

Repeated percentage changes

Year 8 About 70 minutes Calculator allowed 49 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/ks3-year-8-repeated-percentage-changes/

Date _____

A Do Now

Quick questions to start.

- A1** Needed today [1 mark] Write down the multiplier for an increase of 7%. **A2** Needed today [1 mark] Work out 1.2×0.9 .

Answer

Answer

- A3** Last lesson [1 mark] After a 25% increase, a price is £45. Work out the price before the increase. **A4** Year 7 [1 mark] Work out 1.5^2 .

Answer

Answer

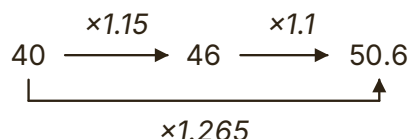
B Example, then your turn

Year 8

For changes one after another, multiply by each multiplier in turn. The product of the multipliers is the single multiplier for the whole change. Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

A plant is 40 cm tall. Its height increases by 15%, and then by a further 10%. Work out its height now.



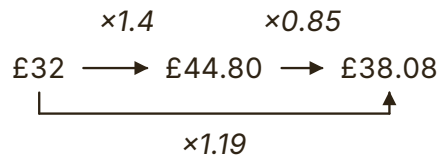
Hint The second 10% is a percentage of the NEW height, so multiply by 1.15 and then by 1.1.

- B1** A house is worth £220 000. Its value increases by 5%, and then by a further 8%. Work out its value now. [2 marks]

Answer

EXAMPLE 2

A shirt costs £32. The price goes up by 40%. Later it is reduced by 15%. Work out (i) the final price, (ii) the overall percentage change.



Hint Multiply the two multipliers to get one multiplier for the whole change.

EXAMPLE 3

A sofa costs £850. It is reduced by 20%, and then by a further 15%. Work out the sale price and the overall percentage reduction.

Hint The 15% is taken off the reduced price, so the reductions do not add to 35%.

EXAMPLE 4

Ben puts £5000 in a savings account. It pays 3% interest each year, and he leaves the interest in the account. How much is in the account after 4 years?

Hint Each year multiplies the amount by 1.03, so 4 years multiply it by 1.03^4 .

EXAMPLE 5

Show that an increase of 20% followed by an increase of 15% is an overall increase of 38%.

Hint Work with the multipliers. You do not need a starting amount.

B2 A museum had 4500 visitors in May. In June the number rose by 12%. In July it fell by 25%. Work out (i) the number of visitors in July, (ii) the overall percentage change from May to July. [3 marks]

Answer (i) (ii)

B3 A coat is reduced by 10%, and then by a further 25%. Work out the overall percentage reduction. [2 marks]

Answer

B4 A car costs £12 400. It loses 15% of its value each year. Work out its value after 3 years. [2 marks]

Answer

B5 Show that a decrease of 20% followed by an increase of 10% is an overall decrease of 12%. [2 marks]

C1 A price goes up by 50% and then down by 50%. Is it back to the price it started at? Give the overall percentage change. [2 marks]

Answer

C2 A game costs £60. Shop A puts the price up by 20% and then down by 10%. Shop B puts it down by 10% and then up by 20%. Work out the final price in each shop. [2 marks]

Answer A £..... B £.....

C3 The population of a town is 12 000. It grows by 5% in each of the next two years, and then falls by 10% in the third year. Work out the population after the three years. [2 marks]

Answer

C4 A jacket costs £150. Shop P takes 35% off. Shop Q takes 20% off, and then a further 20% off the sale price. Which shop is cheaper, and by how much? [3 marks]

Answer Shop ... by £.....

C5 A machine costs £20 000. It loses 18% of its value each year. After how many whole years is it first worth less than £10 000? [2 marks]

Answer

C6 A price goes up by 10% and then by a further 20%. It is now £594. Work out the price before the two increases. [2 marks]

Answer

D Exam-style questions

GCSE Foundation

D1 Tom says, "A decrease of 15% followed by a decrease of 25% is a decrease of 40%." [3 marks]

Tom is wrong. Explain why, and work out the overall percentage decrease.

Answer Overall decrease%

- D2** Kaya puts £3500 in a savings account for 3 years. She leaves the interest in the account. The table shows the interest rate in each year.

- (a) Work out how much [3 marks]
is in the account at
the end of the 3
years.

Year	1	2	3
Interest rate	3%	4%	2.5%

Answer

- (b) Work out the overall percentage increase, to 1 decimal place. [2 marks]

Answer

Total for D2: 5 marks

- D3** Ali has £6000 to invest for 3 years. Bank X pays simple interest of 4% a year. Bank Y pays compound interest of 3.9% a year. Which bank gives Ali more money at the end of the 3 years, and by how much? You must show your working. [4 marks]

Answer Bank ... by £

- D4** A van costs £24 000. It loses 25% of its value in the first year, and then 12% of its value in each year after that. Work out the value of the van after 3 years. [3 marks]

Answer

- D5** A shop takes 20% off the price of a lamp, and then adds VAT at 20% to the sale price. The lamp costs £75 before both changes. Mo says, "The 20% off and the 20% added cancel out, so I pay £75." Is Mo correct? You must show your working. [2 marks]

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** A price goes up by 25%. Then it goes down by $x\%$. Overall, the price has gone down by 10%. Find x . [4 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Start with a price of £100. Where does it end up, and where is it after the 25% rise?
- Hint 2** It goes from £125 down to £90. What percentage of 125 is taken off?
- Hint 3** $125 - 90 = 35$, and $35 \div 125 = 0.28$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

- I can work out several percentage changes in a row with one multiplier. ☐ ☐ ☐
- I can find the overall percentage change after two changes. ☐ ☐ ☐
- I can work out compound interest and depreciation with a power. ☐ ☐ ☐
- I can explain why two percentage changes do not just add. ☐ ☐ ☐