Worksheet - Percentage change and simple interest

Year: Year 9 · 20

Show your working.

Question 1

Question 1 – Percentage multipliers *(Section A · Skills practice)*

A multiplier is the number you multiply by to apply a percentage change in one step. Increase by $r\%$: multiply by $1 + \frac{r}{100}$. Decrease by $r\%$: multiply by $1 - \frac{r}{100}$. Write down the multiplier for each.

a. Increase by 20%
b. Decrease by 15%
c. Increase by 7.5%
d. Decrease by 4%

Question 2

Question 2 – Increase and decrease *(Section A · Skills practice)*

Use a multiplier to work out each new amount. Show the multiplier and the calculation.

a. Increase £80 by 25%.
b. Decrease £64 by 35%.
c. Increase £240 by 12%.
d. Decrease £1 500 by 8%.

Question 3

Question 3 – Finding the percentage change *(Section A · Skills practice)*

Use $\text{percentage change} = \dfrac{\text{change}}{\text{original}} \times 100$. State whether each is an increase or decrease.

a. 40 changes to 52.
b. 80 changes to 60.
c. 250 changes to 275.
d. 18 changes to 13.5.

Question 4

Question 4 – Reverse percentages *(Section A · Skills practice)*

Find the original value. Remember that the new amount is a percentage of the original, so you divide by the multiplier.

a. After a 20% increase the price is £60.
b. After a 15% decrease the price is £68.
c. After a 25% increase the mass is 150 kg.
d. After a 10% decrease the number of pupils is 45.

Question 5

Question 5 – Repeated percentage change *(Section A · Skills practice)*

For repeated change, multiply by the multiplier once for each year or step. Do not add the percentages.

a. £200 is increased by 10% and then by 10% again. Find the final amount.
b. Why is the answer not $200 \times 1.20 = £240$?
c. £1 000 is decreased by 20% twice. Find the final amount.
d. £400 is increased by 5% each year for 3 years. Find the final amount to the nearest penny.

Question 6

Question 6 – Simple interest *(Section A · Skills practice)*

Simple interest is calculated as $I = \dfrac{PRT}{100}$, where P is the amount invested in pounds, R is the yearly rate in percent and T is the time in years.

a. Find the interest on £500 at 4% for 3 years, and the total amount at the end.
b. Find the interest on £1 200 at 2.5% for 4 years.
c. £800 earns £96 in 3 years. Find the rate R.
d. £600 at 5% earns £90. Find the time T.

Question 7

Question 7 – The sports shop sale *(Section B · Real-life practice)*

Fairfield Sports has a sale. Trainers cost £85, football boots £48 and a winter coat £60.

a. The trainers are reduced by 30%. Find the sale price.
b. The boots are reduced by 15%. Find the sale price and the amount saved.
c. The coat is reduced by 20%, and then a further 10% is taken off at the till. Find the final price.
d. Is this the same as a single reduction of 30%? Check by calculation.

Question 8

Question 8 – The pay rise *(Section B · Real-life practice)*

Mr Hughes works at a factory and earns £1 200 per month. He gets a pay rise of 3.5%.

a. Find the multiplier and his new monthly pay.
b. Find the amount of the rise per year.
c. Pension payments are 4% of the new monthly pay. How much is this each month?
d. Find his take-home pay each month after the pension.

Question 9

Question 9 – Price with VAT *(Section B · Real-life practice)*

A shop sells a phone and adds VAT at 20%.

a. The price before VAT is £75. Find the price including VAT.
b. A different phone costs £132 including VAT. Find the price before VAT.
c. How much VAT is included in the £132?
d. Explain why you cannot find the price before VAT by taking 20% off £132.

Question 10

Question 10 – A growing town *(Section B · Real-life practice)*

The population of Redcastle is 12 000. The council expects it to grow by 2% every year.

a. Find the population after 1 year.
b. Find the population after 2 years, to the nearest whole number.
c. By how many people will the population have increased after 2 years?
d. What is the overall percentage increase after 2 years? Give your answer to 2 decimal places.

Question 11

Question 11 – House prices *(Section B · Real-life practice)*

A house is bought for £240 000. In the first year its value rises by 5%. In the second year it falls by 5%.

a. Find the value after the first year.
b. Find the value after the second year.
c. Is the house worth more, less or the same as the original price? By how much?
d. Explain why increasing by 5% and then decreasing by 5% does not return to the start.

Question 12

Question 12 – Saving at the bank *(Section B · Real-life practice)*

Tara puts £800 in an account paying 3% simple interest per year. Her brother Omar puts £800 in an account paying 2.5% simple interest per year.

a. Find Tara's interest after 5 years and her total.
b. Find Omar's interest after 6 years.
c. Who has more money after 6 years and by how much?
d. After how many years will Omar's interest first be at least £150?

Question 13

Question 13 – Match attendance *(Section B · Real-life practice)*

A football club's average attendance was 18 500 last season. This season it is 22 200.

a. Find the percentage increase, to 1 decimal place.
b. Next season the club expects attendance to fall by 15% from 22 200. Find the new attendance.
c. Each ticket costs £24. Find the income from one match at 22 200 fans.
d. Find the income if the average attendance falls by 15%.

Question 14

Question 14 – Bus fares *(Section B · Real-life practice)*

The cost of a single bus fare has risen from £2.40 to £2.76.

a. Find the percentage increase.
b. The fare rises by a further 10% next year. Find the new fare to the nearest penny.
c. A season ticket costs £3.30 per day after a 10% rise. Find its price before the rise.
d. Find the total percentage increase from £2.40 to the new fare in part (b), to 1 decimal place.

Question 15

Question 15 – Which shop is cheapest? *(Section C · Problem solving)*

Three shops sell the same £90 jacket in different ways.

Shop	Offer	Price
A	25% off	?
B	one third off	?
C	£28 off	?

a. Complete the table.
b. Which shop is cheapest and by how much cheaper than the dearest?

c. Shop C increases the offer to 40% off if you spend over £100. A customer buys the jacket and a £15 hat. Find the total cost.
d. Is it better for the customer to buy the hat at shop A (25% off both)? Find the total at A.

Question 16

Question 16 – Original prices *(Section C · Problem solving)*

The market stall has a sale. The table shows the sale price and the percentage reduction.

Item	Sale price	Reduction	Original price
T-shirt	£12	20%	?
Jeans	£42	30%	?
Hat	£9	25%	?
Bag	£34	15%	?

a. Complete the table.
b. Find the total of the original prices and the total of the sale prices.
c. Find the total saving and express it as a percentage of the total original price, to 1 decimal place.
d. Explain why this overall percentage is not the mean of 20, 30, 25 and 15.

Question 17

Question 17 – Simple or compound interest? *(Section C · Problem solving)*

Ben invests £1 000 for 3 years at 5% per year. Ali says the interest is the same every year. Chloe says it grows each year.

Year	Simple interest total (£)	Compound total (£)
1	1 050	1 050
2	1 100	?
3	1 150	?

a. Explain which method gives the values in the second column.
b. Complete the compound column. Round to the nearest penny.
c. How much more does Ben earn with compound interest after 3 years?
d. After how many years does the compound interest first exceed £300? (Use the multiplier 1.05 repeatedly.)

Question 18

Question 18 – Café profit *(Section C · Problem solving)*

A café buys a cake for £1.20 and sells it for £2.10.

a. Find the profit per cake.
b. Find the percentage profit on the cost price.
c. The café raises its selling price by 10%. Find the new price and new percentage profit.
d. Then the cost price rises by 5%. Find the new cost price, the profit and the percentage profit if the new price is kept.
e. The café sells 140 cakes a week at the price from part (c). Find the weekly profit using the new cost price from part (d).

Question 19

Question 19 – The falling value of a phone *(Section C · Problem solving)*

A new phone costs £600. Its value falls by 20% in the first year and by 15% in each later year.

Year	1	2	3
Value (£)	?	?	?

a. Complete the table.
b. Find the total loss in value after 3 years.
c. Express the loss as a percentage of £600, to 1 decimal place.
d. Gareth says that this is the same as losing $20 + 15 + 15 = 50\%$. Is he right? Explain.

Question 20

Question 20 – Challenge: up then down *(Section D · Challenge)*

A price is increased by 20% and then decreased by 20%.

a. Start with £100. Find the final price.
b. Find the single multiplier for the whole change and the overall percentage change.
c. What percentage decrease follows a 25% increase to return exactly to the original price?
d. Find a single percentage increase equal to a 10% increase followed by another 10% increase.
e. Show that a rise of $x\%$ followed by a fall of $x\%$ always gives a net decrease.