

Distance - time graphs 2002 - 2011



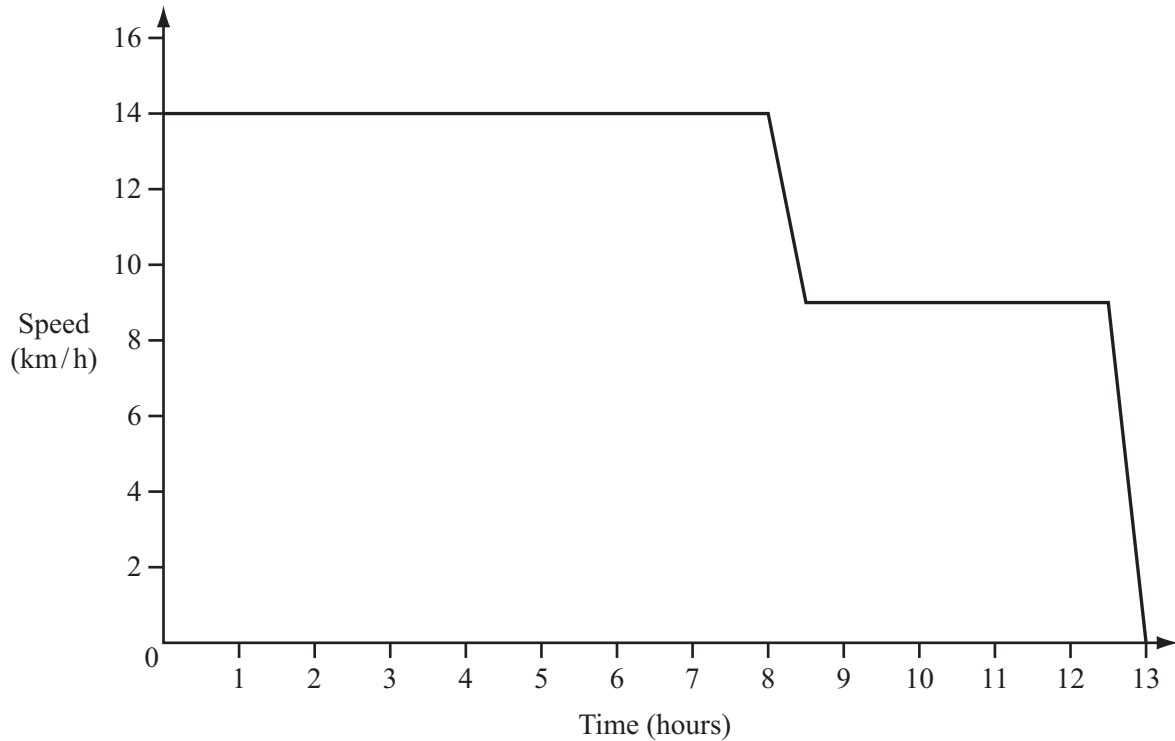
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- 15 A container ship travelled at 14 km/h for 8 hours and then slowed down to 9 km/h over a period of 30 minutes.

For
Examiner's
Use

It travelled at this speed for another 4 hours and then slowed to a stop over 30 minutes.

The speed-time graph shows this voyage.

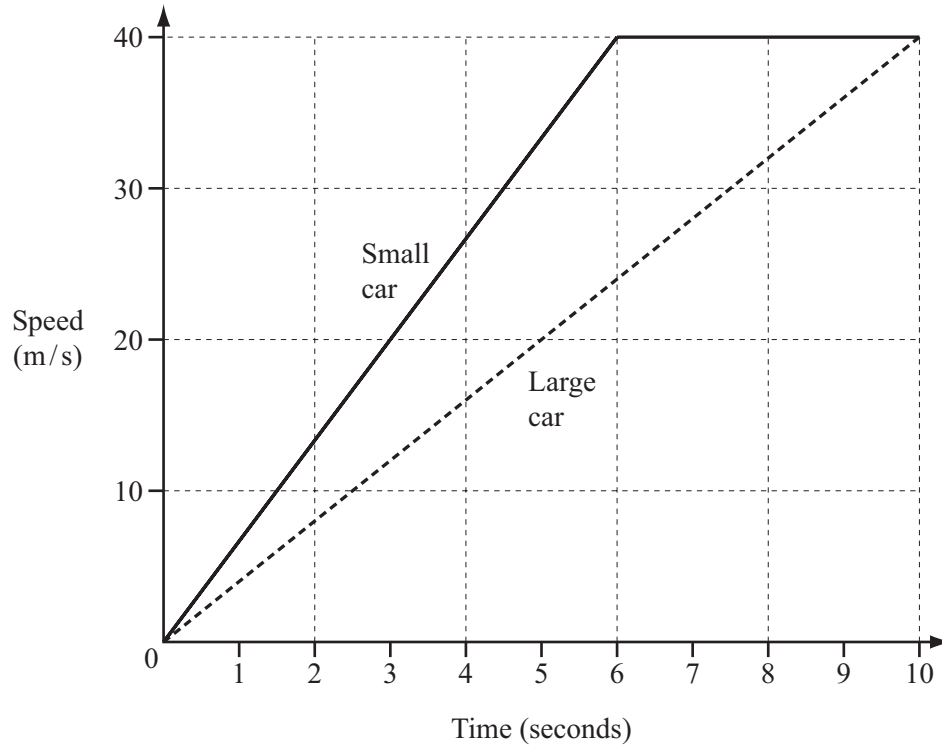


- (a) Calculate the total distance travelled by the ship.

Answer(a) km [4]

- (b) Calculate the average speed of the ship for the whole voyage.

Answer(b) km/h [1]

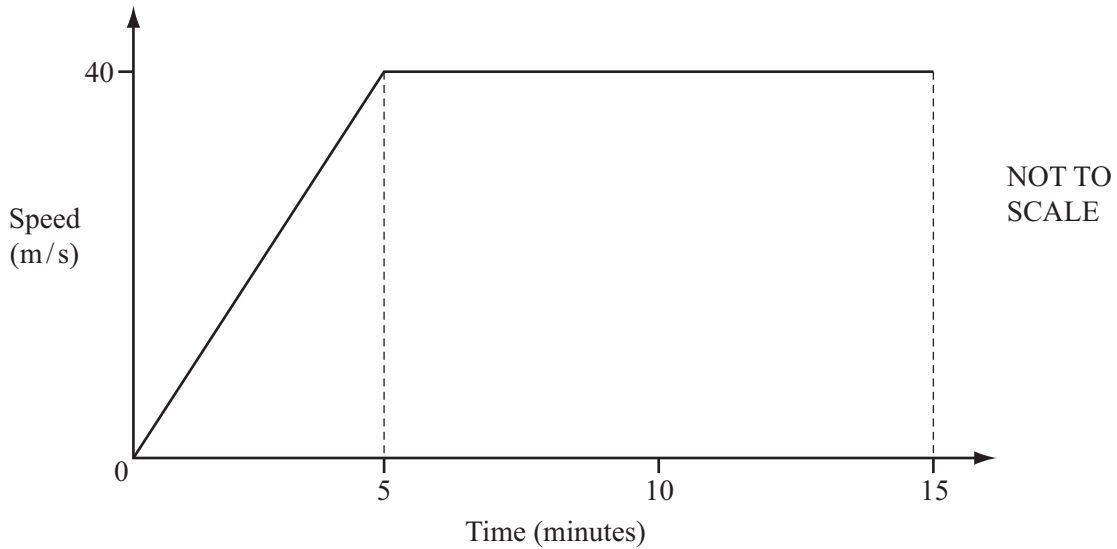


A small car accelerates from 0 m/s to 40 m/s in 6 seconds and then travels at this constant speed.
A large car accelerates from 0 m/s to 40 m/s in 10 seconds.

Calculate how much further the small car travels in the first 10 seconds.

Answer m [4]

23

For
Examiner's
Use

The diagram shows the speed-time graph for the first 15 **minutes** of a train journey. The train accelerates for 5 minutes and then continues at a constant speed of 40 metres/**second**.

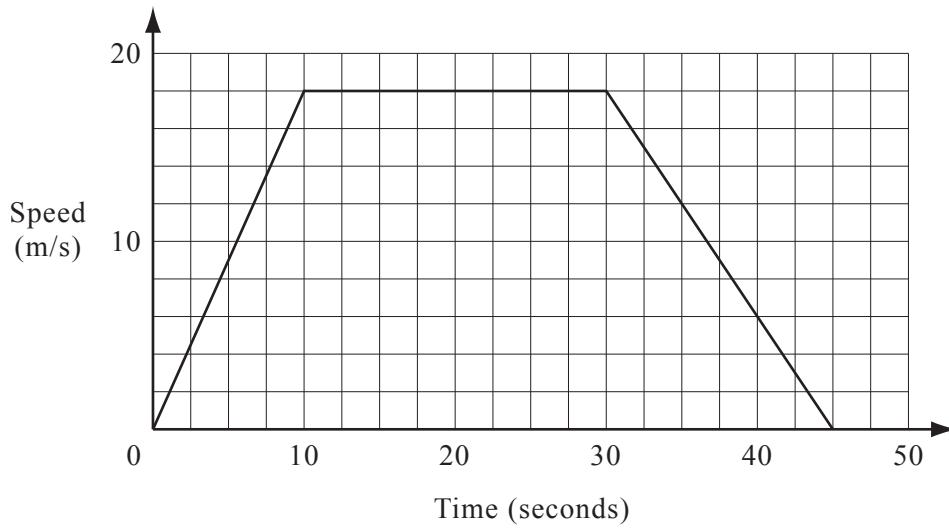
- (a) Calculate the acceleration of the train during the first 5 minutes.
Give your answer in m/s^2 .

Answer(a) m/s^2 [2]

- (b) Calculate the average speed for the first 15 minutes of the train journey.
Give your answer in m/s .

Answer(b) m/s [3]

21 A cyclist is training for a competition and the graph shows one part of the training.



(a) Calculate the acceleration during the first 10 seconds.

Answer(a) m/s² [2]

(b) Calculate the distance travelled in the first 30 seconds.

Answer(b) m [2]

(c) Calculate the average speed for the entire 45 seconds.

Answer(c) m/s [3]

1 (a) A train completed a journey of 850 kilometres with an average speed of 80 kilometres per hour. Calculate, giving **exact** answers, the time taken for this journey in

(i) hours, [2]

(ii) hours, minutes and seconds. [1]

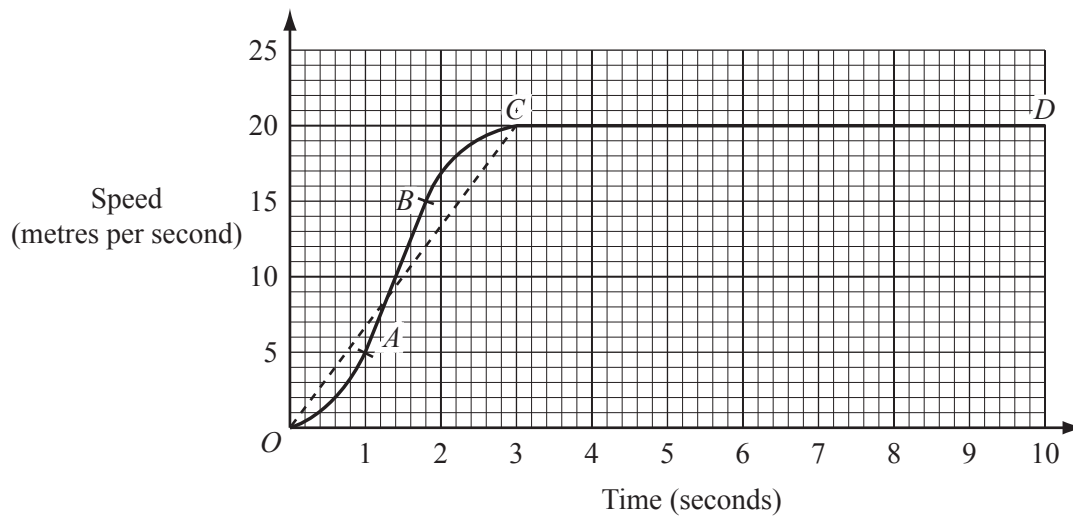
(b) Another train took 10 hours 48 minutes to complete the same 850 km journey.

(i) It departed at 1920.

At what time, on the next day, did this train complete the journey? [1]

(ii) Calculate the average speed, in kilometres per hour, for the journey. [2]

(c)



The **solid** line $OABCD$ on the grid shows the first 10 seconds of a car journey.

(i) Describe briefly what happens to the **speed** of the car between B and C . [1]

(ii) Describe briefly what happens to the **acceleration** of the car between B and C . [1]

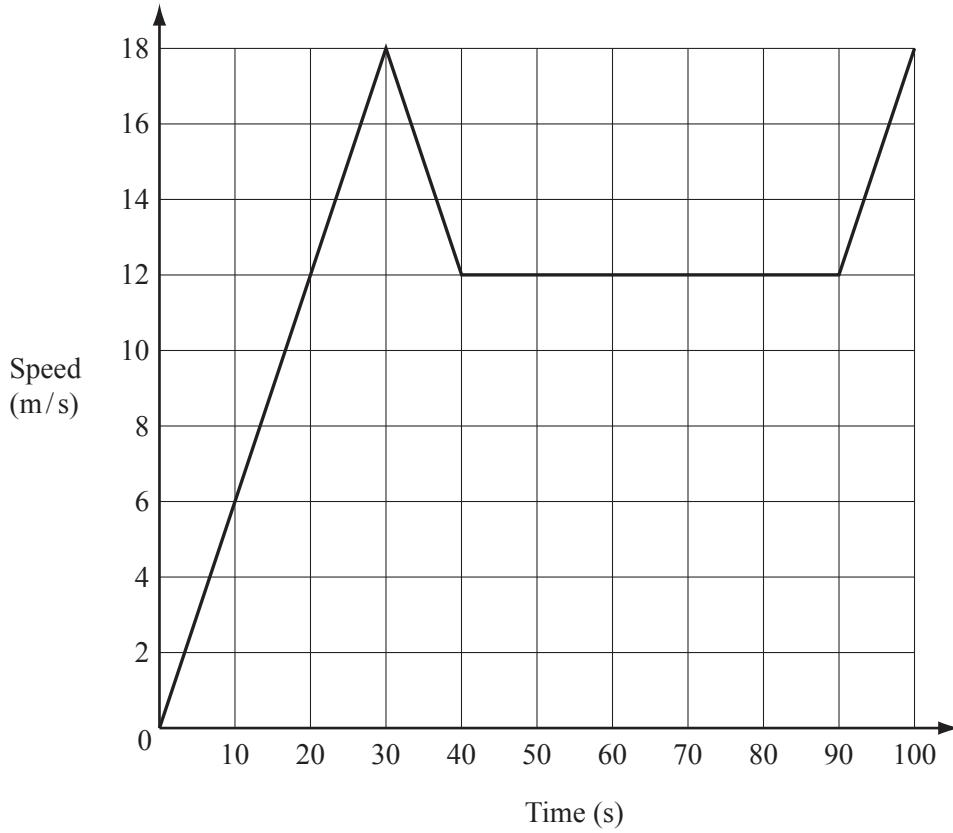
(iii) Calculate the acceleration between A and B . [2]

(iv) Using the **broken** straight line OC , estimate the total distance travelled by the car in the whole 10 seconds. [3]

(v) Explain briefly why, in this case, using the broken line makes the answer to **part (iv)** a good estimate of the distance travelled. [1]

(vi) Calculate the average speed of the car during the 10 seconds. Give your answer in kilometres per hour. [2]

21



The diagram shows part of a journey by a truck.

- (a) The truck accelerates from rest to 18 m/s in 30 seconds.
Calculate the acceleration of the truck.

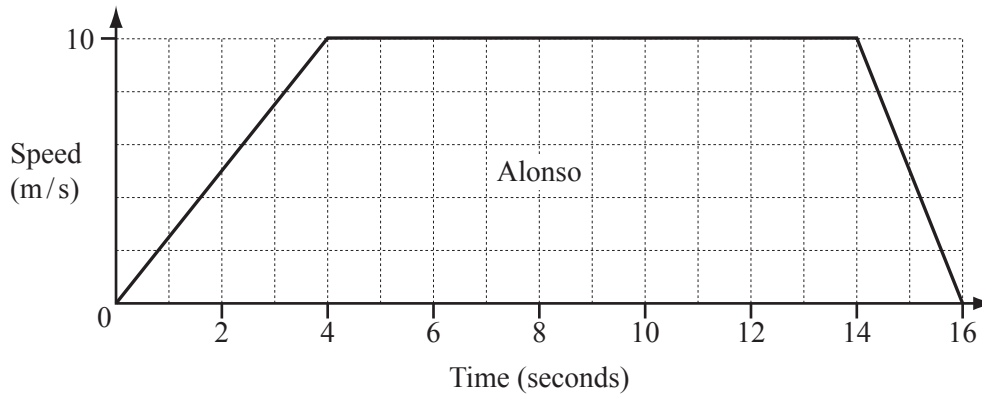
Answer(a) m/s² [1]

- (b) The truck then slows down in 10 seconds for some road works and travels through the road works at 12 m/s.
At the end of the road works it accelerates back to a speed of 18 m/s in 10 seconds.
Find the **total** distance travelled by the truck in the 100 seconds.

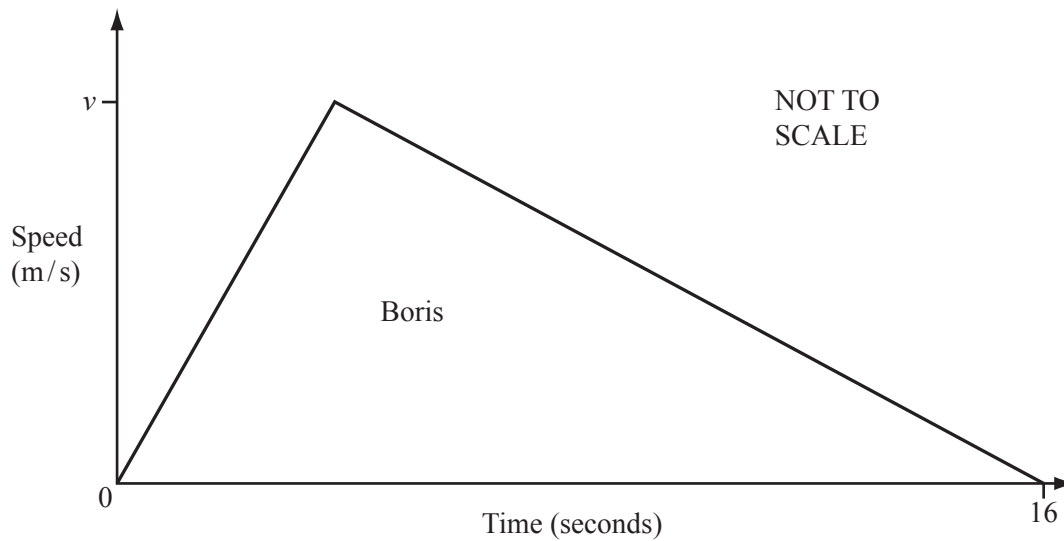
Answer(b) m [3]

16 The graphs show the speeds of two cyclists, Alonso and Boris.

Alonso accelerated to 10 m/s, travelled at a steady speed and then slowed to a stop.



Boris accelerated to his maximum speed, v m/s, and then slowed to a stop.



Both cyclists travelled the same distance in the 16 seconds.

Calculate the maximum speed for Boris.
Show all your working.

Answer m/s [5]

19 The braking distance, d metres, for Alex's car travelling at v km/h is given by the formula

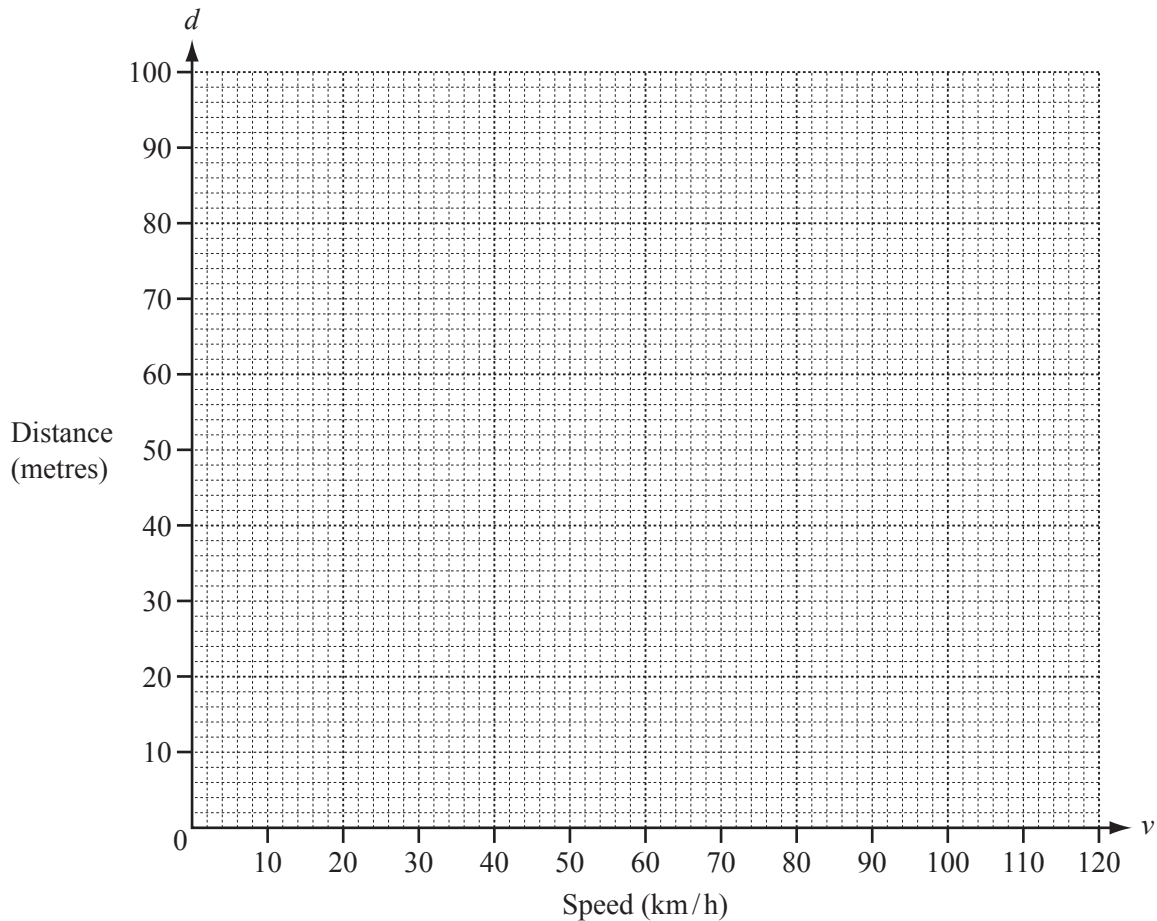
$$200d = v(v + 40).$$

(a) Calculate the missing values in the table.

| | | | | | | | |
|-----------------|---|----|----|----|----|-----|-----|
| v (km/h) | 0 | 20 | 40 | 60 | 80 | 100 | 120 |
| d (metres) | 0 | | 16 | | 48 | | 96 |

[2]

(b) On the grid below, draw the graph of $200d = v(v + 40)$ for $0 \leq v \leq 120$.



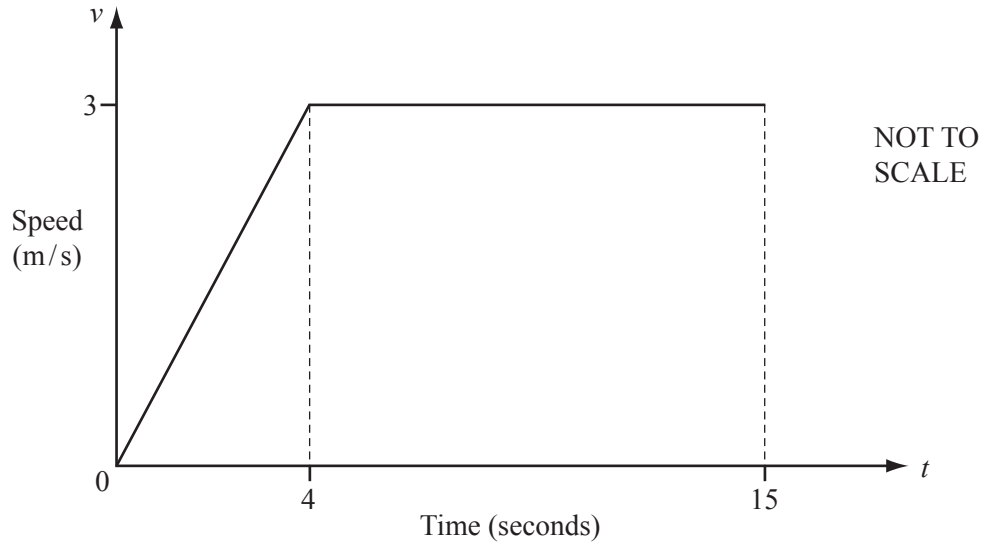
[3]

(c) Find the braking distance when the car is travelling at 110 km/h.

Answer(c) m [1]

(d) Find the speed of the car when the braking distance is 80 m.

Answer(d) km/h [1]



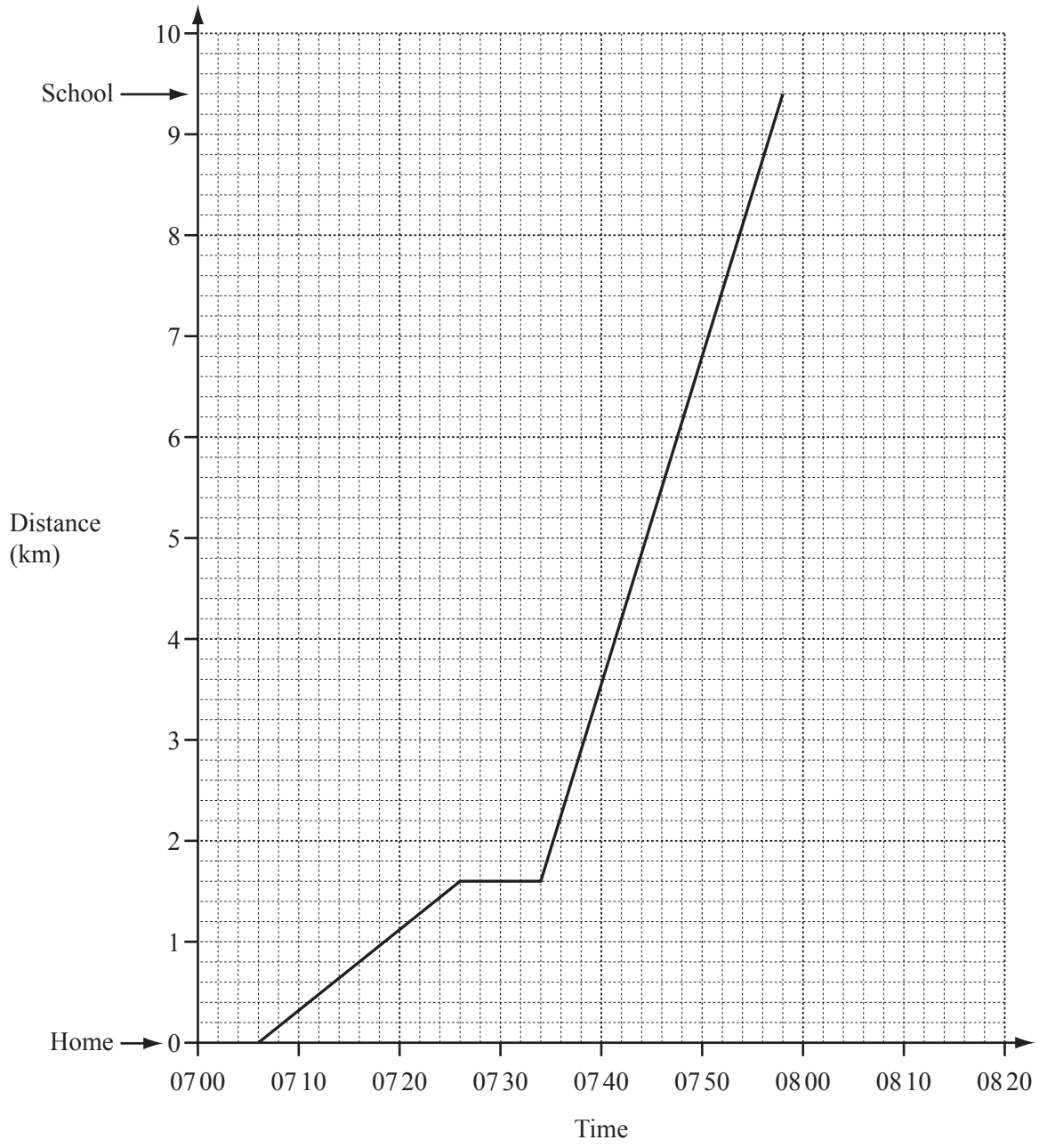
The diagram shows the speed-time graph for 15 seconds of the journey of a cyclist.

- (a) Calculate the acceleration of the cyclist during the first 4 seconds.

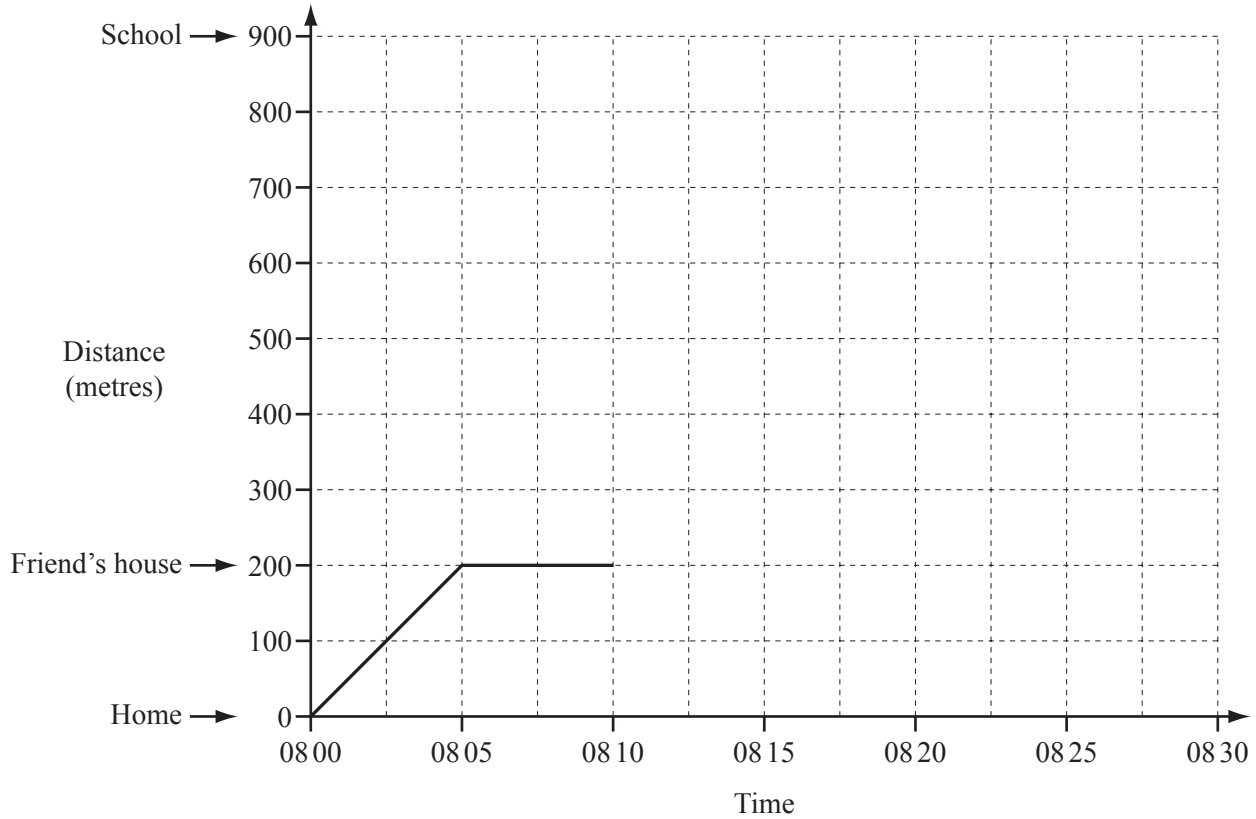
Answer(a) m/s^2 [1]

- (b) Calculate the average speed for the first 15 seconds.

Answer(b) m/s [3]



20



The graph shows part of Ali's journey from home to his school.
 The school is 900 m from his home.
 He walks 200 m to his friend's house and waits there.
 He then takes 20 minutes to walk with his friend to their school.

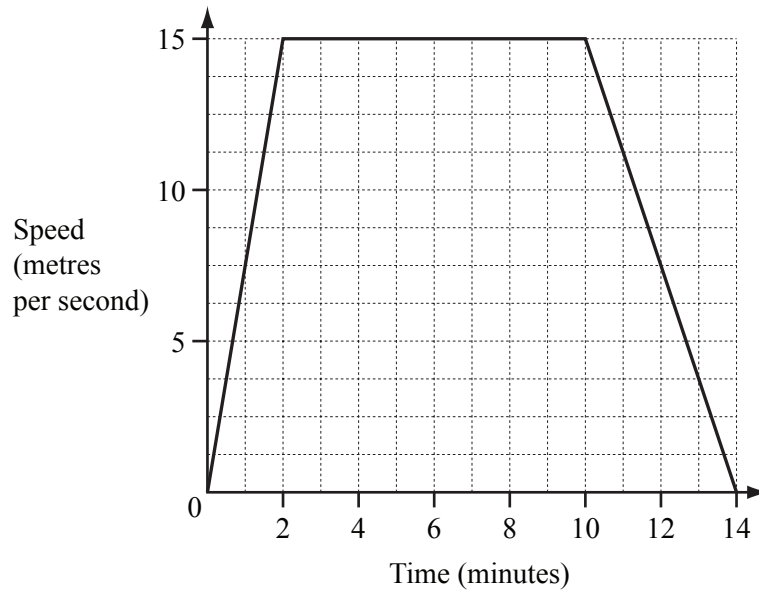
(a) Complete the travel graph showing Ali's journey. [1]

(b) How long does he wait at his friend's house?

Answer(b) min [1]

(c) Calculate the average speed for Ali's complete journey from home to his school.
 Give your answer in **kilometres per hour**.

Answer(c) km/h [4]



The diagram shows the speed-time graph of a train journey between two stations. The train accelerates for two minutes, travels at a constant maximum speed, then slows to a stop.

(a) Write down the number of **seconds** that the train travels at its constant maximum speed.

Answer(a) s [1]

(b) Calculate the distance between the two stations **in metres**.

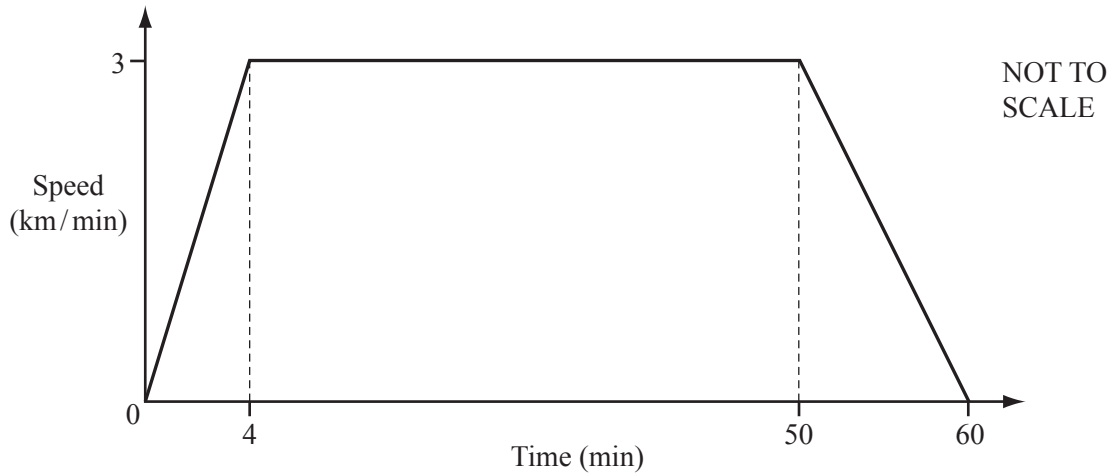
Answer(b) m [3]

(c) Find the acceleration of the train in the **first two minutes**.
Give your answer in m/s^2 .

Answer(c) m/s^2 [2]

Question 20 is printed on the next page.

22



A train journey takes one hour.
The diagram shows the speed-time graph for this journey.

- (a) Calculate the total distance of the journey.

Give your answer in kilometres.

Answer(a) km [3]

- (b) (i) Convert 3 kilometres/minute into metres/second.

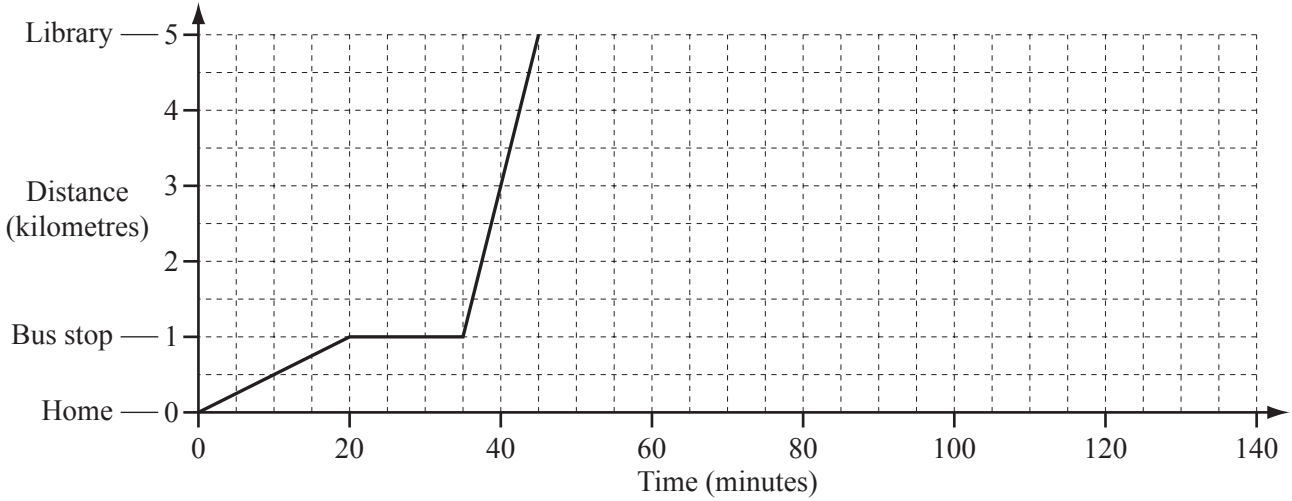
Answer(b)(i) m/s [2]

- (ii) Calculate the acceleration of the train during the first 4 minutes.

Give your answer in metres/second².

Answer(b)(ii) m/s² [2]

4



Sonia travels from home to the library.
She walks to the bus stop and waits for a bus to take her to the library.

(a) Write down

(i) the distance to the bus stop,
Answer(a)(i) km [1]

(ii) how many minutes Sonia waits for a bus,
Answer(a)(ii) min [1]

(iii) how many minutes the bus journey takes to the library.
Answer(a)(iii) min [1]

(b) Calculate, in **kilometres per hour**,

(i) Sonia's walking speed,
Answer(b)(i) km/h [1]

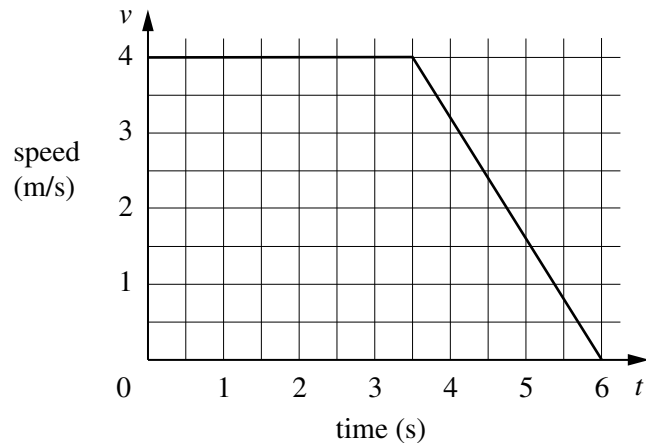
(ii) the speed of the bus,
Answer(b)(ii) km/h [2]

(iii) the **average** speed for Sonia's journey from home to the library.
Answer(b)(iii) km/h [3]

(c) Sonia works in the library for one hour.
Then she travels home by car.
The average speed of the car is 30 km/h.

Complete the travel graph. [2]

13



Ameni is cycling at 4 metres per second.

After 3.5 seconds she starts to decelerate and after a further 2.5 seconds she stops.

The diagram shows the speed-time graph for Ameni.

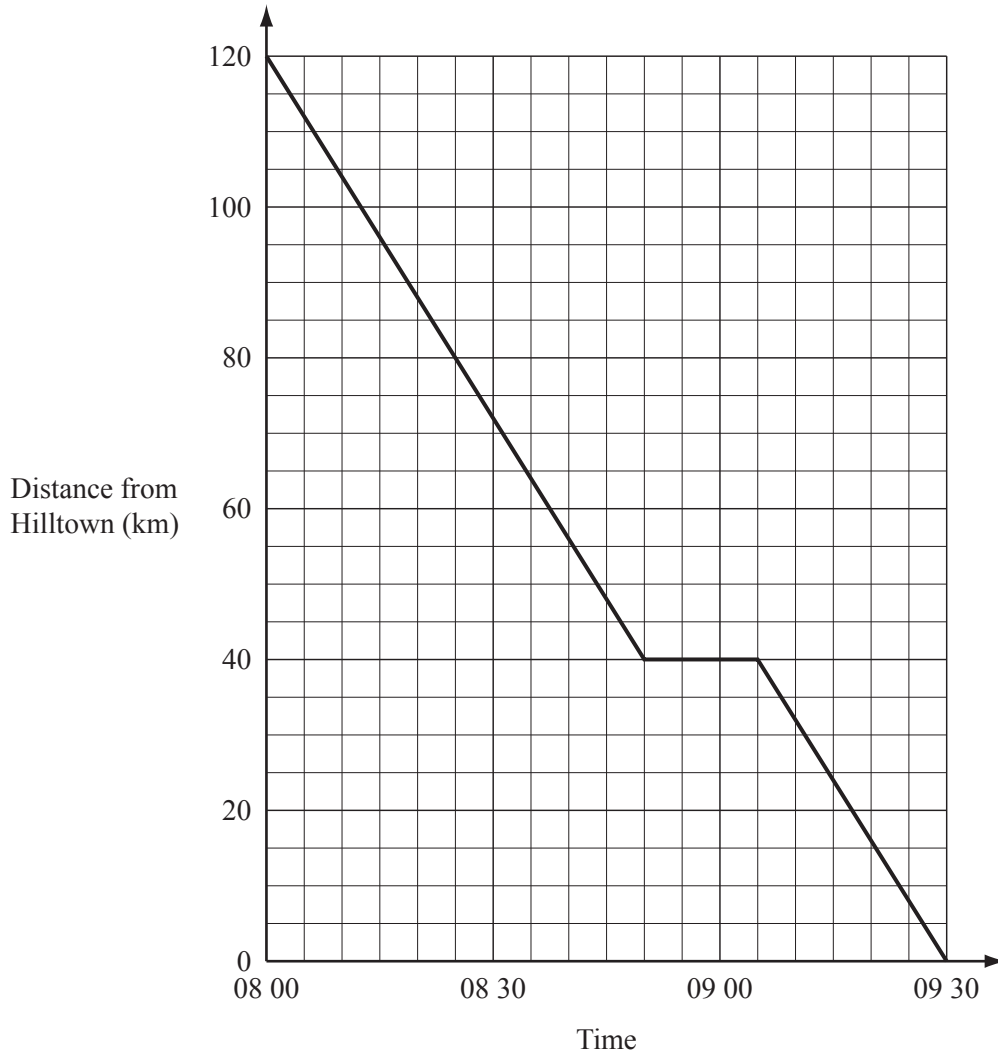
Calculate

(a) the constant deceleration,

Answer (a)m/s² [1]

(b) the total distance travelled during the 6 seconds.

Answer (b)m [2]



The graph shows the distance, in kilometres, of a train from Hilltown.

Find the speed of the train in kilometres per hour at

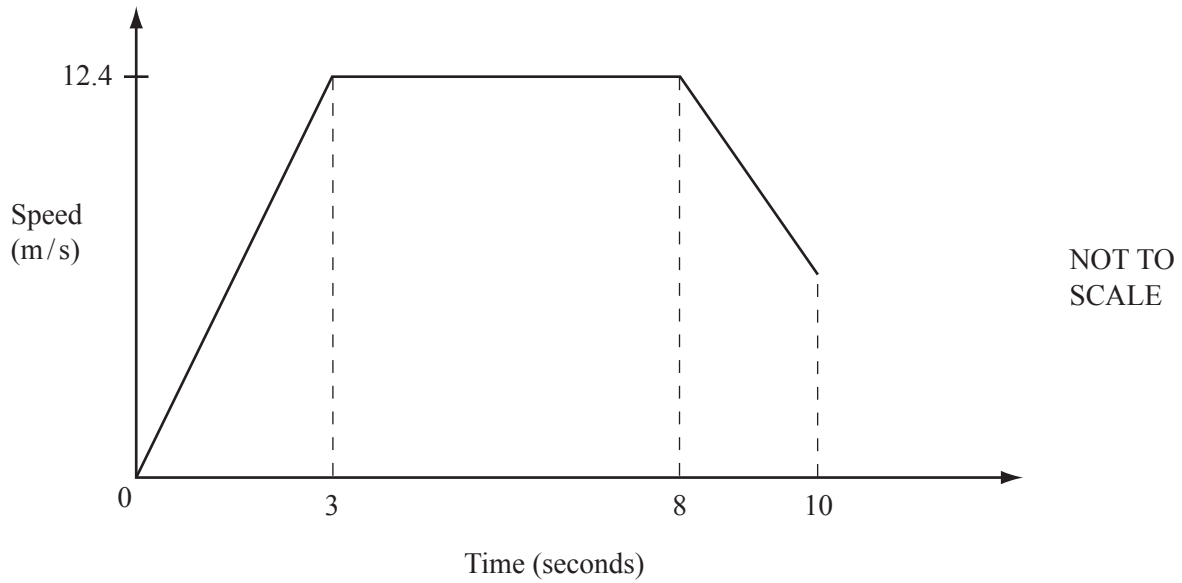
(a) 08 30,

Answer(a) km/h [2]

(b) 09 00.

Answer(b) km/h [1]

20



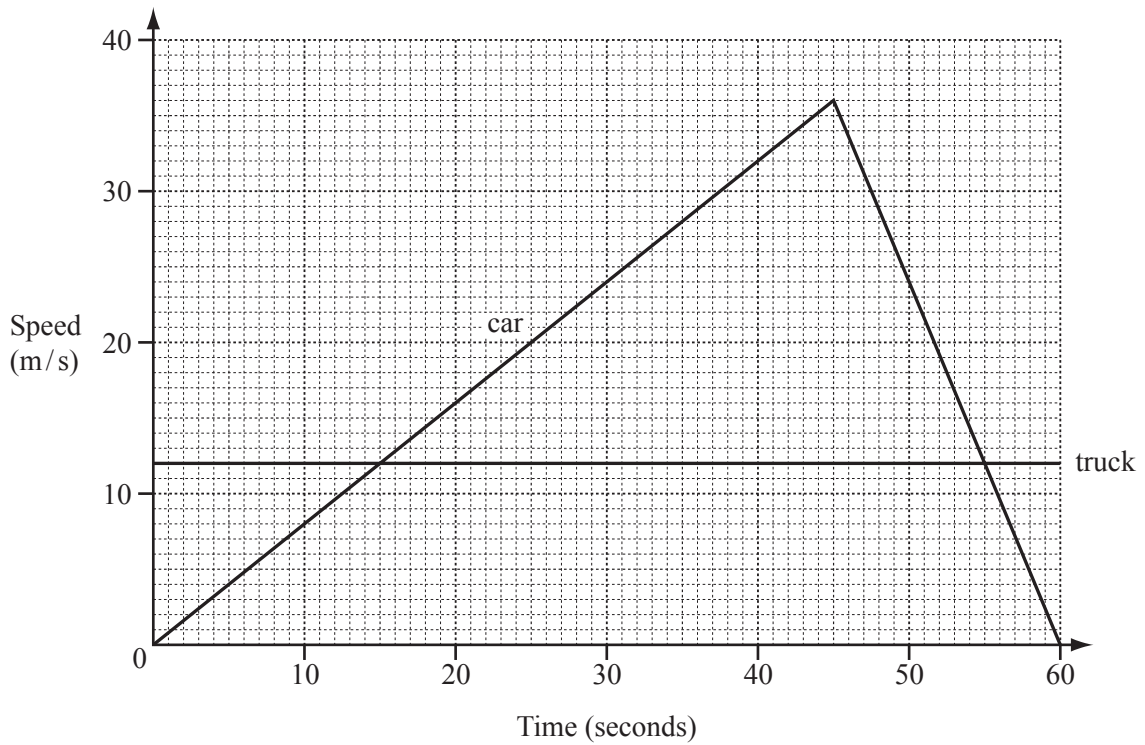
An athlete, in a race, accelerates to a speed of 12.4 metres per second in 3 seconds. He runs at this speed for the next 5 seconds and slows down over the last 2 seconds as shown in the speed-time graph above. He crosses the finish line after 10 seconds. The total distance covered is 100 m.

(a) Calculate the distance he runs in the first 8 seconds.

Answer(a) m [2]

(b) Calculate his speed when he crosses the finish line.

Answer(b) m/s [2]



The graph shows the speed of a truck and a car over 60 seconds.

(a) Calculate the acceleration of the car over the first 45 seconds.

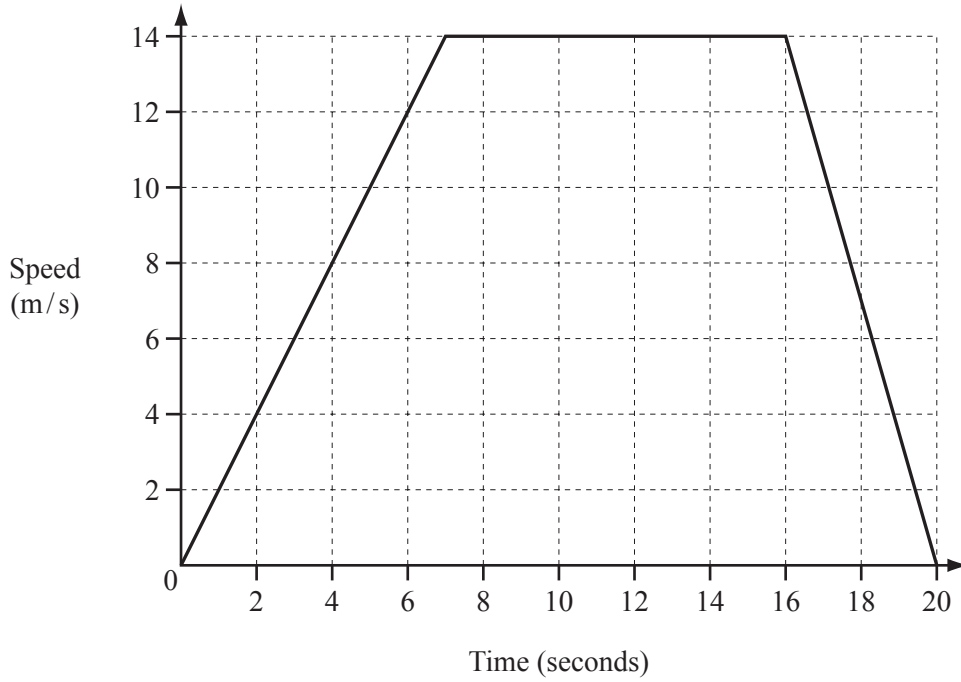
Answer(a) m/s² [2]

(b) Calculate the distance travelled by the car while it was travelling faster than the truck.

Answer(b) m [3]

- 21 An animal starts from rest and accelerates to its top speed in 7 seconds. It continues at this speed for 9 seconds and then slows to a stop in a further 4 seconds.

The graph shows this information.



- (a) Calculate its acceleration during the first seven seconds.

Answer(a) m/s^2 [1]

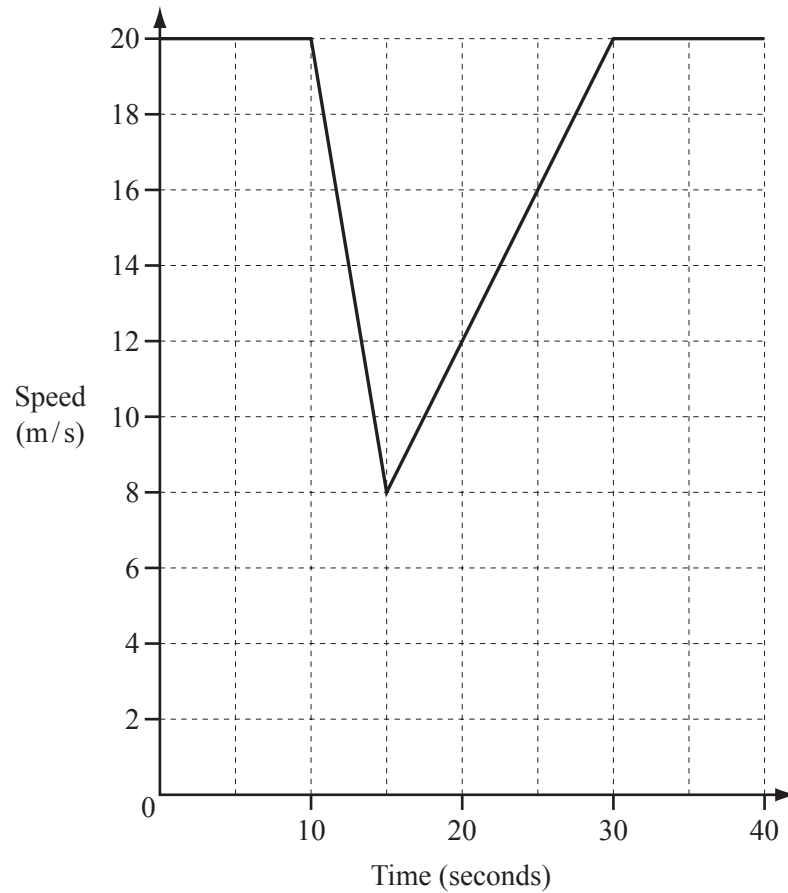
- (b) Write down its speed 18 seconds after the start.

Answer(b) m/s [1]

- (c) Calculate the total distance that the animal travelled.

Answer(c) m [3]

21



The graph shows 40 seconds of a car journey.

The car travelled at a constant speed of 20 m/s, decelerated to 8 m/s then accelerated back to 20 m/s.

Calculate

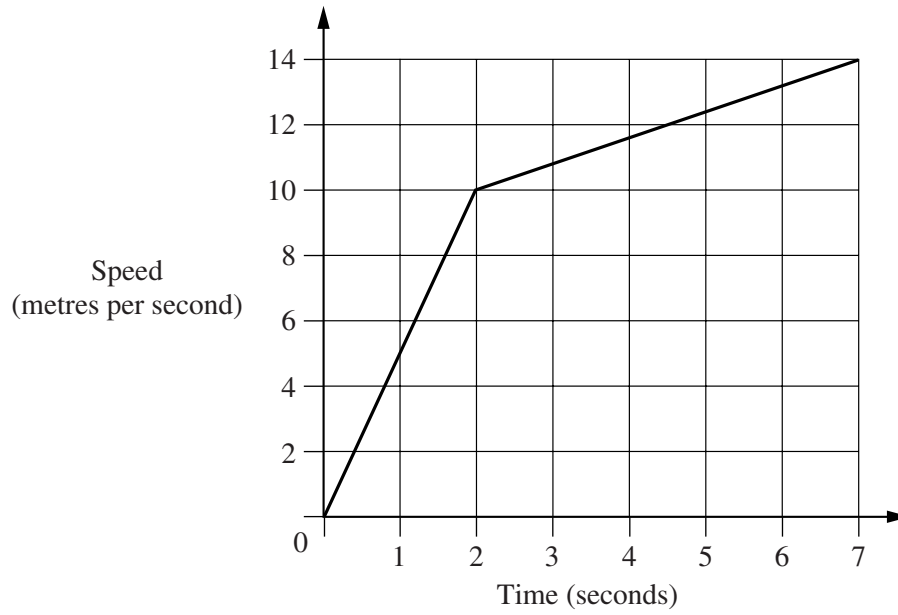
(a) the deceleration of the car,

Answer(a) m/s² [1]

(b) the total distance travelled by the car during the 40 seconds.

Answer(b) m [3]

12



A car starts from rest. The speed-time graph shows the first 7 seconds of its journey. Calculate

- (a) the acceleration between 2 and 7 seconds,

Answer (a)m/s² [1]

- (b) the distance travelled by the car during the first 7 seconds.

Answer (b)m [2]