



- 1** A distance-time graph for a train journey is a straight line from the origin. It passes through the point (1 h 30 min, 150 km).

- Work out the speed of the train.
- How far has the train travelled after 2 hours 15 minutes, at the same speed?

(3 marks)

a)

$$1 \text{ h } 30 \text{ min} = 1.5 \text{ h}$$

$$\text{speed} = 150 \div 1.5 = 100$$

$$100 \text{ km/h}$$

b)

$$2 \text{ h } 15 \text{ min} = 2.25 \text{ h}$$

$$100 \times 2.25 = 225$$

$$225 \text{ km}$$

- 2** Amina cycles from home to a lake and back. She leaves home at 09:00. By 09:30 she is 12 km from home (the graph is a straight line up to this point). She then stays at the lake until 10:00. She cycles straight home at a steady speed and arrives at 11:00.

- For how many minutes was Amina at the lake?
- Work out her speed on the way to the lake.
- Work out her speed on the way home.

(4 marks)

a)

Stopped from 09:30 to 10:00

$$30 \text{ minutes}$$

b)

$$30 \text{ min} = 0.5 \text{ h}$$

$$12 \div 0.5 = 24$$

$$24 \text{ km/h}$$

c)

$$10:00 \text{ to } 11:00 = 1 \text{ h}$$

$$12 \div 1 = 12$$

$$12 \text{ km/h}$$

3

Amy cycles from her house to the library.

She leaves home at 09:00 and arrives at the library at 09:45.

The library is 12 km from her house and she cycles at a steady speed.

Work out Amy's average speed in km/h.

(3 marks)

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

$$\text{Speed} = \text{distance divided by time} = \frac{12}{0.75}$$

$$\text{Speed} = 16 \text{ km/h}$$

$$\boxed{16 \text{ km/h}}$$

4

Callum cycles for 100 minutes. On a distance-time graph the first stage is a straight line from (0, 0) to (40 min, 10 km). The second stage is a straight line from (40 min, 10 km) to (100 min, 28 km).

Which stage was faster? Show your working.

(3 marks)

Stage 1

$$40 \text{ min} = \frac{2}{3} \text{ h}$$

$$10 \div \frac{2}{3} = 15 \text{ km/h}$$

Stage 2

$$28 - 10 = 18 \text{ km in } 60 \text{ min} = 1 \text{ h}$$

$$18 \div 1 = 18 \text{ km/h}$$

$$\boxed{\text{Stage 2 was faster } (18 > 15)}$$

5

A coach leaves Leeds at 08:00. It travels 54 km in the first hour. It then stops for 30 minutes. It then travels at a steady 60 km/h until 11:00, when it arrives in London.

- How far is the coach from Leeds at 10:15?
- Work out the average speed of the coach for the whole journey from 08:00 to 11:00.

(4 marks)

a)

Moving again from 09:30

$$09:30 \text{ to } 10:15 = 0.75 \text{ h}$$

$$60 \times 0.75 = 45$$

$$54 + 45 = 99$$

99 km

b)

$$09:30 \text{ to } 11:00 = 1.5 \text{ h}$$

$$60 \times 1.5 = 90$$

$$\text{Total distance} = 54 + 90 = 144 \text{ km}$$

$$\text{Total time} = 3 \text{ h}$$

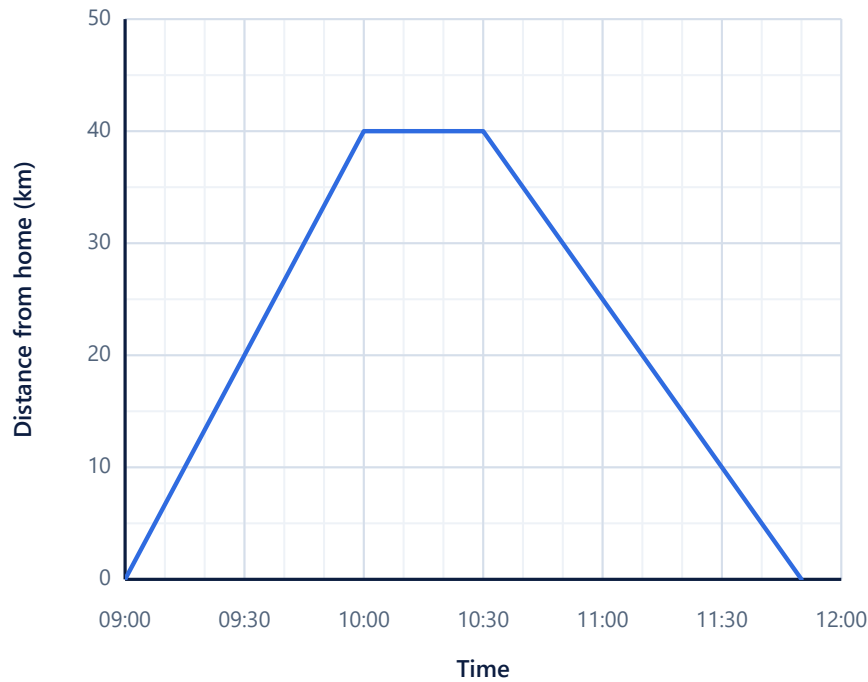
$$144 \div 3 = 48$$

48 km/h

6

The distance-time graph shows Marek's car journey from home to a garden centre and back.

- For how many minutes does Marek stay at the garden centre?
- Work out his speed, in km/h, on the way to the garden centre.
- Work out his speed, in km/h, on the way home.



(3 marks)

a) The horizontal section runs from 10:00 to 10:30, so 30 minutes

b) He travels 40 km between 09

00 and 10:00, so speed = $\frac{40}{1} = 40$ km/h

c) He travels 40 km between 10

30 and 11:50, which is 80 minutes = $\frac{4}{3}$ hours

Speed = 40 divided by $\frac{4}{3} = 30$
km/h

7

Leon walks to his friend's house. He leaves home at 10:00. The distance-time graph is a straight line which reaches 3 km at 10:45. He keeps walking at the same speed.

- Work out his speed in km/h.
- His friend lives 7 km from Leon's home. At what time does Leon arrive?

(3 marks)

a)

$$45 \text{ min} = 0.75 \text{ h}$$

$$3 \div 0.75 = 4$$

$$4 \text{ km/h}$$

b)

$$7 \div 4 = 1.75 \text{ h}$$

$$1.75 \text{ h} = 1 \text{ h } 45 \text{ min}$$

$$10:00 + 1 \text{ h } 45 \text{ min} = 11:45$$

8

A car accelerates from rest. Its distance-time graph is a curve. A tangent is drawn to the curve at $t = 5$ seconds. The tangent passes through the points (3 s, 10 m) and (7 s, 50 m).

- Work out the speed of the car at $t = 5$ seconds, in m/s.
- Change your answer to km/h.

(3 marks)

a)

$$\begin{aligned} \text{Speed} &= \text{gradient of tangent} \\ &= (50 - 10) \div (7 - 3) \end{aligned}$$

$$40 \div 4 = 10$$

$$10 \text{ m/s}$$

b)

$$10 \times 60 \times 60 = 36\,000 \text{ m per hour}$$

$$36\,000 \div 1000 = 36$$

$$36 \text{ km/h}$$

9

Ben drives from Leeds to visit his aunt.

He leaves Leeds at 09:30 and drives 60 km in 1 hour.

He then stops at a service station for 30 minutes.

He then drives a further 40 km in 1 hour to arrive at his aunt's house.

a. Work out the time Ben arrives at his aunt's house.

b. Work out Ben's average speed, in km/h, for the whole journey from Leeds to his aunt's house.

(4 marks)

a) 09

$$30 + 1 \text{ hour} = 10:30, + 30 \text{ minutes} = 11:00, + 1 \text{ hour} = 12:00$$

$$\text{b) Total distance} = 60 + 40 = 100 \text{ km}$$

$$\text{Total time} = 2.5 \text{ hours, including the stop}$$

$$\text{Average speed} = \frac{100}{2.5} = 40 \text{ km/h}$$

10

Sara walks from home to a park 3 km away.

She leaves home at 14:00 and walks at a steady speed, arriving at the park at 14:40.

She stays at the park for 30 minutes.

She then walks straight home at a steady speed of 4 km/h.

a. Work out Sara's speed, in km/h, on the way to the park.

b. Work out the time Sara arrives back home.

c. Work out the total time, in hours and minutes, that Sara is away from home.

(5 marks)

$$\text{a) } 40 \text{ minutes} = \frac{2}{3} \text{ hour, so speed} = 3 \text{ divided by } \frac{2}{3} = 4.5 \text{ km/h}$$

b) She leaves the park at 14

$$40 + 30 \text{ minutes} = 15:10$$

$$\text{Walking home takes } \frac{3}{4} \text{ hour} = 45 \text{ minutes at } 4 \text{ km/h}$$

$$15:10 + 45 \text{ minutes} = 15:55$$

c) From 14:00 to 15:55 is 1 hour 55 minutes

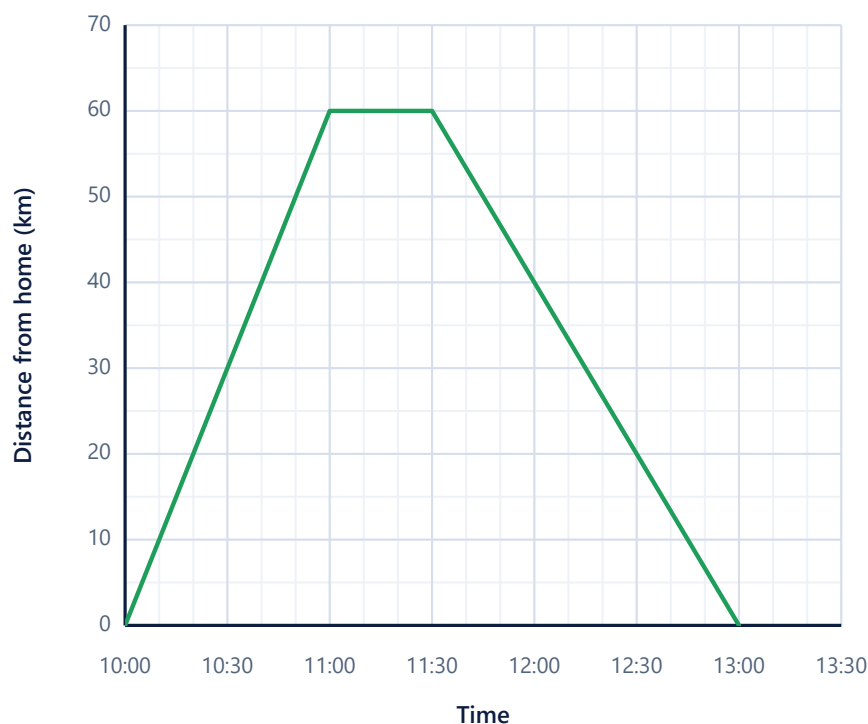
11

Jamal leaves home at 10:00 and drives at a steady speed of 60 km/h for 1 hour.

He rests for 30 minutes.

He then drives straight home at a steady speed of 40 km/h.

- Draw a distance-time graph for Jamal's journey.
- Work out the time Jamal arrives back home.



(5 marks)

a) In the first hour he travels 60 km, so draw a line from (10:00, 0) to (11:00, 60)

The rest is a horizontal line from (11:00, 60) to (11:30, 60)

b) The journey home is 60 km at 40 km/h, which takes $\frac{60}{40} = 1.5$

hours

11:30 + 1 hour 30 minutes = 13:00, so the final line goes down to (13:00, 0)