \times 6\% = 18\%$ of 250 000. Each year's 6% is of the **new**, larger number.

Marks: 1 mark for using 1.06. 1 mark for $250\,000 \times 1.06^3$ or three correct steps. 1 mark for 297 754.

9 (3 marks)

Kwame has £5000 to put in a savings account for 2 years.
Two banks offer these compound interest rates.

Bank A	Bank B
Year 1: 6%	Year 1: 2%
Year 2: 2%	Year 2: 6%

Kwame says,

‘Bank A is better, because it pays the higher rate first.’

Is he correct?

You must show your working.

Bank A: $\times 1.06$ in year 1, then $\times 1.02$ in year 2

$$5000 \times 1.06 \times 1.02 = 5406$$

Bank B: $\times 1.02$ in year 1, then $\times 1.06$ in year 2

$$5000 \times 1.02 \times 1.06 = 5406$$

Both banks give £5406.

(Multiplying in a different order gives the same answer.)

So Kwame is not correct.

Answer: No (both give £5406)

Tip: Use a different multiplier for each year: $\times 1.06$ and $\times 1.02$. Do not add the rates to get 8%: that gives £5400, which is wrong.

Marks: 1 mark for $5000 \times 1.06 \times 1.02$ or $5000 \times 1.02 \times 1.06$. 1 mark for 5406 for both banks. 1 mark for No, with both values.

10 (2 marks)

House prices on a street increase by 6.2% each year.

Show that after 12 years the house prices on the street will be at least double.

A 6.2% increase each year means multiply by 1.062 each year.

For 12 years the multiplier is 1.062^{12}

$$1.062^{12} = 2.058 \dots$$

Doubling means multiplying by 2.

2.058 ... is more than 2, so the prices will be at least double.

(Or use an example: £100 000 becomes $100\,000 \times 1.062^{12} = £205\,823$, which is more than £200 000)

Answer: $1.062^{12} = 2.058 \dots$, which is more than 2

Marks: 1 mark for 1.062^{12} (or a price $\times 1.062^{12}$). 1 mark for 2.058... (or a correct value) with a conclusion.
