Compound Interest, Growth and Decay

GCSE Mathematics • **Higher Tier** • Grades 6–7 • Non-calculator

WORKED SOLUTIONS

Name: worked example Class: _____ Total: 66 / 66

Show all your working. Marks are given for correct method as well as the final answer.

1. Write down the multiplier for a 5% increase. **[1 mark]**

100 + 5 = 105%

Answer: 1.05

2. Write down the multiplier for an 8% decrease. **[1 mark]**

100 – 8 = 92%

Answer: 0.92

3. $1 000 is invested at 5% compound interest. Work out the value after 2 years. **[3 marks]**

1000×1.05^2
$= 1000 \times 1.1025$
$= 1102.50$

Answer: £1102.50

4. $2 000 is invested at 3% compound interest. Work out the value after 4 years, to the nearest penny. **[3 marks]**

2000×1.03^4
$= 2251.018...$
$= £2251.02$

Answer: £2251.02

5. $500 is invested at 4% compound interest for 3 years. Work out the INTEREST earned. **[4 marks]**

$500 \times 1.04^3 = 562.432$
interest = final – original
562.43 – 500 = 62.43

Answer: £62.43

6. A car worth $12 000 depreciates by 15% a year. Work out its value after 2 years. **[3 marks]**

12000×0.85^2
$= 12000 \times 0.7225$
$= 8670$

Answer: £8670

7. A laptop worth $800 loses 20% of its value each year. Work out its value after 3 years. **[3 marks]**

800×0.8^3
$= 800 \times 0.512$
$= 409.60$

Answer: £409.60

8. $1 000 earns 5% SIMPLE interest for 3 years. Work out the total interest. **[2 marks]**

50 per year
50 × 3 = 150

Answer: £150

9. $1 000 earns 5% COMPOUND interest for 3 years. Work out the total interest, and say how much more it is than simple interest. **[4 marks]**

$1000 \times 1.05^3 = 1157.625$
interest = 157.63
157.63 − 150 = 7.63 more
compound earns interest on interest

Answer: £157.63, £7.63 more

10. After 2 years at 10% compound interest an account holds $2 420. Work out the original amount. **[3 marks]**

$2420 \div 1.1^2$
$= 2420 \div 1.21$
$= 2000$

Answer: £2000

11. A car is worth $7 225 after 2 years of 15% depreciation. Work out its original value. **[3 marks]**

$7225 \div 0.85^2$
$= 7225 \div 0.7225$
$= 10000$

Answer: £10000

12. $5 000 grows to $5 832 in 2 years of compound interest. Work out the annual rate. **[4 marks]**

$\text{multiplier}^2 = \frac{5832}{5000} = 1.1664$
$\text{multiplier} = \sqrt{1.1664} = 1.08$
so 8%

Answer: 8%

13. An investment doubles in 2 years. Work out the annual compound rate, to 1 d.p. **[4 marks]**

$\text{multiplier}^2 = 2$
$\text{multiplier} = \sqrt{2} = 1.41421...$
$= 41.4\%$

Answer: 41.4%

14. $1 000 is invested at 6% compound interest. Work out the first year the balance exceeds $1 200. **[4 marks]**

yr1 1060 yr2 1123.60
yr3 1191.02 yr4 1262.48
year 4 is the first over 1200

Answer: year 4

15. A population of 8 000 falls by 10% a year. Work out the first year it drops below 6 000. **[4 marks]**

yr1 7200 yr2 6480 yr3 5832
year 3 is the first below 6000

Answer: year 3

16. A population of bacteria doubles every hour. It starts at 500. Work out the population after 5 hours. **[3 marks]**

500×2^5
$= 500 \times 32$

Answer: 16000

17. A radioactive sample has a half-life of 1 day. From 80 g, work out the mass left after 4 days. **[3 marks]**

80×0.5^4
$= 80 \div 16 = 5$

Answer: 5 **g**

18. Explain why a 10% rise followed by a 10% fall does not return to the original amount. **[2 marks]**

the fall is 10% of a BIGGER number
multiplier = 0.99, so 1% is lost

Answer: $1.1 \times 0.9 = 0.99$

19. \$4 000 is invested at 2.5% compound interest for 5 years.

(a) Work out the value after 5 years, to the nearest penny. **[3 marks]**

4000×1.025^5
$= 4525.63$ (2 d.p.)

(b) Work out the total interest earned. **[2 marks]**

$4525.63 - 4000$
$= £525.63$

Answer: £4525.63 ; £525.63

20. A motorbike bought for \$6 000 depreciates by 20% in year one, then 10% a year after that.

(a) Work out its value after 3 years. **[4 marks]**

$6000 \times 0.8 = 4800$
$4800 \times 0.9^2 = 3888$

(b) Work out the overall percentage loss. **[3 marks]**

loss $= 6000 - 3888 = 2112$
$\frac{2112}{6000} \times 100 = 35.2\%$

Answer: £3888 ; 35.2% loss

Free to print and use at home or in class. Please do not re-host or sell. Written by Hampstead Tuition Centre from the published exam specifications.