

Percentages and changing amounts

Topic cliff notes / objectives, key ideas and examples

Learning objectives

- Use multipliers for percentage increases and decreases.
- Reverse a change and calculate repeated percentage changes.

Key ideas

- A percentage means a fraction out of one hundred.

$$p\% = \frac{p}{100}$$

- Multiply by the appropriate change multiplier.

$$\text{increase: } 1 + \frac{p}{100}, \quad \text{decrease: } 1 - \frac{p}{100}$$

- For a non-zero multiplier, divide the changed amount to recover the original.

$$\text{original} = \frac{\text{changed amount}}{\text{multiplier}}$$

- Repeated changes apply to the current amount; multiply by every multiplier in sequence.
- A full percentage decrease leaves zero; its original amount cannot be recovered from that zero alone.

Worked example

A coat costs fifty-four pounds after a quarter-price discount. Find its original price.

$$\text{discount} = 25\%, \quad \text{multiplier} = 1 - 0.25 = 0.75$$

$$\text{original price} = \frac{\pounds 54}{0.75} = \pounds 72$$

Check by applying the discount.

$$\pounds 72 \times 0.75 = \pounds 54$$

Answer

$$\pounds 72$$

Quick example

Find the amount after two years of annual compound interest.

$$\pounds 200 \text{ at } 5\% : \quad \pounds 200 \times 1.05^2 = \pounds 220.50$$

Answer

$$\pounds 220.50$$

Watch out

A reverse percentage is not undone by adding the same percentage. Divide by the original multiplier.

