Exercise walk-through

3.2
Percentage change, growth and decay (R9–R16)

AQA · GCSE · Mathematics

Scale, similarity and rates of change

- **Scale drawings.** A map **scale** of $1 : 25\,000$ means 1 cm on the map is 25 000 cm in real life.
- A 4 cm line on the map is $4 \times 25\,000 = 100\,000$ cm, which is 1 km.
- **Length, area and volume.** If two shapes are similar with a length **scale** factor of k, the **area scale factor** is k^2 and the volume scale factor is k^3.
- A square with sides 3 times as long has 9 times the area.

Growth and decay

- **Simple interest** pays the same amount every year. **Compound interest** pays interest on the interest too, so the amount is multiplied by the same number every year:
- where P is the starting amount, r the percentage rate and n the number of years.
- For decay, such as a car losing value, use $1 - \frac{r}{100}$.
- **Worked example 13.** 1000 yuan is saved at 10% a year for 4 years.

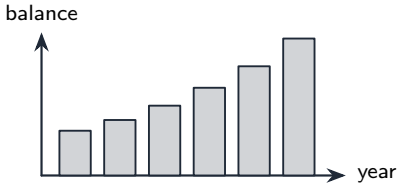
$$A = P\left(1 + \frac{r}{100}\right)^n$$

Sources for this lesson

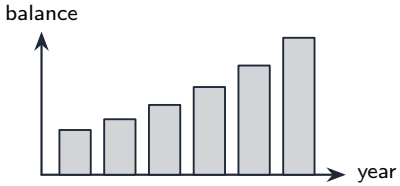
- AQA, *GCSE Mathematics (8300) specification*, subject content section 3.3 (Ratio, proportion and rates of change).
- NASA, *Mars Climate Orbiter Mishap Investigation Board Phase I Report* (10 November 1999).
- AQA, *GCSE Mathematics* Higher Paper 2 (June 2024), the reverse-percentage and house-price questions, adapted.

Exercises 2.1·2.2

2.1 Find 35% of 240 [2]

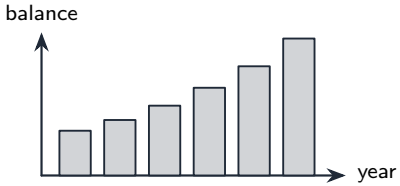


2.2 Increase 65 by 20% [2]



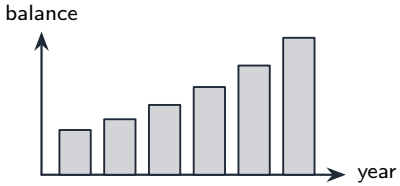
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2.1 $0.35 \times 240 = 84$.

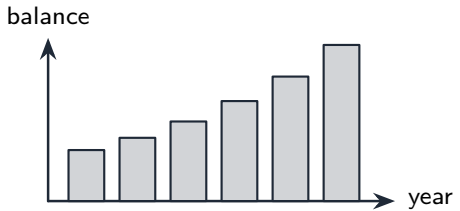
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2.2 $65 \times 1.2 = 78$.

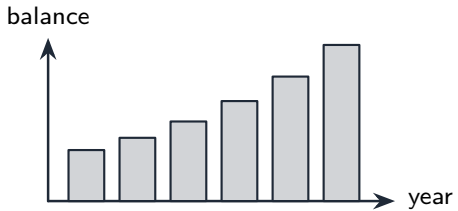
Exercise 2.3

2.3 A jumper priced £28 is reduced by 25%. Find the sale price. [2]



Exercise 2.3

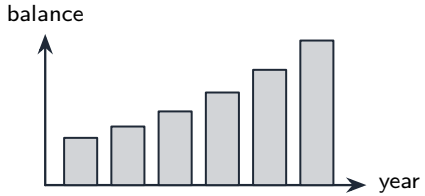
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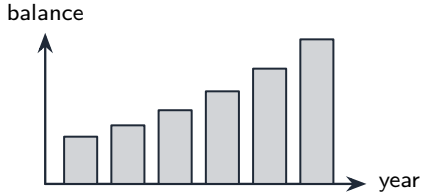
2.3 $28 \times 0.75 = £21$.

Setup for exercise 2.4

2.4 After a 10% rise a ticket costs £22. Find the original price. [3]

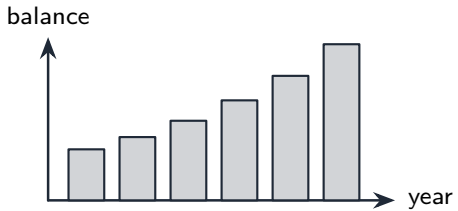


2.5 Express 84 as a percentage of 70. [2]



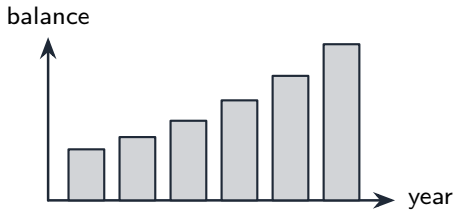
Exercise 2.4

2.6 £500 is invested at 4% simple interest for 3 years. Find the total. [3]



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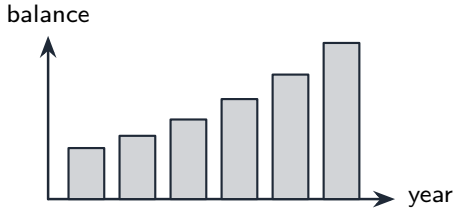
2.4 $22 \div 1.1 = £20$.

2.5 $84 \div 70 = 1.2$, so 120%.

2.6 Interest $= 500 \times 0.04 \times 3 = £60$; total £560.

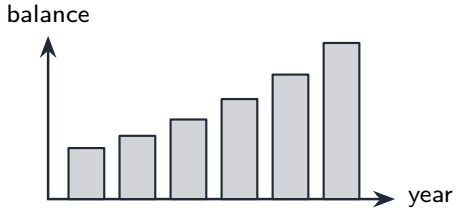
Exercise 3.1

3.1 *(Edexcel-style, 2H June 2024 Q2 adapted.)* The population of a town has decreased by 12%. The population is now 2.2×10^6. Work out the population before the decrease, giving your answer in standard form. [3]



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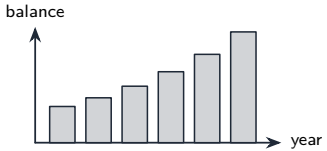
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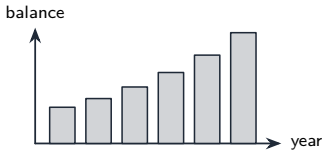
3.1 $2.2 \times 10^6 \div 0.88 = 2.5 \times 10^6$.

Exercise 3.2

3.2 *(Original.)* A quantity increases by 15% and is now 184. What was it? [3]

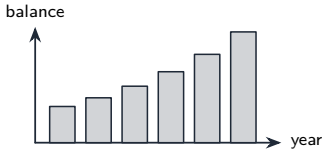


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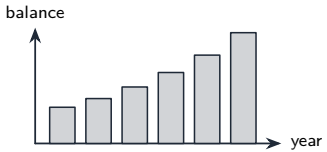


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3.2 $184 \div 1.15 = 160$.

3.3 $\times 1.2 \times 0.9 = 1.08$: up 8% overall (never add $20 - 10$).

Local review guidance: the multiplier stated; exact values; reverse answers divide, not subtract. This is authored classroom guidance.