

# Speed, Distance and Time

## Solutions

For AQA GCSE Mathematics (8300) • Foundation tier

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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.

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**1** (2 marks)

Kenji walks at a constant speed of 5 km/h for 1 hour 24 minutes.  
How far does he walk?

Distance = speed  $\times$  time

Write the time in hours: 24 minutes =  $\frac{24}{60}$  = 0.4 hours

So 1 hour 24 minutes = 1.4 hours

Distance =  $5 \times 1.4 = 7$

**Answer:** 7 km

**Tip:** 1 hour 24 minutes is 1.4 hours, **not** 1.24 hours. Divide the minutes by 60.

*Marks:* 1 mark for  $5 \times 1.4$  (or  $5 \times \frac{84}{60}$ ). 1 mark for 7.

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**2** (2 marks)

How long does it take to travel 75 km at 60 km/h?  
Give your answer in hours and minutes.

Time = distance  $\div$  speed

$75 \div 60 = 1.25$  hours

Change the decimal part into minutes:  $0.25 \times 60 = 15$  minutes

So the time is 1 hour 15 minutes.

**Answer:** 1 hour 15 minutes

**Tip:** 1.25 hours is 1 hour 15 minutes, not 1 hour 25 minutes. Multiply the decimal part by 60.

*Marks:* 1 mark for  $75 \div 60$ . 1 mark for 1 hour 15 minutes.

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**3** (3 marks)

A tram leaves the first stop at 10:52 am.

It reaches the last stop at 11:07 am.

The tram line is 5 miles long.

Work out the average speed of the tram in miles per hour.

Time taken: 10:52 am to 11:07 am =  $8 + 7 = 15$  minutes

15 minutes =  $\frac{15}{60} = \frac{1}{4}$  hour

Speed = distance  $\div$  time

Speed =  $5 \div \frac{1}{4} = 5 \times 4 = 20$

(Or: there are 4 lots of 15 minutes in an hour, so  $4 \times 5 = 20$  miles in an hour.)

**Answer:** 20 mph

**Tip:** Count the minutes across the hour carefully: 10:52 to 11:00 is 8 minutes, then 7 more minutes. Subtracting  $1107 - 1052 = 55$  is wrong, because there are 60 minutes in an hour, not 100.

*Marks:* 1 mark for 15 minutes. 1 mark for  $5 \div \frac{15}{60}$  or  $5 \times 4$ . 1 mark for 20.

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**4** (1 mark)

$$\text{Time} = \frac{\text{distance}}{\text{speed}}$$

A cyclist travels twice as far at half the speed.

What happens to the time taken?

Circle your answer.

Options: no change,  $\times 2$ ,  $\times 4$ ,  $\div 4$

Doubling the distance (the top) multiplies the time by 2.

Halving the speed (the bottom) also multiplies the time by 2.

Altogether:  $2 \times 2 = 4$

Check with numbers:

10 miles at 10 mph takes 1 hour.

20 miles at 5 mph takes 4 hours.

$4 = 4 \times 1$  ✓

**Answer:**  $\times 4$

**Tip:** Try easy numbers to check. Halving the bottom of a fraction makes the answer **twice** as big, not half as big.

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**5** (4 marks)

A cheetah can run at 30 metres per second.

A car on a motorway travels at 70 miles per hour.

Use 1 mile = 1.6 km

Which is faster, the cheetah or the car?

You must show your working.

Change both speeds into km/h.

**Cheetah:** 30 metres in 1 second

In 1 hour (3600 seconds):  $30 \times 3600 = 108\,000$  metres

108 000 metres = 108 km, so 108 km/h

**Car:** 70 miles in 1 hour

$70 \times 1.6 = 112$  km, so 112 km/h

112 > 108, so the car is faster.

**Answer:** The car (112 km/h compared with 108 km/h)

**Tip:** To compare speeds, they must be in the same units. There are  $60 \times 60 = 3600$  seconds in an hour, not 60 or 100.

*Marks:* 1 mark for  $30 \times 3600$  (or  $30 \times 60 \times 60$ ). 1 mark for 108 km/h. 1 mark for 112 km/h. 1 mark for the car, with both speeds in the same units.

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**6** (3 marks)

A runner runs 400 metres in 60 seconds.  
Work out her average speed in kilometres per hour.

60 seconds is 1 minute, so she runs 400 m each minute.

In one hour (60 minutes):  $400 \times 60 = 24\,000$  m

Change metres to kilometres (divide by 1000):  $24\,000 \div 1000 = 24$  km

So she runs 24 km in one hour.

**Answer:** 24 km/h

*Marks:* 1 mark for  $400 \times 60$  or  $\frac{400}{60}$  m/s. 1 mark for dividing by 1000. 1 mark for 24.

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**7** (3 marks)

A delivery drone flies 18 km in 24 minutes.  
At the same average speed, how long will it take to fly 60 km?  
Give your answer in hours and minutes.

$$\text{Speed} = 18 \div \frac{24}{60} = 18 \div 0.4 = 45 \text{ km/h}$$

$$\text{Time for 60 km} = 60 \div 45 = 1\frac{1}{3} \text{ hours}$$

$$\frac{1}{3} \text{ hour} = 20 \text{ minutes}$$

So the time is 1 hour 20 minutes.

(Or: 6 km takes 8 minutes, so 60 km takes  $10 \times 8 = 80$  minutes = 1 hour 20 minutes.)

**Answer:** 1 hour 20 minutes

**Tip:**  $1\frac{1}{3}$  hours is 1 hour 20 minutes. Writing 1.33 hours as 1 hour 33 minutes is a common mistake.

**Marks:** 1 mark for 45 km/h (or 6 km in 8 minutes). 1 mark for  $60 \div 45$  or 80 minutes. 1 mark for 1 hour 20 minutes.

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**8** (3 marks)

Maya rides in a 120 km cycle race.

She finishes the race in 4 hours.

For the first 1 hour 30 minutes her average speed is 24 km/h.

Maya says,

“For the rest of the race, my average speed was more than 30 km/h.”

Is Maya correct?

You must show your working.

First part: distance = speed  $\times$  time =  $24 \times 1.5 = 36$  km

Rest of the race: distance =  $120 - 36 = 84$  km

Rest of the race: time =  $4 - 1.5 = 2.5$  hours

Speed =  $84 \div 2.5 = 33.6$  km/h

33.6 km/h is more than 30 km/h, so Maya is correct.

**Answer:** Yes (33.6 km/h is more than 30 km/h)

**Tip:** Use only the distance and time for the rest of the race: 84 km in 2.5 hours. 1 hour 30 minutes is 1.5 hours, not 1.3 hours.

**Marks:** 1 mark for 36 (km). 1 mark for  $84 \div 2.5$ . 1 mark for 33.6 and yes.

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**9** (4 marks)

Hana is driving 132 miles to an airport.  
She leaves home at 11:05 am.  
She must arrive at the airport by 1:50 pm.

- (a) Work out the lowest average speed at which she can drive to arrive on time.

Time available: 11:05 am to 1:50 pm

11:05 am to 1:05 pm is 2 hours, then 45 minutes more.

So 2 hours 45 minutes = 2.75 hours

Speed = distance  $\div$  time

Speed =  $132 \div 2.75 = 48$

**Answer:** 48 mph

**Tip:** 45 minutes is 0.75 hours, not 0.45 hours.

*Marks:* 1 mark for 2 hours 45 minutes (or 2.75 hours). 1 mark for  $132 \div 2.75$ . 1 mark for 48.

- (b) Hana decides to stop for a break on the way.  
She still leaves at 11:05 am and arrives at 1:50 pm.  
Does she need to drive at a higher or lower average speed than your answer to part (a)?  
Give a reason for your answer.

The break uses up some of the time.

So she has less time for the driving.

The distance is the same, so she must drive faster.

**Answer:** Higher, because she has less time to drive the same distance

**10** (4 marks)

Sofia drives from her home to the coast.

First she drives for 45 minutes on country roads at an average speed of 40 mph.

Then she drives 105 miles on the motorway at an average speed of 70 mph.

Work out her average speed for the whole journey.

$$\text{Country roads: distance} = 40 \times \frac{45}{60} = 40 \times 0.75 = 30 \text{ miles}$$

$$\text{Motorway: time} = 105 \div 70 = 1.5 \text{ hours}$$

$$\text{Total distance} = 30 + 105 = 135 \text{ miles}$$

$$\text{Total time} = 0.75 + 1.5 = 2.25 \text{ hours}$$

$$\text{Average speed} = 135 \div 2.25 = 60$$

**Answer:** 60 mph

**Tip:** Do not just find the mean of 40 mph and 70 mph (that gives 55 mph). Use total distance  $\div$  total time.

*Marks:* 1 mark for 30 miles. 1 mark for 1.5 hours. 1 mark for  $135 \div 2.25$ . 1 mark for 60.

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