

Year 9 Higher – Repeated percentage change

1. If £500 is invested for 3 years at a rate of compound interest of 4% per annum, how much will be in the account after 3 years?

$$500 \times 1.04^3 = \text{£}562.43$$

2. Dave invests £3000 at a rate of interest of 6% a year. How much is in his account after 5 years?

$$3000 \times 1.06^5 = \text{£}4014.68$$

3. Glenn invests £7000 at a rate of interest of 2% for 4 years.

- a. What is the total in his account after the 4 years?

$$7000 \times 1.02^4 = \text{£}7577.03$$

- b. How much interest would he have gained?

$$\begin{aligned} &7577.03 - 7000 \\ &= \text{£}577.03 \end{aligned}$$

- c. If he had invested the same amount of money in a different account at an interest rate of 4% for only three years would he have made more or less money? Show your working clearly.

$$7000 \times 1.04^3 = \text{£}7874.05$$

$\text{£}7874.05 > \text{£}7577.03$ so Glenn would have made more money.

4. Annie invests £1500 at a rate of compound interest of 2.5% for 6 years. How much is in her account after the six years?

$$1500 \times 1.025^6 = \text{£}1739.54$$

5. 2. Harry invests £1000 at a rate of interest of 5% a year. After how many years will he have doubled his investment?

$$\begin{aligned} &1000 \times 1.05^n \\ &1000 \times 1.05^8 = 1477.45 \\ &1000 \times 1.05^{12} = 1798.86 \\ &1000 \times 1.05^{15} = 2078.93 \\ &1000 \times 1.05^{14} = 1979.93 \end{aligned}$$

15 years

Trial & Improvement

6. Henry invests £4500 at a compound interest rate of 5% per annum. At the end of n complete years the investment has grown to £5469.78. Find the value of n .

Challenge

$$4500 \times 1.05^n = 5469.78$$

$$1.05^n = \frac{5469.78}{4500} = 1.2155066$$

$$1.05^3 = 1.1576$$

$$1.05^4 = 1.2155$$

$$n = 4$$

Trial & Improvement

7. Ella wants to invest £6000 in a savings account for 2 years.

She finds information about savings accounts at two different banks.

<p>Northway Bank</p> <p>Compound interest</p> <p>of</p> <p>3.8% per annum</p>
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<p>Portland Bank</p> <p>Compound interest</p> <p>of</p> <p>5% per annum in year 1</p> <p>3.2% per annum in year 2</p>
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Ella wants to choose the bank that pays the greater total amount of interest for the 2 years.

Which bank should she choose?

You must show all your working.

Northway

$$6000 \times 1.038^2 = £6464.66$$

Portland

$$6000 \times 1.05 \times 1.032 = £6501.60$$

$$6501.60 > 6464.66$$

Ella should choose Portland Bank as she will receive £36.94 more interest.

- 8 John buys a house for £219000. The house depreciates in value at 6% each year. What is the value of the house after 7 years?

$$219000 \times 0.94^7 = \text{£}142016.59$$

9. The value of a car depreciates by 15% each year. At the end of 2007, the value of the car was £8490. Work out the value of the car at the end of 2010.

$$8490 \times 0.85^3 = \text{£}5213.92$$

10. 1. Bill buys a new lawnmower.
The value of the lawnmower depreciates by 20% each year.
Bill says "after 5 years the lawnmower will have no value"

a) Bill is wrong. Explain why.

Because each year it will reduce by 20% but it's the reduced value being reduced each year not the original value.
and $0.8^5 \neq 0$

Bill wants to work out the value of the lawnmower after 2 years.

b) By what single number should Bill multiply the value of the lawnmower when new?

$$0.8^2 = 0.64$$

11. A ball fell 2 metres onto horizontal ground.
The ball hit the ground and bounced up and down 3 times.
The first time the ball bounced, it rose to 75% of the height it fell from.
The second time the ball bounced, it rose to 75% of the height it reached after the first bounce.
The third time the ball bounced, it rose to 75% of the height it reached after the second bounce.
Work out the height the ball reached after the third bounce.
Give your answer correct to 2 decimal places.

$$\begin{aligned} 2 \times 0.75 \times 0.75 \times 0.75 \\ = 0.84375 \\ = 0.84 \text{ m} \end{aligned}$$