

Speed

Starter

1. **(Review of last lesson)** A model car is made on a scale of 1 : 20. The length of the model is 24 cm. The area of the windscreen of the model is 32 cm². The volume of the boot of the model is 90 cm³. Calculate the actual:
- length of the car,
 - area of the windscreen,
 - volume of the boot.
- Give your answers in m, m² and m³ respectively.

Working:

- Actual length = $24 \times 20 = 480 \text{ cm} = 4.8 \text{ m}$
- Actual area = $(32 \times 20) \text{ cm} \times (1 \times 20) \text{ cm}$
 $= 640 \text{ cm} \times 20 \text{ cm}$
 $= 6.4 \text{ m} \times 0.2 \text{ m}$
 $= 1.28 \text{ m}^2$.
- Actual volume = $(90 \times 20) \text{ cm} \times (1 \times 20) \text{ cm} \times (1 \times 20) \text{ cm}$
 $= 1800 \text{ cm} \times 20 \text{ cm} \times 20 \text{ cm}$
 $= 18 \text{ m} \times 0.2 \text{ m} \times 0.2 \text{ m}$
 $= 0.72 \text{ m}^3$.

2. How fast, in km/h, would you need to travel in order to cover 100 km in 2 hours?

Working: Travelling 100 km in 2 hours means travelling 50 km in 1 hour.
Therefore, the speed would need to be 50 km/h

E.g. 1 Calculate the average speed, giving appropriate units, for the following journeys:

- The distance travelled is 80 miles in 4 hours.
- It took 2h 30m to travel 60 km.
- 260 miles was covered in 4h 20m

Working:

- Average speed = $\frac{\text{Distance travelled}}{\text{Time taken}} = \frac{80}{4} = 20 \text{ mph}$
- Convert the time into hours:** $2\text{h } 30\text{m} \equiv 2.5 \text{ hours}$
 Average speed = $\frac{\text{Distance travelled}}{\text{Time taken}} = \frac{60}{2.5} = 24 \text{ km/h}$
- Convert the time into hours:** $4\text{h } 20\text{m} \equiv 4\frac{20}{60} = 4\frac{1}{3} \text{ hours}$
 Average speed = $\frac{\text{Distance travelled}}{\text{Time taken}} = \frac{260}{4\frac{1}{3}} = 60 \text{ mph}$

E.g. 2 A runner sets out at midday to run to the next village, 12 miles away. She wants to arrive at 13 : 30. At what average speed should she run?

Working: She needs to run 12 miles in 1h 30m

Convert the time into hours: $1\text{h } 30\text{m} \equiv 1\frac{30}{60} = 1\frac{1}{2}$ hours

$$\text{Average speed} = \frac{\text{Distance travelled}}{\text{Time taken}} = \frac{12}{1.5} = 8 \text{ km/h}$$

E.g. 3 Ali ran 800 m in 2 min 38 sec. What was his average speed in m/s?

Working: **Convert the time into seconds:** $2\text{h } 38\text{m} \equiv 2 \times 60 + 38 = 158 \text{ s}$

$$\text{Average speed} = \frac{\text{Distance travelled}}{\text{Time taken}} = \frac{800}{158} = 5.06 \text{ m/s (3 s.f.)}$$

E.g. 4 15 litres of water flows from a hose in 20 seconds. Give this rate of flow in litres/second.

Working: In 20 seconds, 15 litres of water flow

In 1 second, $\frac{15}{20}$ litres of water flow

$$\text{So the rate of flow is } \frac{15}{20} = \frac{3}{4} = 0.75 \text{ litres/second}$$

E.g. 5 Mr White swam 102 lengths of a 25 m swimming pool in 50 minutes 27 seconds.

Calculate his average time

(a) per length

(b) per 10 lengths.

Choose suitable units for your answer.

Working: (a) Convert 50m 27s to seconds $= 50 \times 60 + 27 = 3027 \text{ s}$

$$\text{Time per length} = \frac{3027}{102} = 29.7 \text{ s}$$

$$(b) \text{ Time per 10 lengths} = \frac{3027}{102} \times 10 = 296.8 \text{ s} \equiv 4\text{m } 57\text{s}$$

Video: [Speed, distance and time](#)

[Solutions to Starter and E.g.s](#)

Exercise

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