

Speed, Distance and Time

Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (2 marks)

A ferry sails at an average speed of 24 km/h.
The crossing takes 45 minutes.
How far does the ferry sail?

Distance = speed $\times$ time

$$45 \text{ minutes} = \frac{45}{60} = 0.75 \text{ hours}$$

$$\text{Distance} = 24 \times 0.75 = 18$$

Answer: 18 km

Tip: 45 minutes is 0.75 hours, not 0.45 hours. Divide the minutes by 60.

Marks: 1 mark for 24×0.75 (or $24 \times \frac{45}{60}$). 1 mark for 18.

2 (2 marks)

Change a speed of 54 kilometres per hour into metres per second.

54 km/h means 54 km in 1 hour.

$$54 \text{ km} = 54 \times 1000 = 54\,000 \text{ metres}$$

$$1 \text{ hour} = 60 \times 60 = 3600 \text{ seconds}$$

$$\text{Speed} = 54\,000 \div 3600 = 15 \text{ metres per second}$$

Answer: 15 m/s

Tip: Change **both** units: km to metres ($\times 1000$) and hours to seconds ($\times 3600$).

Marks: 1 mark for 54 000 or 3600 used correctly. 1 mark for 15.

3 (2 marks)

A canal boat travels 9 km along a canal.

It sets off at 10 50

It arrives at 12 20

Work out the average speed of the canal boat.

Give your answer in kilometres per hour.

Time taken: 10 50 to 12 20 = 1 hour 30 minutes = 1.5 hours

Speed = distance $\div$ time

$$\text{Speed} = 9 \div 1.5 = 6 \text{ km/h}$$

Answer: 6 km/h

Tip: 1 hour 30 minutes is 1.5 hours, not 1.3 hours.

Marks: 1 mark for $9 \div 1.5$. 1 mark for 6.

4 (3 marks)

A high-speed train travels 351 km in 1 hour 18 minutes.

Work out the average speed of the train.

Give your answer in kilometres per hour.

$$18 \text{ minutes} = \frac{18}{60} = 0.3 \text{ hours}$$

So 1 hour 18 minutes = 1.3 hours

Speed = distance $\div$ time

$$\text{Speed} = 351 \div 1.3 = 270 \text{ km/h}$$

Answer: 270 km/h

Tip: 1 hour 18 minutes is 1.3 hours, not 1.18 hours.

Marks: 1 mark for 1.3 hours (or 78 minutes). 1 mark for $351 \div 1.3$ (or $351 \div 78 \times 60$). 1 mark for 270.

5 (5 marks)

Ines cycles to work.

On Route A she cycles 12 km in 40 minutes.

(a) Work out Ines's average speed on Route A.

$$40 \text{ minutes} = \frac{40}{60} = \frac{2}{3} \text{ hour}$$

$$\text{Speed} = \text{distance} \div \text{time}$$

$$\text{Speed} = 12 \div \frac{2}{3} = 12 \times \frac{3}{2} = 18$$

Answer: 18 km/h

Tip: 40 minutes is $\frac{2}{3}$ of an hour, not 0.4 hours.

Marks: 1 mark for $12 \div \frac{40}{60}$. 1 mark for 18.

(b) Route B is 15 km long.

On Route B, Ines can cycle at an average speed of 20 km/h.

Ines says,

“Route B is longer, but it is quicker than Route A.”

Is Ines correct?

You must show how you get your answer.

$$\text{Time for Route B} = \text{distance} \div \text{speed}$$

$$15 \div 20 = 0.75 \text{ hours}$$

$$0.75 \text{ hours} = 45 \text{ minutes}$$

Route A takes 40 minutes.

45 minutes is longer than 40 minutes, so Route B is slower.

Ines is not correct.

Answer: No: Route B takes 45 minutes, which is longer than 40 minutes

Tip: Compare like with like: change 0.75 hours into 45 minutes (or 40 minutes into $\frac{2}{3}$ hour) before you compare.

Marks: 1 mark for $15 \div 20$. 1 mark for 45 minutes (or 0.75 hours). 1 mark for a correct conclusion with a comparison.

6 (4 marks)

Zara rode her bike 40.8 km in 1 hour 56 minutes.

- (a) Work out an estimate for her average speed.
Give your answer in kilometres per hour.

Round each value to make the calculation easy.

$$40.8 \text{ km} \approx 40 \text{ km}$$

$$1 \text{ hour } 56 \text{ minutes} \approx 2 \text{ hours}$$

$$\text{Speed} = \text{distance} \div \text{time}$$

$$\text{Speed} \approx 40 \div 2 = 20$$

Answer: 20 km/h

Tip: Round 1 hour 56 minutes to 2 hours. Do not write it as 1.56 hours.

Marks: 1 mark for rounding to 40 and 2 hours. 1 mark for $40 \div 2$. 1 mark for 20.

- (b) Is your answer to part (a) an underestimate or an overestimate?
Give a reason for your answer.

The distance was rounded **down** (40.8 to 40), so the top of the division is too small.

The time was rounded **up** (1 h 56 min to 2 h), so we divided by a number that is too big.

Both of these make the answer smaller than the real speed.

Answer: An underestimate: the distance was rounded down and the time was rounded up

7 (3 marks)

Ali's journey to work takes 1 hour in total.

He walks 2 km to the station at an average speed of 5 km/h.

He then catches a train straight away and travels 45 km by train to work.

Work out the average speed of the train.

Give your answer in kilometres per hour.

Walking time = distance $\div$ speed = $2 \div 5 = 0.4$ hours

0.4 hours = $0.4 \times 60 = 24$ minutes

Time on the train = $60 - 24 = 36$ minutes = 0.6 hours

Speed of the train = $45 \div 0.6 = 75$ km/h

Answer: 75 km/h

Tip: 0.4 hours is 24 minutes, not 40 minutes. Multiply by 60 to change hours into minutes.

Marks: 1 mark for 24 minutes (or 0.4 hours). 1 mark for $45 \div 0.6$ (or 45 km in 36 minutes). 1 mark for 75.

8 (4 marks)

Priti is driving to a concert hall 75 miles from her home.

She wants to arrive at the concert hall by 19 30

She thinks she can drive at an average speed of 50 miles per hour.

(a) Work out the latest time Priti can leave home.

Time = distance $\div$ speed

$75 \div 50 = 1.5$ hours = 1 hour 30 minutes

$$19\ 30 - 1\ \text{hour}\ 30\ \text{minutes} = 18\ 00$$

Answer: 18 00 (6 pm)

Tip: Here you need the time she **leaves**, so subtract the journey time from 19 30.

Marks: 1 mark for $75 \div 50$. 1 mark for 1 hour 30 minutes. 1 mark for 18 00.

- (b) On the day, Priti leaves home at 17 50 and arrives at the concert hall at 19 25
Was her average speed more than or less than 50 miles per hour?
Give a reason for your answer.

17 50 to 19 25 is 1 hour 35 minutes.

At 50 miles per hour the journey takes 1 hour 30 minutes.

She took longer than this for the same distance.

So her average speed was less than 50 miles per hour.

Answer: Less: she took 1 hour 35 minutes, longer than 1 hour 30 minutes

9 (4 marks)

Dev goes on a bike ride.

For the first 12 km of the ride, his average speed is 16 km/h.

For the last 30 minutes of the ride, his average speed is 20 km/h.

Work out Dev's average speed for the whole ride.

First part: time = distance $\div$ speed = $12 \div 16 = 0.75$ hours

Second part: 30 minutes = 0.5 hours

Distance = $20 \times 0.5 = 10$ km

Total distance = $12 + 10 = 22$ km

Total time = $0.75 + 0.5 = 1.25$ hours

Average speed = $22 \div 1.25 = 17.6$ km/h

Answer: 17.6 km/h

Tip: Do not just find the mean of 16 and 20 (that gives 18). Use total distance $\div$ total time.

Marks: 1 mark for 0.75 hours or 10 km. 1 mark for 22 km and 1.25 hours. 1 mark for $22 \div 1.25$. 1 mark for 17.6.
