Level 3 Algebra · Distance-Time Graphs

June 2013 - Question 19

Jan 2014 - Question 20

Jan 2015 - Question 4

June 2015 - Question 18

Jan 2016 - Question 7

June 2016 - Question 20

Jan 2017 - Question 11,16

June 2017 - Question 18

Jan 2018 - Question 16

June 2018 - Question 17

June 2019 - Question 12

Jan 2020 - Question 13

Jan 2021 - Question 17

Jan 2022 - Question 7

June 2022 - Question 22

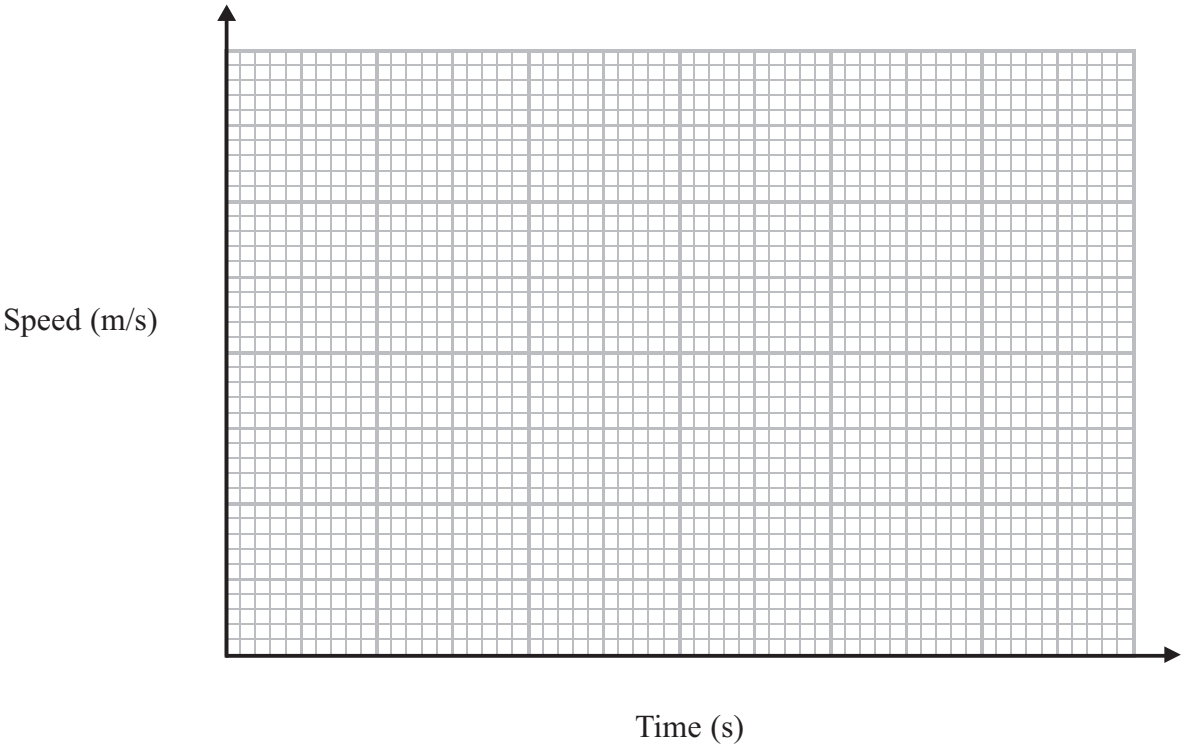
June 2023 - Question 16

Jan 2024 - Question 21

19 A rocket is launched vertically upwards.

It accelerates from a speed of 0 m/s at a rate of 30 m/s^2 for 1.2 seconds.
The rocket runs out of fuel 1.2 seconds after it was launched.
The rocket then decelerates at a constant rate for 3.8 seconds to reach its greatest height.

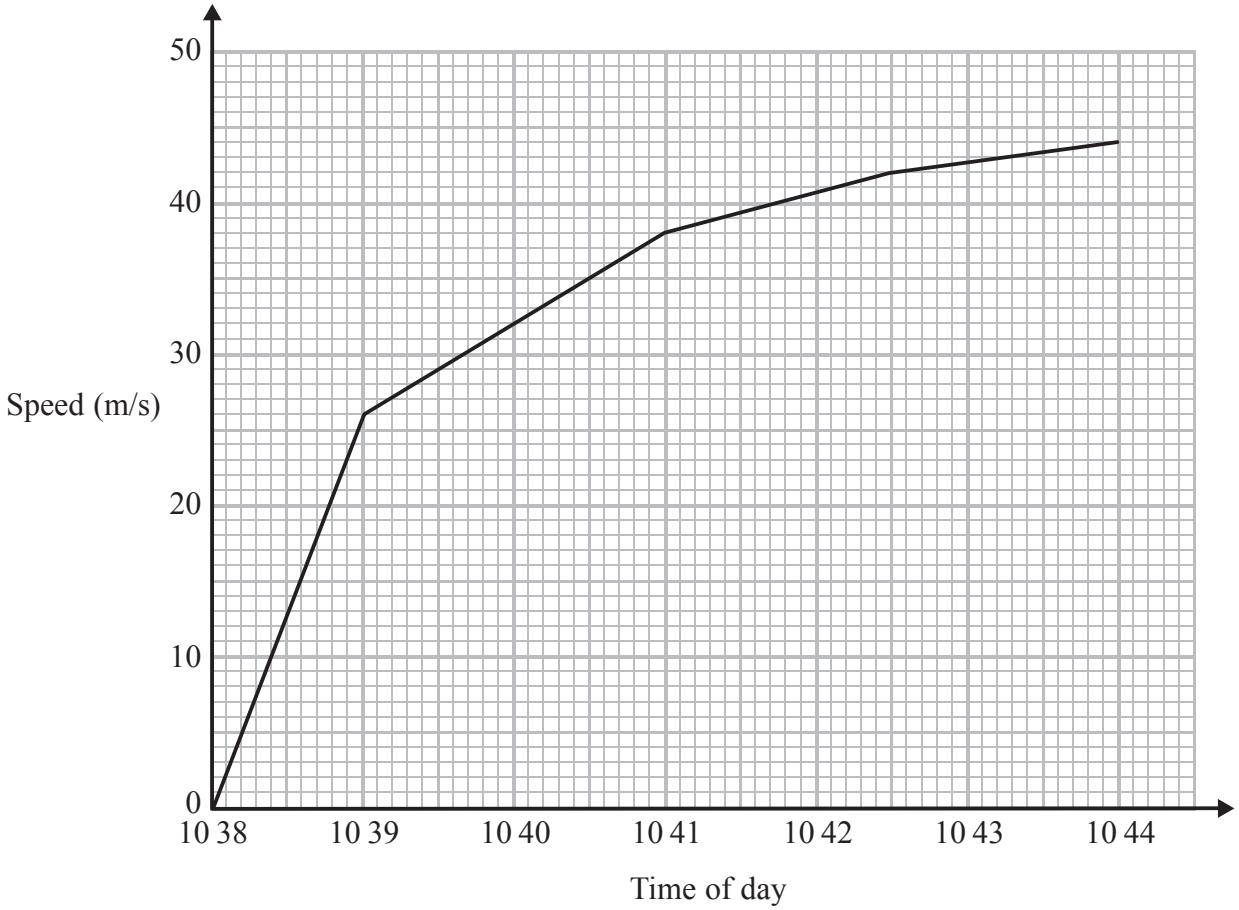
Show this information on a speed-time graph.



(Total for Question 19 is 3 marks)

TOTAL FOR PAPER IS 90 MARKS

20 Here is a speed-time graph for the first 6 **minutes** of a train's journey.



(a) Between which two times does the train have its greatest acceleration?

.....

(1)

(b) Calculate the acceleration of the train between 10 39 and 10 41

Give your answer in m/s^2.

..... m/s^2

(2)

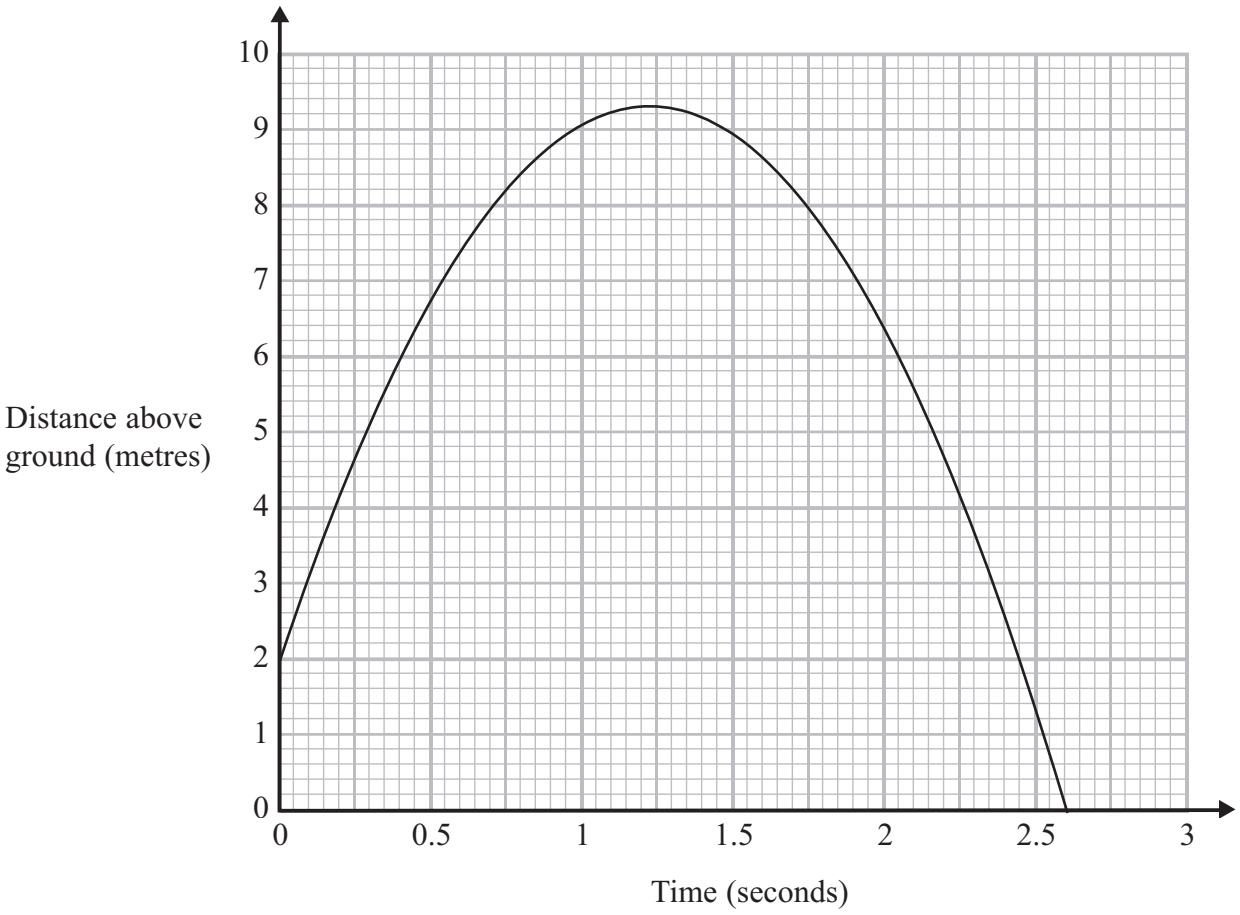
(c) Find the total distance, in metres, travelled by the train in the first 3 minutes of its journey.

..... m

(3)

(Total for Question 20 is 6 marks)

4 Here is the distance-time graph for a ball which is thrown vertically upwards.



The ball is thrown from a point above the ground.

(a) How far above the ground is this point?

..... m

(1)

(b) Write down the time when the speed of the ball is zero.

..... s

(1)

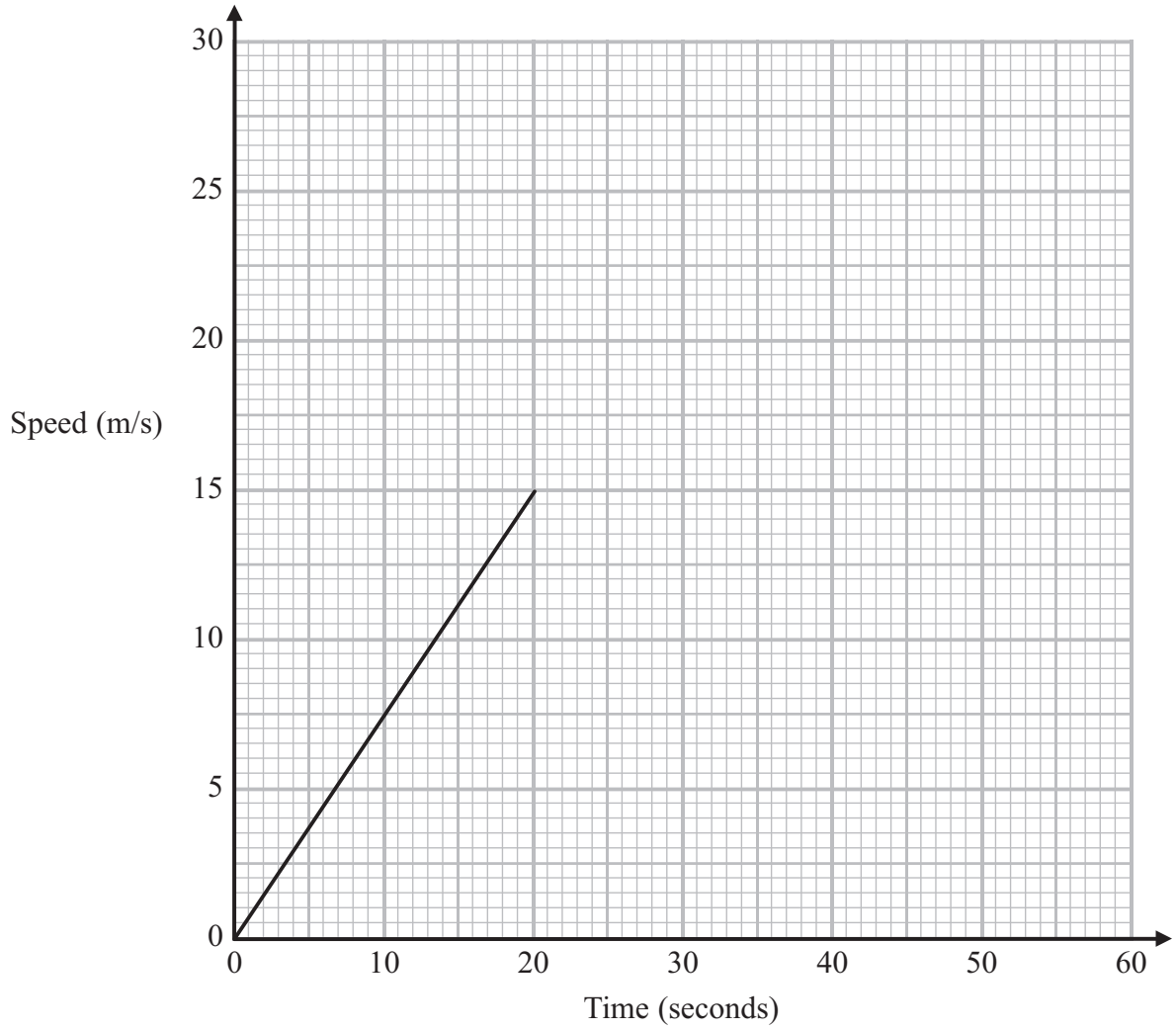
(c) Work out the total distance, in metres, travelled by the ball.

..... m

(2)

(Total for Question 4 is 4 marks)

18 Here is part of a speed-time graph for a cart.



(a) Work out the acceleration of the cart during the first 20 seconds.

..... m/s^2

(2)

When the cart has reached a speed of 15 m/s, it moves at this constant speed for 15 seconds.

(b) Show this information on the graph.

(1)

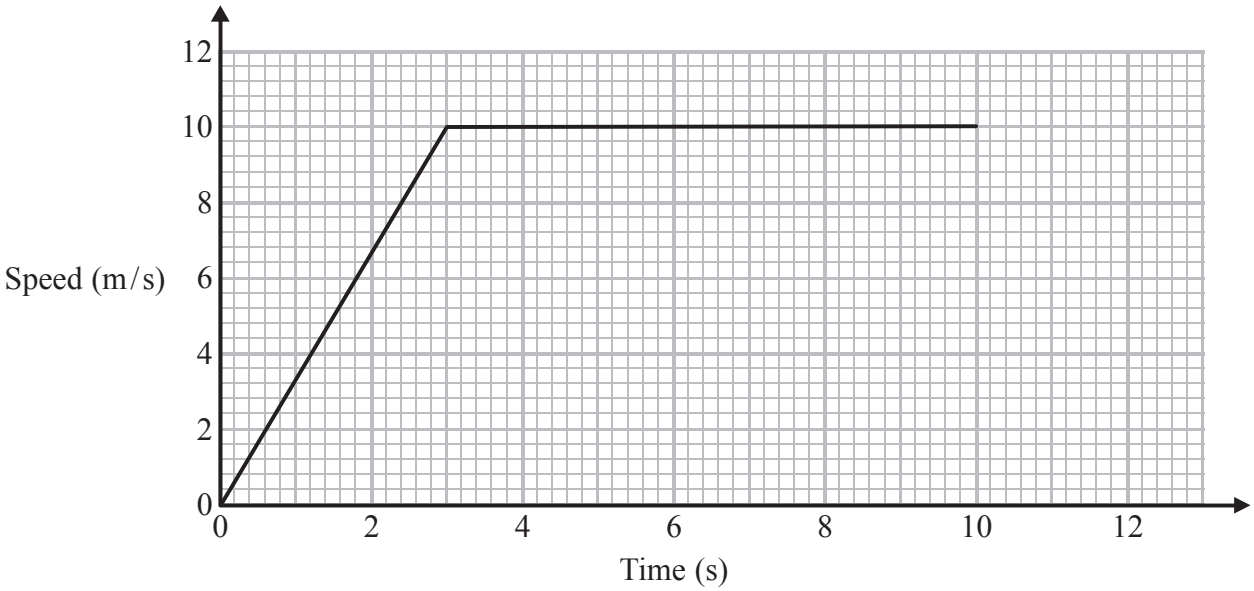
(c) Work out the total distance travelled by the cart in the first 10 seconds.

..... m

(2)

(Total for Question 18 is 5 marks)

7 Here is a speed-time graph of a runner for the first 10 seconds of a race.



(a) Calculate the acceleration of the runner during the first 3 seconds of the race.
Give your answer in m/s^2.

..... m/s^2

(1)

(b) Calculate how far the runner ran in the first 10 seconds of the race.
Give your answer in metres.

..... m

(3)

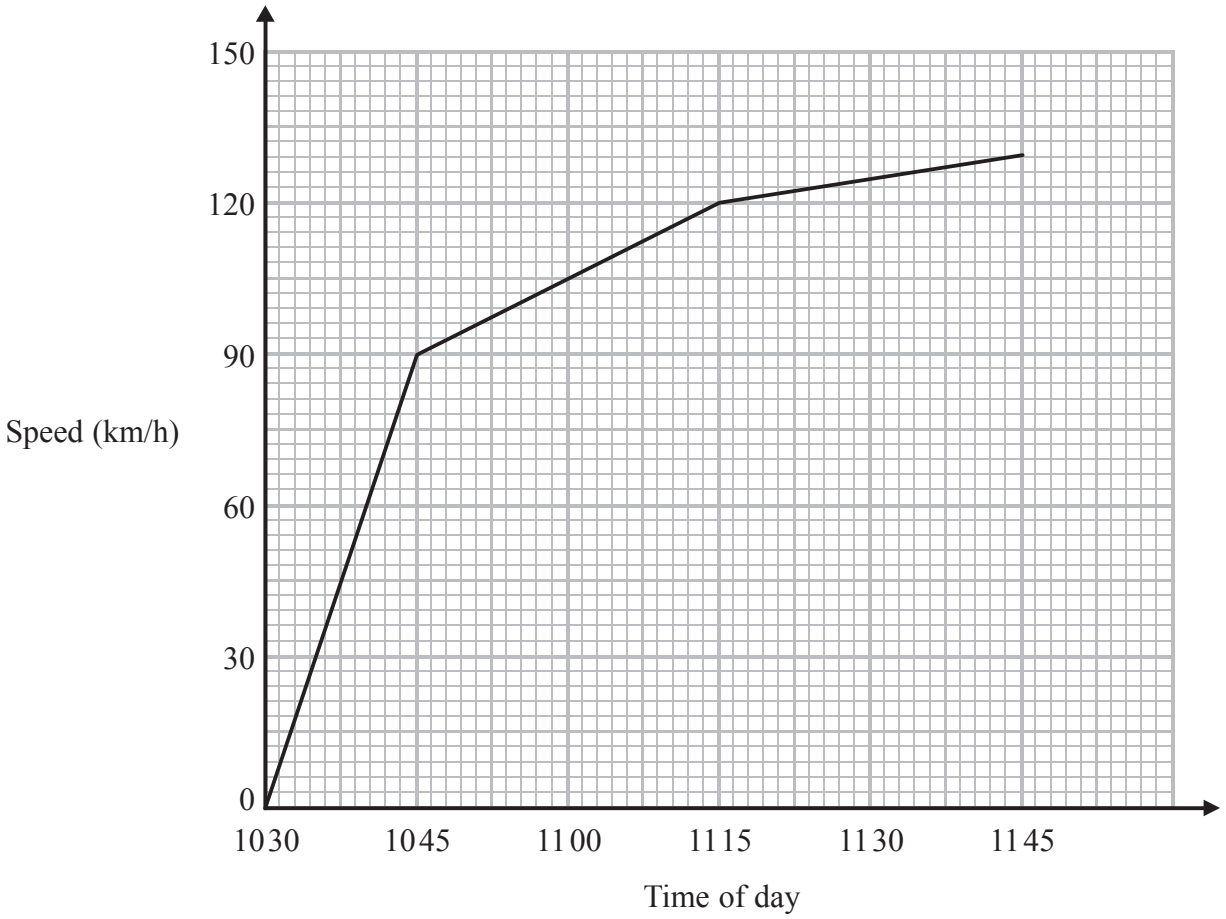
After 10 seconds the runner decelerated at a constant rate of 2.5 m/s^2 for 2 seconds.

(c) Show this information on the speed-time graph.

(2)

(Total for Question 7 is 6 marks)

20 Here is a speed-time graph for part of a journey.



(a) Between which two times is the acceleration greatest?

.....

(1)

(b) Calculate the acceleration, in km/h², in the first 15 minutes of the journey.

..... km/h²

(2)

(c) Work out the total distance travelled in the first 45 minutes of the journey.

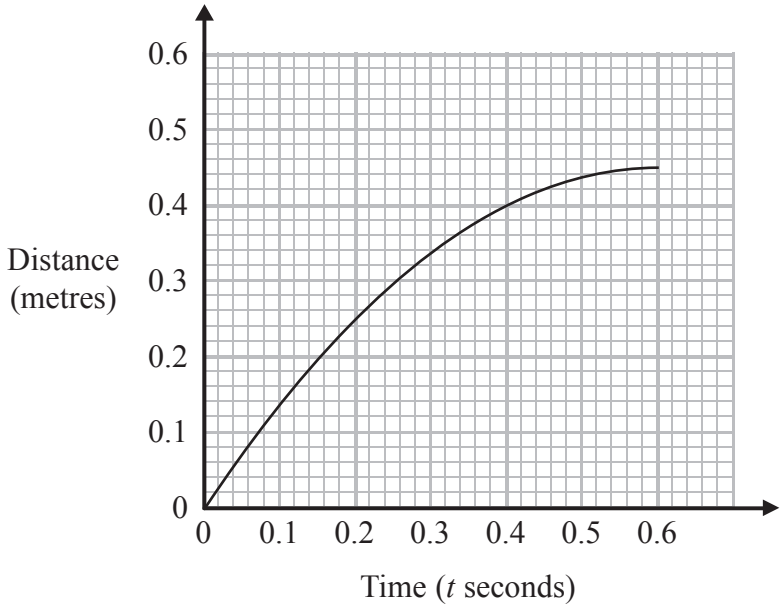
..... km

(2)

(Total for Question 20 is 5 marks)

TOTAL FOR PAPER IS 90 MARKS

11 Here is a distance-time graph for a particle.



(a) Explain what the gradient of the curve represents.

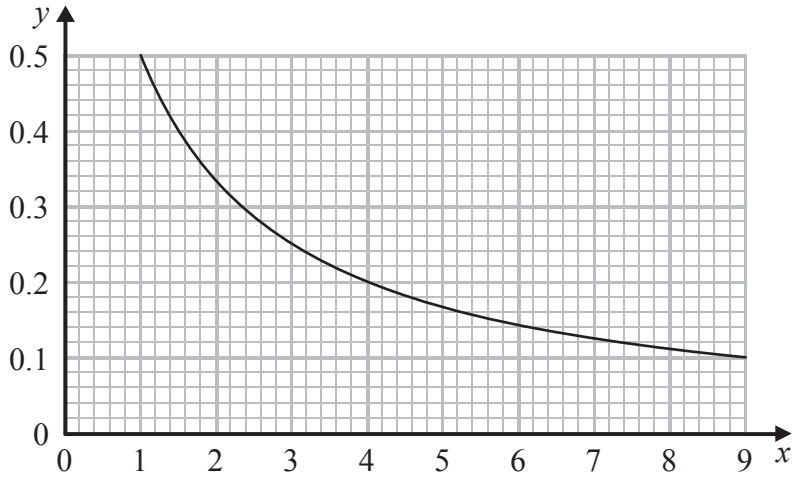
(1)

(b) Draw a tangent to the curve at $t = 0.3$

(1)

(Total for Question 11 is 2 marks)

12 Here is part of the graph of $y = \dfrac{1}{1+x}$



Use the trapezium rule to find an estimate of the area of the region under the curve and between $x = 1$, $y = 0$ and $x = 9$
Use 4 strips of equal width.

(Total for Question 12 is 3 marks)

13 (a) Solve $12 - 5x < 2x$

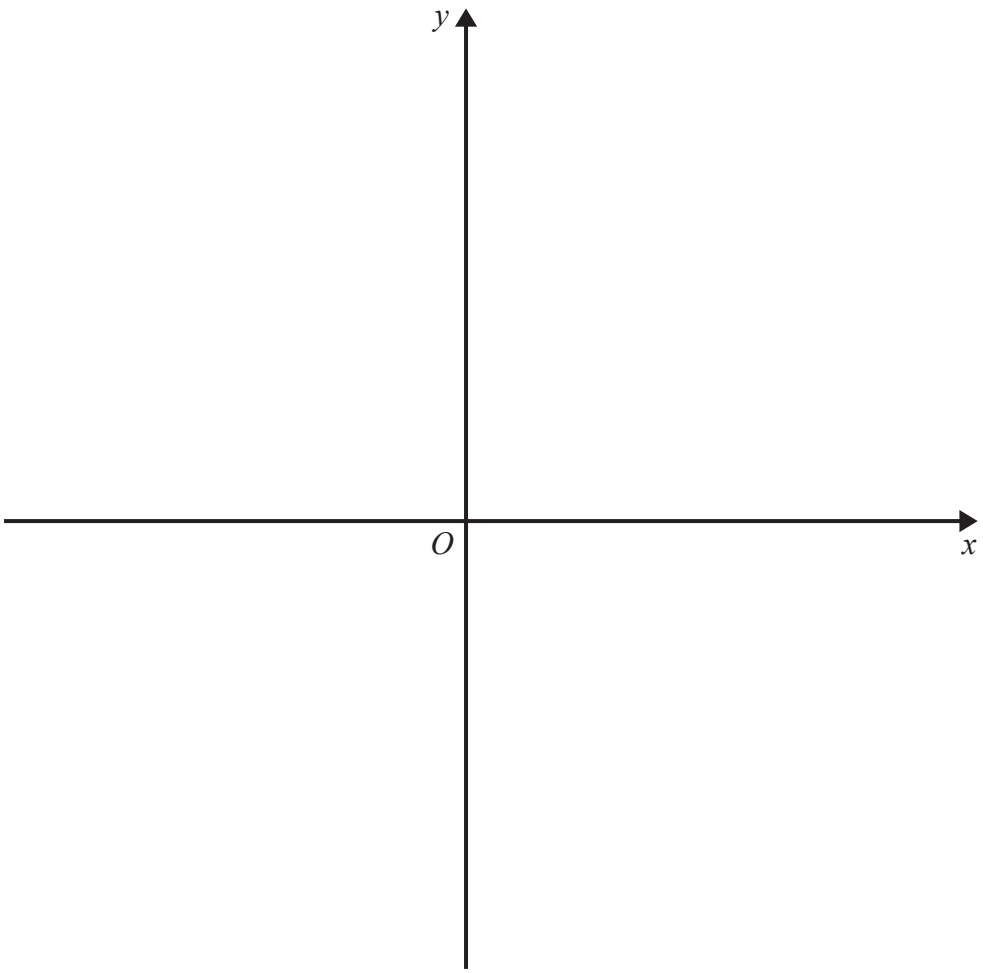
(2)

(b) Solve $x^2 + 4x + 3 < 0$

(2)

(Total for Question 13 is 4 marks)

14 Sketch the graph of $y = x^3 - 2$



(Total for Question 14 is 3 marks)

15 (a) Rationalise the denominator of $\frac{1}{3+\sqrt{7}}$

(2)

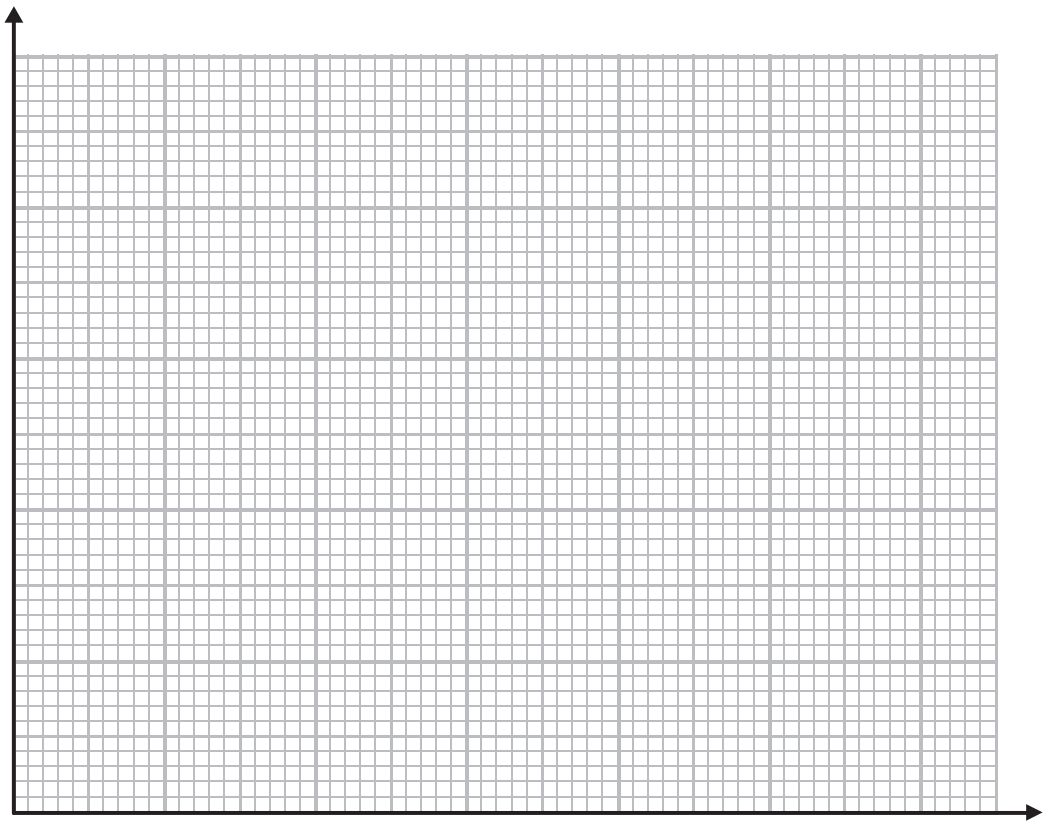
(b) (i) Write $(\sqrt{5}+\sqrt{2})^2-(\sqrt{5}-\sqrt{2})^2$ in the form $a\sqrt{b}$ where a and b are integers.

(ii) Hence find the value of $\left[(\sqrt{5}+\sqrt{2})^2-(\sqrt{5}-\sqrt{2})^2\right]^2$

(4)

(Total for Question 15 is 6 marks)

16 A runner accelerates from rest at 2 m/s^2 for 4 seconds, then runs at a constant speed for 5 seconds and then decelerates at 4 m/s^2 until he comes to rest.



(a) Draw a speed-time graph to show this information.

(4)

(b) Work out the total distance travelled by the runner in the first 3 seconds.

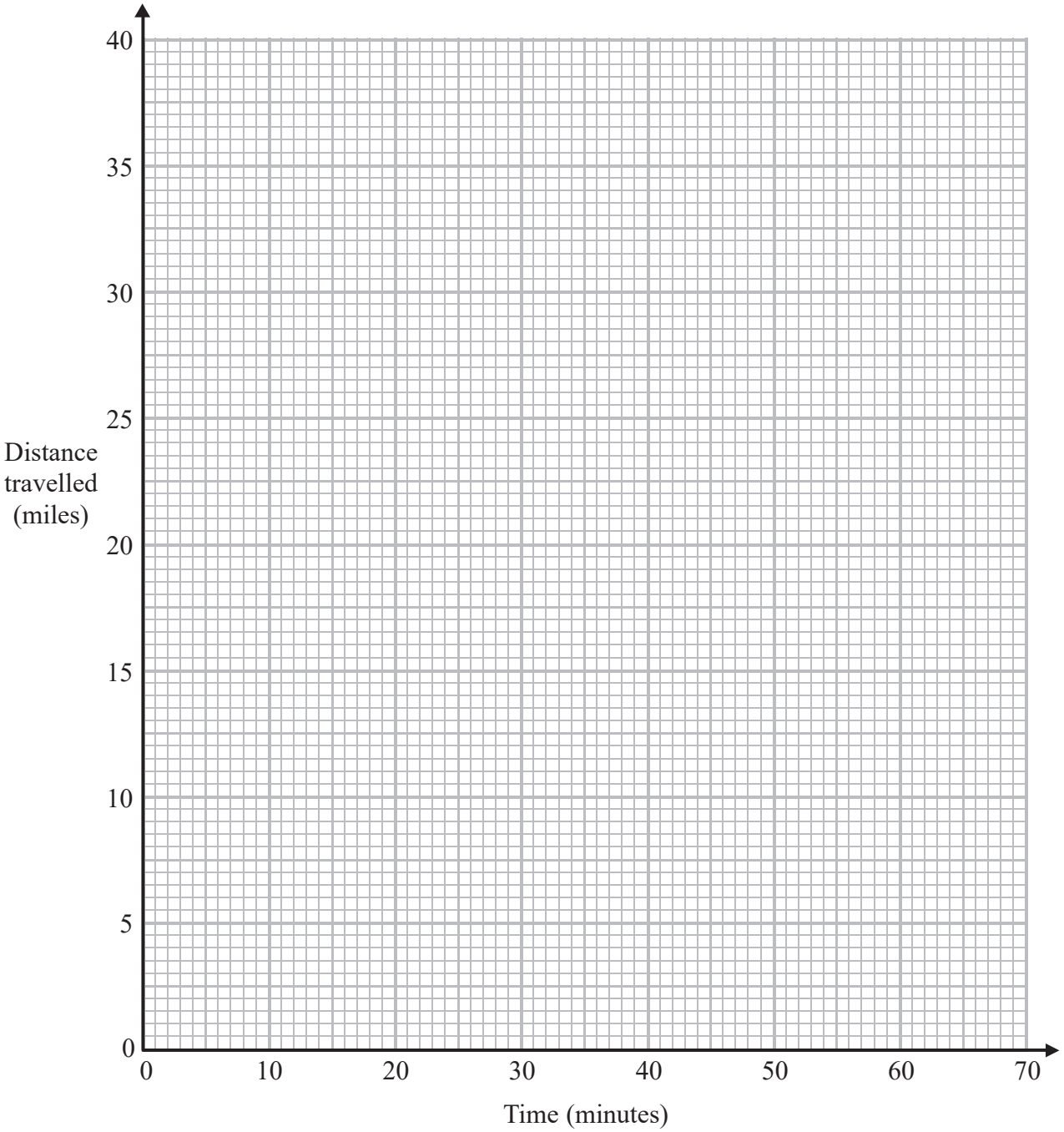
.....

(2)

(Total for Question 16 is 6 marks)

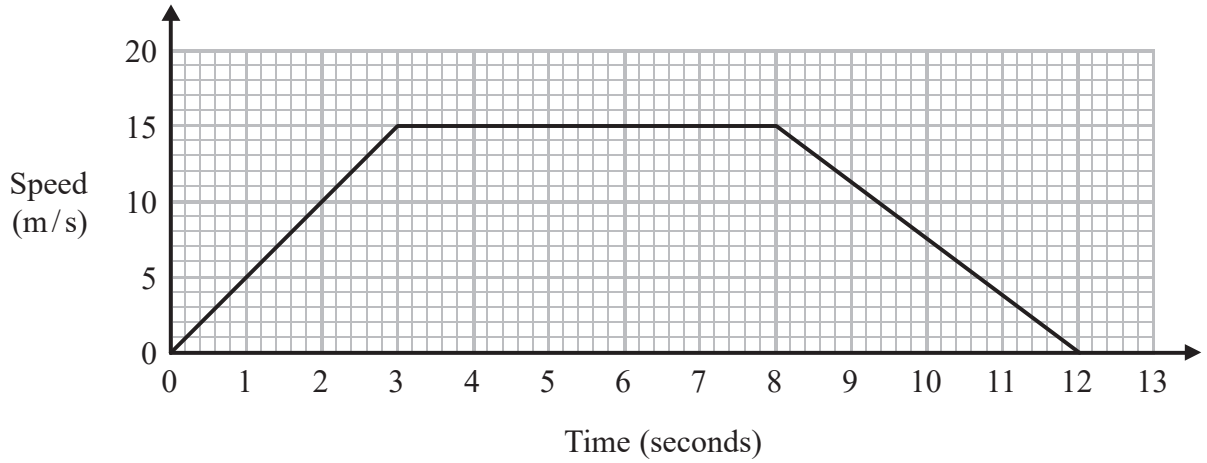
18 A train travels at a constant speed of 40 mph for 30 minutes.
It then travels at a constant speed of 30 mph for a further 20 minutes.

On the grid below, draw a distance-time graph for the train's journey.



(Total for Question 18 is 2 marks)

16 Here is the speed-time graph of a car travelling between two road junctions.



(a) Work out the distance between the two road junctions.

..... m

(3)

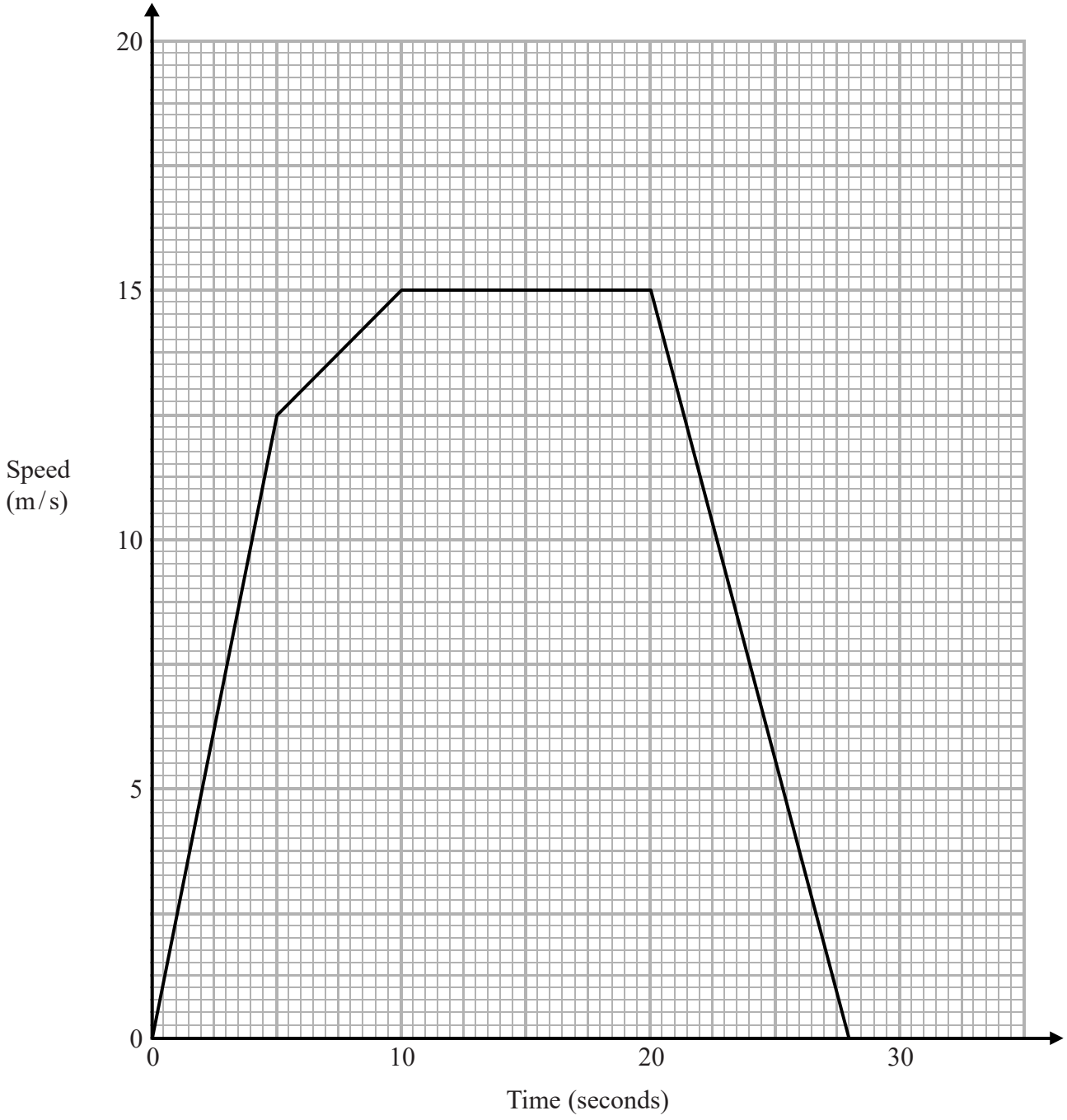
(b) Work out the deceleration in the last 4 seconds of its journey between the two road junctions.

..... m/s^2

(2)

(Total for Question 16 is 5 marks)

17 The graph gives information about the speed of a car as it travelled between two road junctions.



(a) Calculate the acceleration of the car during the first 5 seconds of the journey.

..... m/s^2

(2)

(b) Calculate the distance between the two road junctions.

..... m

(3)

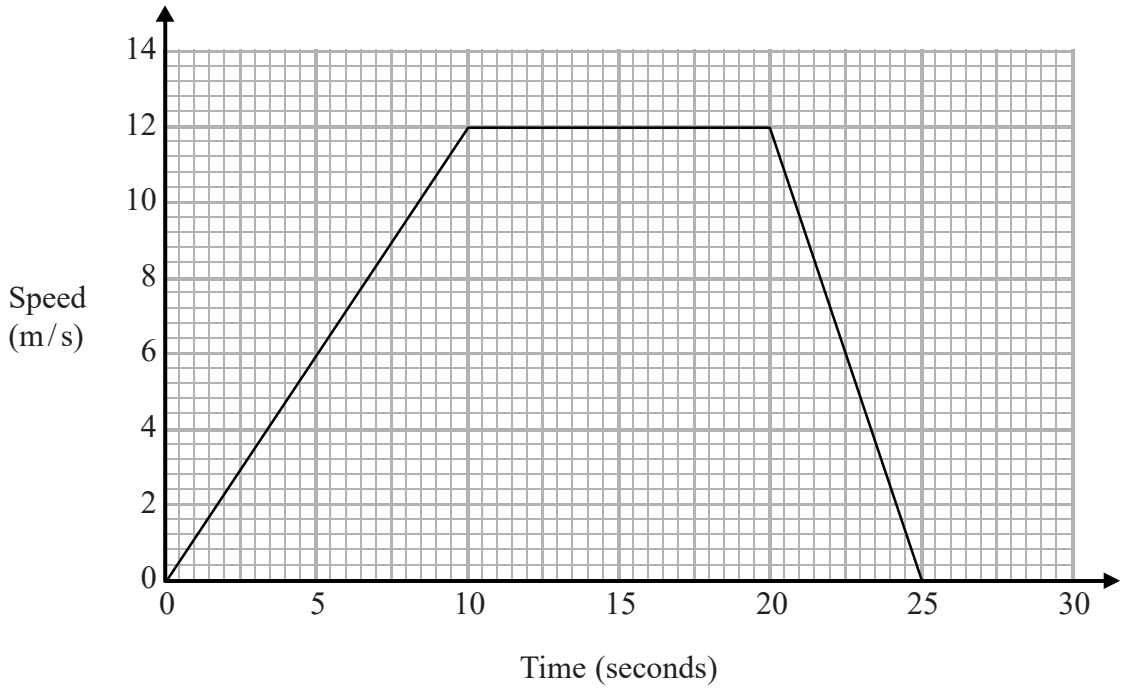
(c) For how long did the car decelerate?

..... s

(1)

(Total for Question 17 is 6 marks)

12 Here is a speed-time graph for a toy car.



(a) Write down the acceleration of the car at time 15 seconds.

..... m/s^2

(1)

(b) What does the area under the graph represent?

.....

(1)

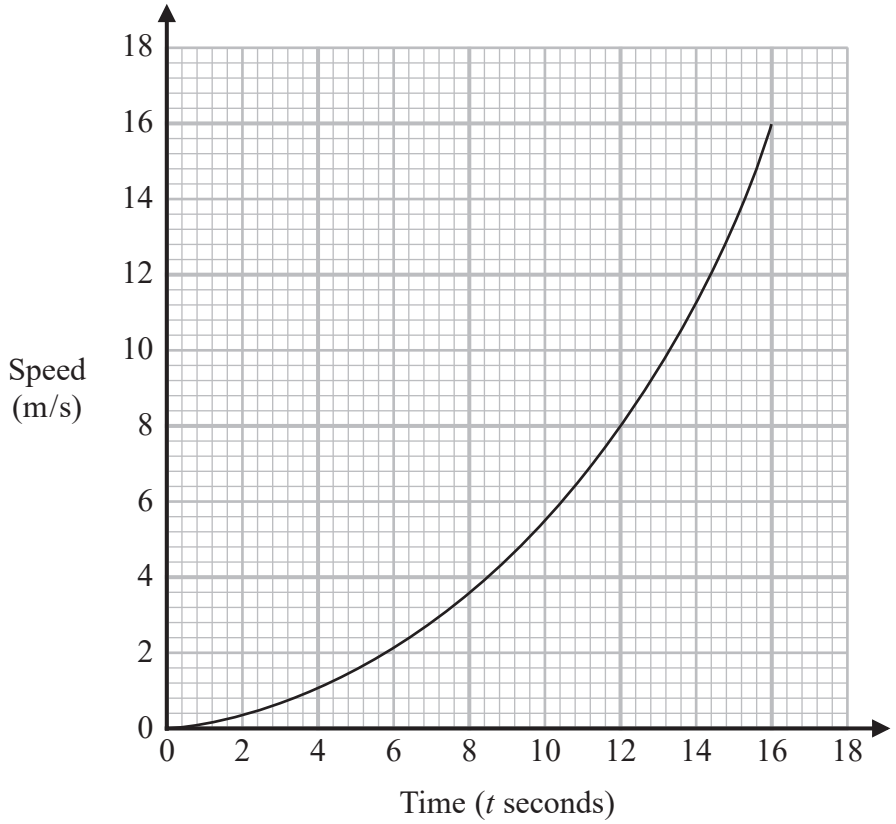
(c) When does the car begin to decelerate?

..... seconds

(1)

(Total for Question 12 is 3 marks)

13 Here is a speed-time graph for a particle moving in a straight line.



(a) (i) Use the trapezium rule to find an estimate for the area of the region under the curve between $t = 0$, $t = 16$ and the time axis.
Use 4 strips of equal width.

.....

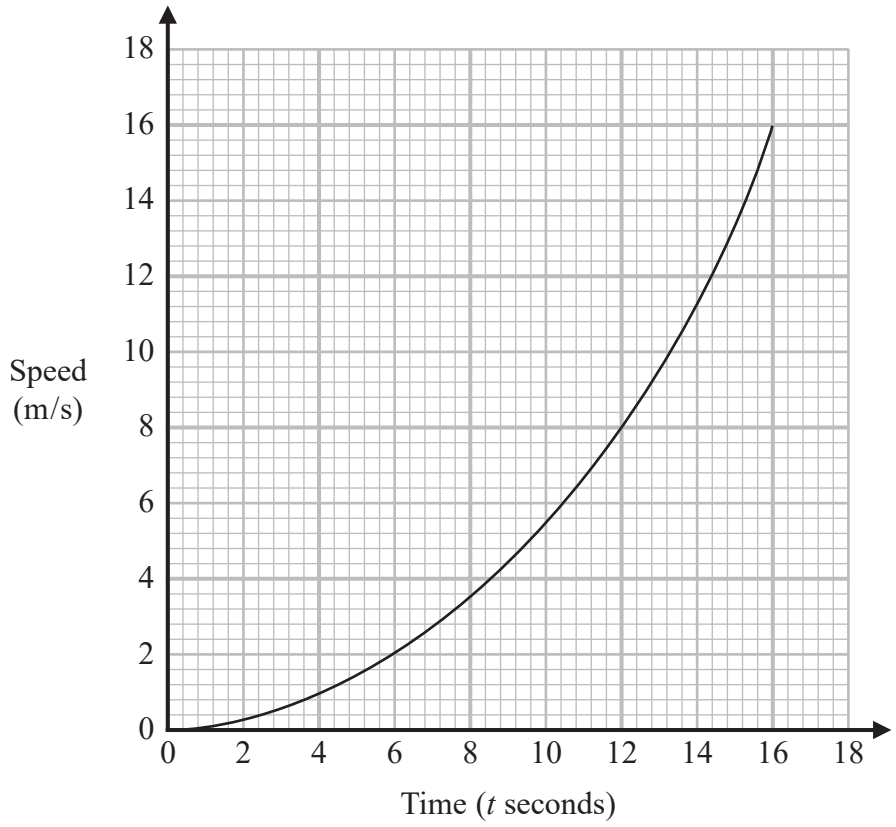
(3)

(ii) What does this area represent?

.....

.....

(1)



(b) (i) On the grid above, draw the tangent to the curve at $t = 12$

(1)

(ii) Calculate the gradient of this tangent.

.....

(2)

(c) What does the gradient of the curve at the point where $t = 12$ represent?

.....

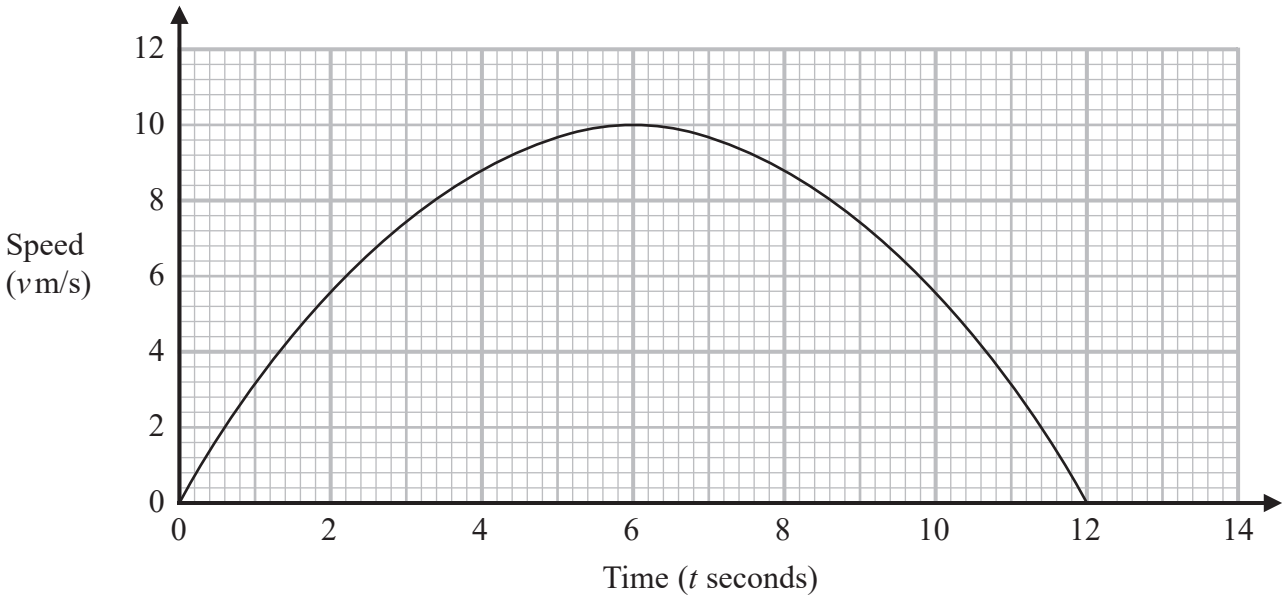
.....

(1)

(Total for Question 13 is 8 marks)

17 A ball moves so that its speed is v m/s at time t seconds after starting from rest.

The speed-time graph for the ball is drawn on the grid.



The ball is moving at its maximum speed at time T seconds.

(a) (i) Write down the value of T.

$T =$ .....

(1)

(ii) Write down the gradient of the tangent to the curve at the time when the ball is moving at its maximum speed.

.....

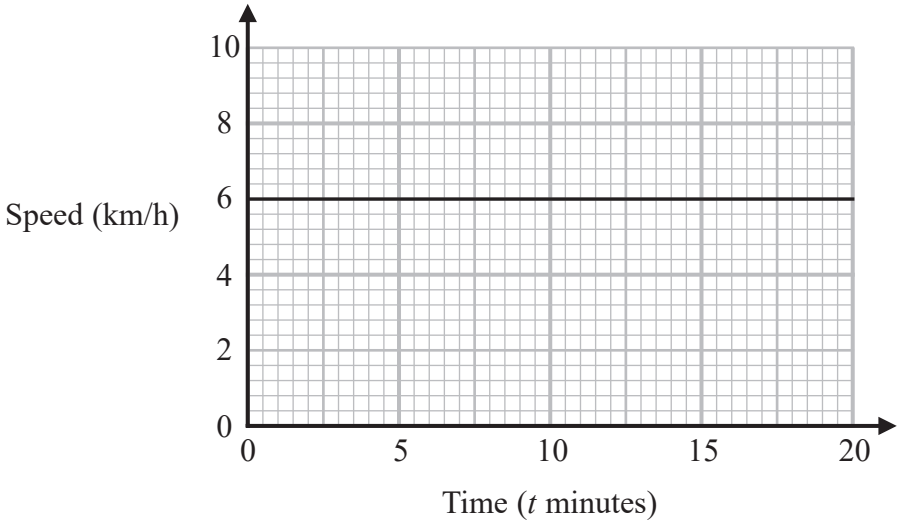
(1)

(b) Work out an estimate of the acceleration of the ball when $t = 3$

..... m/s^2

(2)

7 Here is part of a speed-time graph for a walker.



(a) Write down the acceleration of the walker for values of t between $t = 0$ and $t = 20$

.....

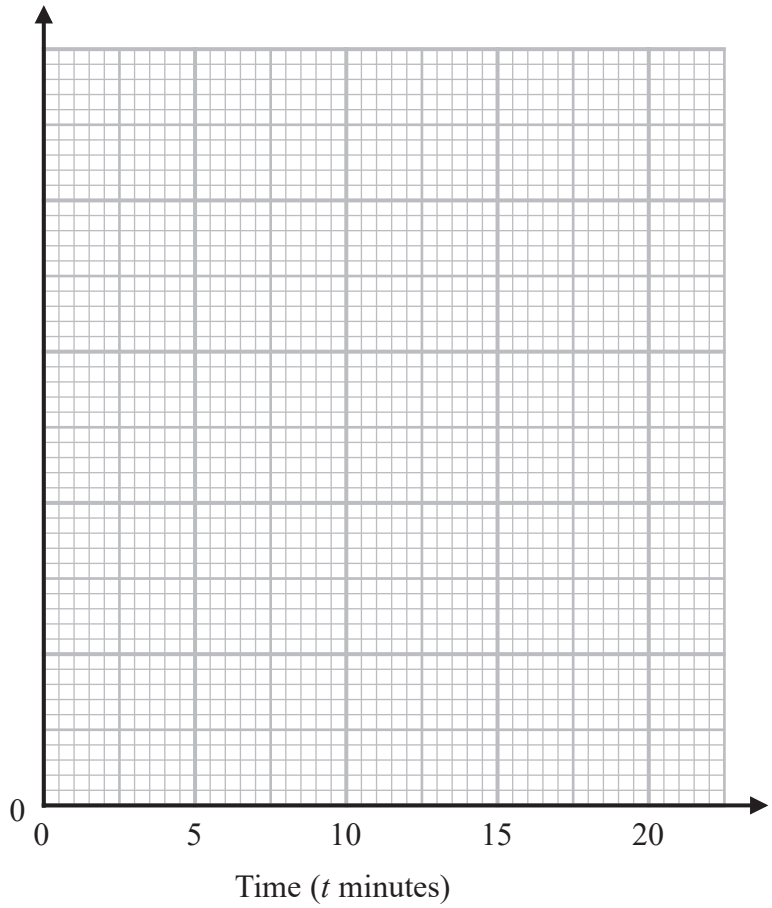
(1)

(b) Find the distance walked between $t = 0$ and $t = 20$

..... km

(2)

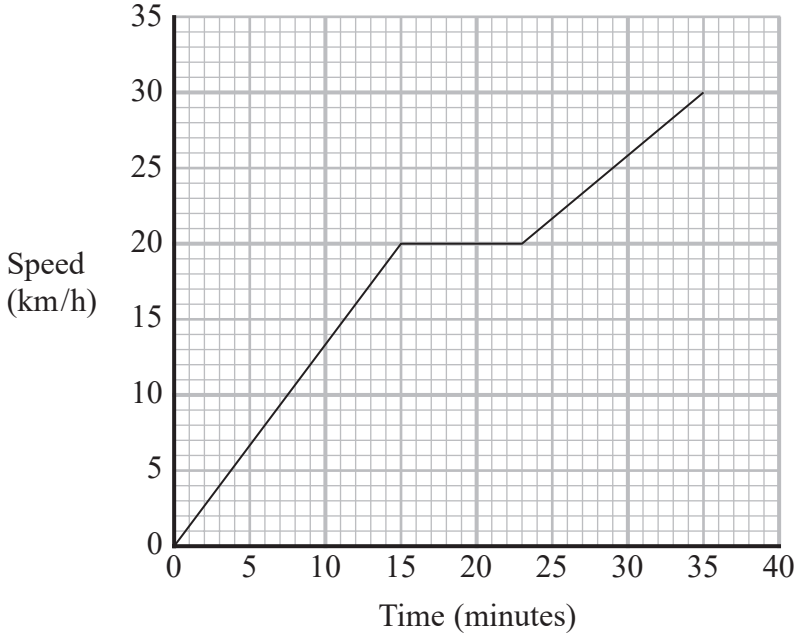
(c) On the grid below, draw a distance–time graph for the walker for values of t between $t = 0$ and $t = 20$



(2)

(Total for Question 7 is 5 marks)

22 Here is a speed-time graph for the first 35 minutes of a training ride for a cyclist.



(a) For how many minutes is the cyclist accelerating?

..... minutes

(1)

(b) Work out the greatest acceleration of the cyclist.
Give your answer in km/h^2

..... km/h^2

(2)

(c) What does the area under the graph represent?

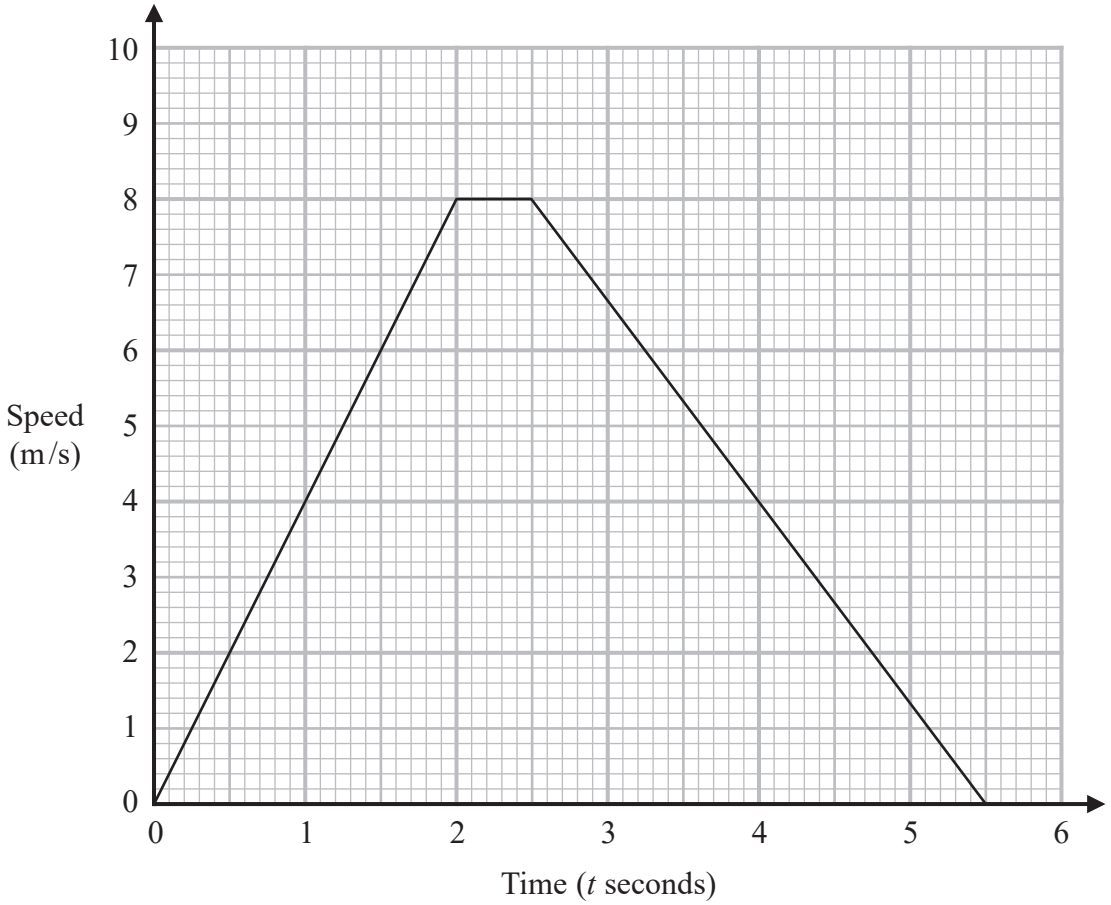
.....

(1)

(Total for Question 22 is 4 marks)

TOTAL FOR PAPER IS 90 MARKS

16 Here is a speed-time graph for a particle.



(a) Work out the total distance travelled by the particle between $t = 0$ and $t = 2.5$

..... m

(3)

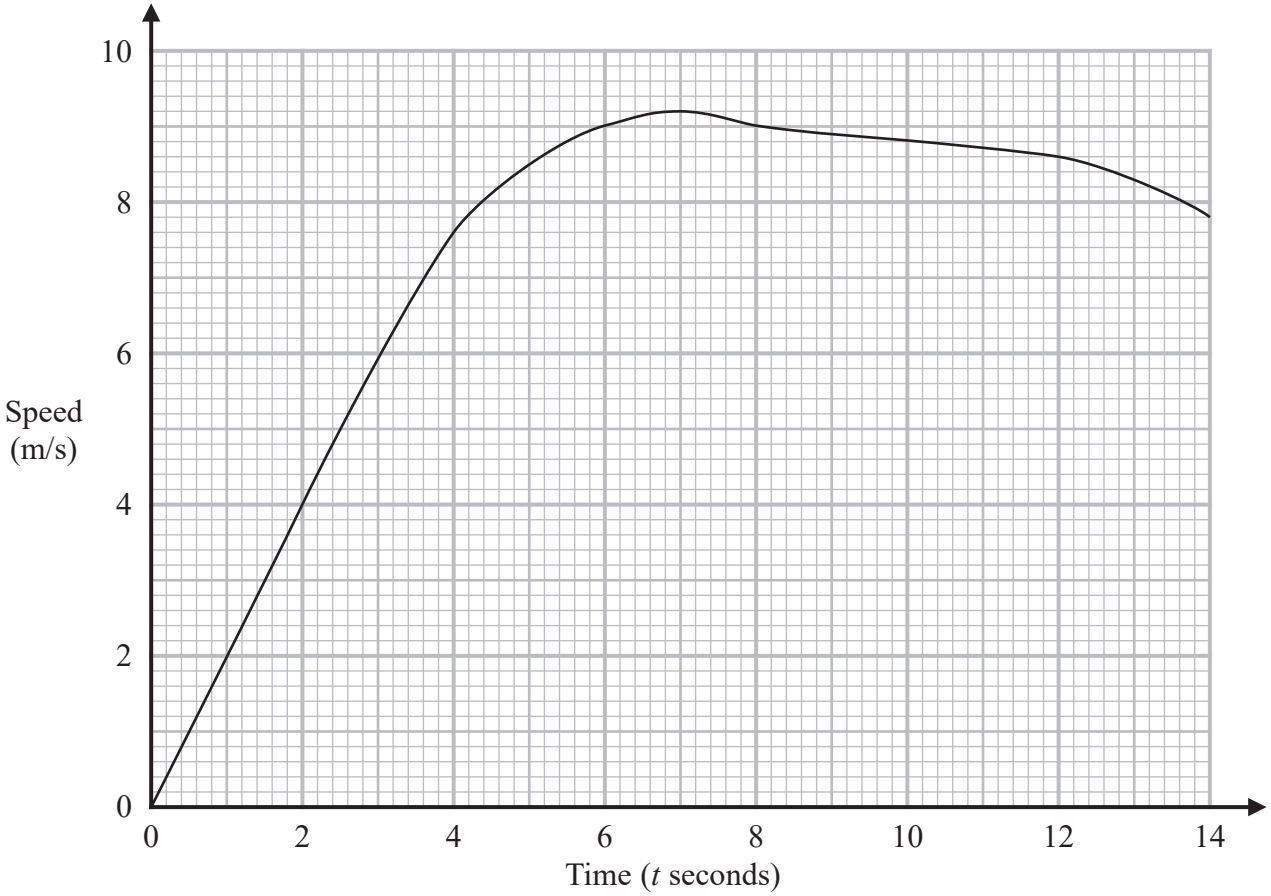
(b) Work out the deceleration of the particle between $t = 2.5$ and $t = 5.5$

..... m/s^2

(2)

(Total for Question 16 is 5 marks)

21 Here is a speed-time graph for a sprinter running a race.



(a) Find the speed of the sprinter at time $t = 4$

..... m/s

(1)

(b) For how many seconds is the sprinter accelerating?

..... seconds

(1)

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(c) Work out an estimate for the distance travelled by the sprinter between $t = 6$ and $t = 8$

..... metres

(2)

(Total for Question 21 is 4 marks)

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