Name: SOLUTIONS

GCSE (1 - 9)

Velocity Time Graphs

Solutions by
Kenneth Stafford
MATHS TUTOR
ken@kennethstafford.co.uk

These questions are compiled from released Pearson Edexcel GCSE maths exam papers

They contain exam questions from up until the ***November 2023*** exam series

More recent exam papers do exist but are withheld for mock exams

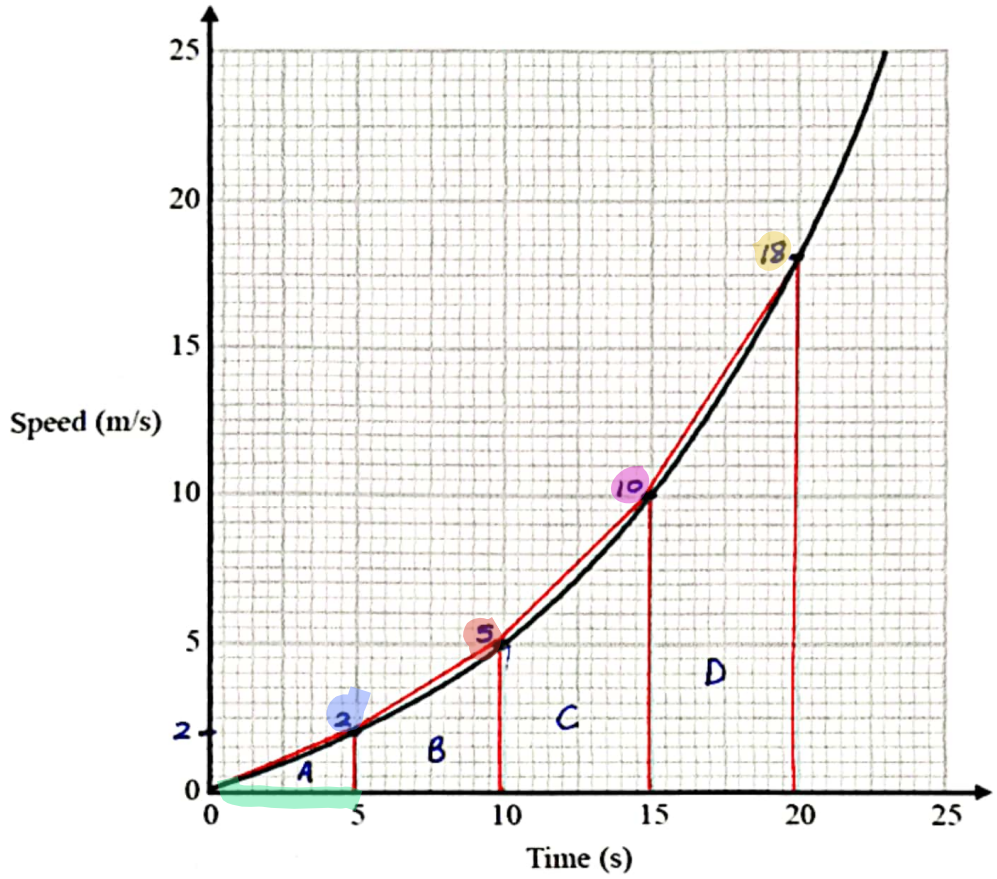
As new exam papers are released these worksheets will gradually be updated

The **most current** version of these worksheets will always be available at: kennethstafford.co.uk

Past Papers:	Similar Worksheets:
Solutions:	This worksheet:

1

Here is a speed-time graph for a train.



(a) Work out an estimate for the distance the train travelled in the first 20 seconds.
Use 4 strips of equal width.

$A = \frac{5 \times 2}{2} = 5$

$B = \frac{1}{2}(2+5) \times 5 = 17.5$

$C = \frac{1}{2}(5+10) \times 5 = 37.5$

$D = \frac{1}{2}(10+18) \times 5 = 70$

$5 + 17.5 + 37.5 + 70 = 130$

130 m

(3)

(b) Is your answer to (a) an underestimate or an overestimate of the actual distance the train travelled?
Give a reason for your answer.

Overestimate. The area is smaller so the distance travelled is less.

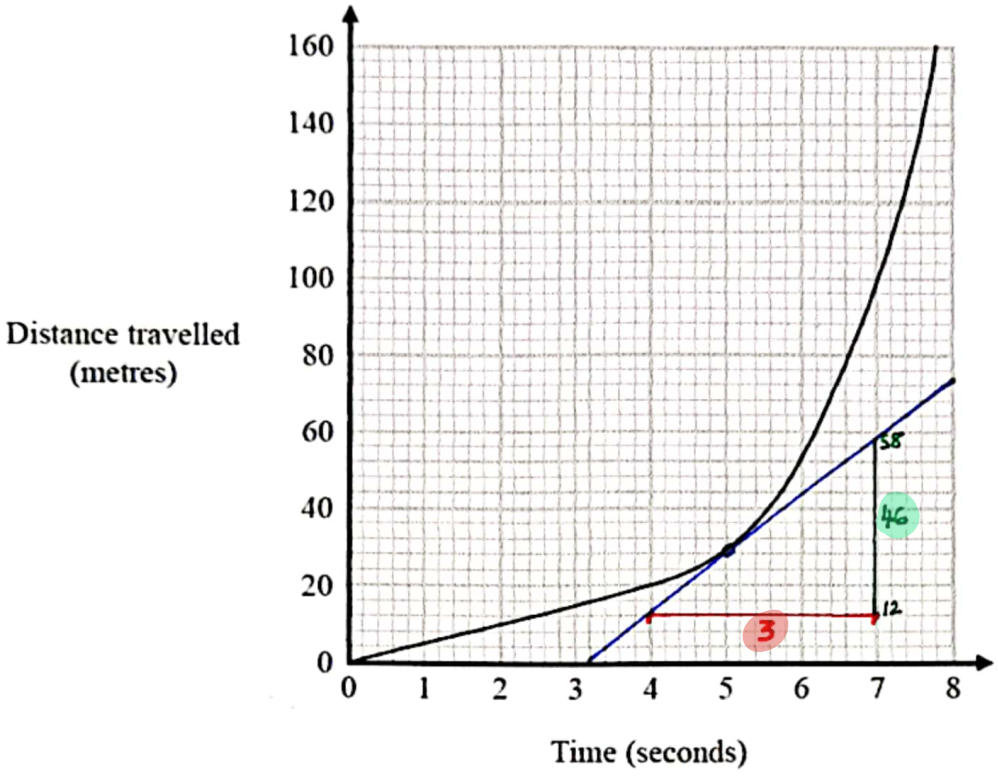
(1)

(Total for Question 18 is 4 marks)

[Edexcel, GCSE, Autumn 2017, Paper 3H, Q18]

2

The distance-time graph shows information about part of a car journey.



Use the graph to estimate the speed of the car at time 5 seconds.

Gradient = $\frac{46}{3} = 15.\dot{3}$

[Any answer between 11 and 19]

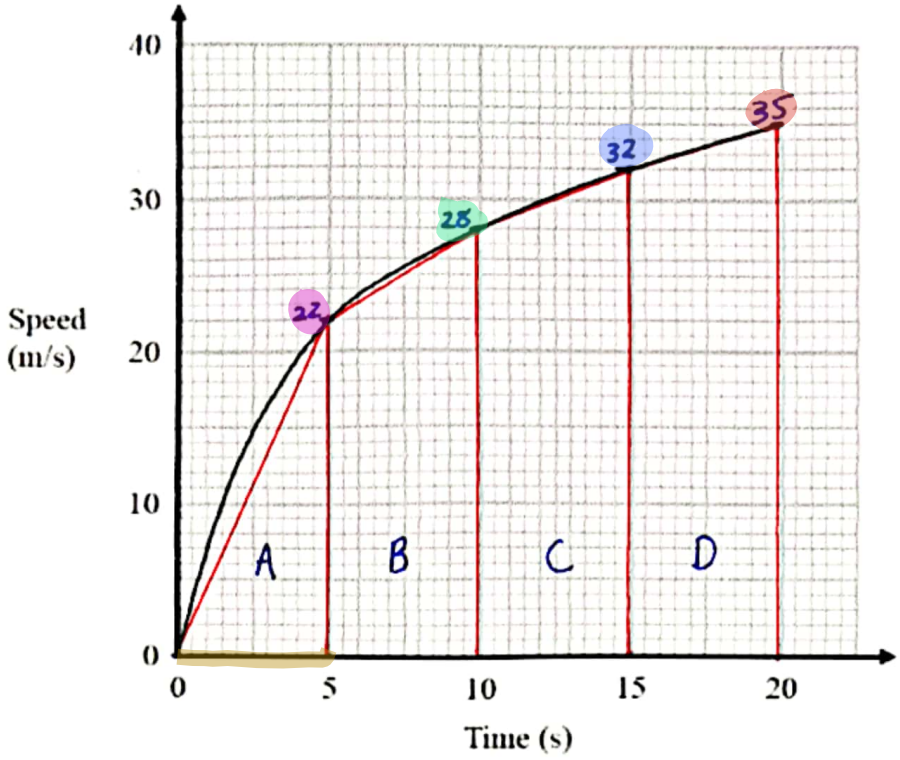
$15.\dot{3}$ m/s

(Total for Question 14 is 3 marks)

[Edexcel, GCSE, Summer 2018, Paper 2H, Q14]

3

The graph shows the speed of a car, in metres per second, during the first 20 seconds of a journey.



(a) Work out an estimate for the distance the car travelled in the first 20 seconds.
Use 4 strips of equal width.

$A = \frac{5 \times 22}{2} = 55$

$B = \frac{1}{2}(22+28) \times 5 = 125$

$C = \frac{1}{2}(28+32) \times 5 = 150$

$D = \frac{1}{2}(32+35) \times 5 = 167.5$

$55+125+150+167.5 = 497.5$

497.5 metres

(3)

[488 - 507 accepted]

(b) Is your answer to part (a) an underestimate or an overestimate of the actual distance the car travelled in the first 20 seconds?
Give a reason for your answer.

Underestimate. Area under the curve was slightly bigger so car actually went further.

(1)

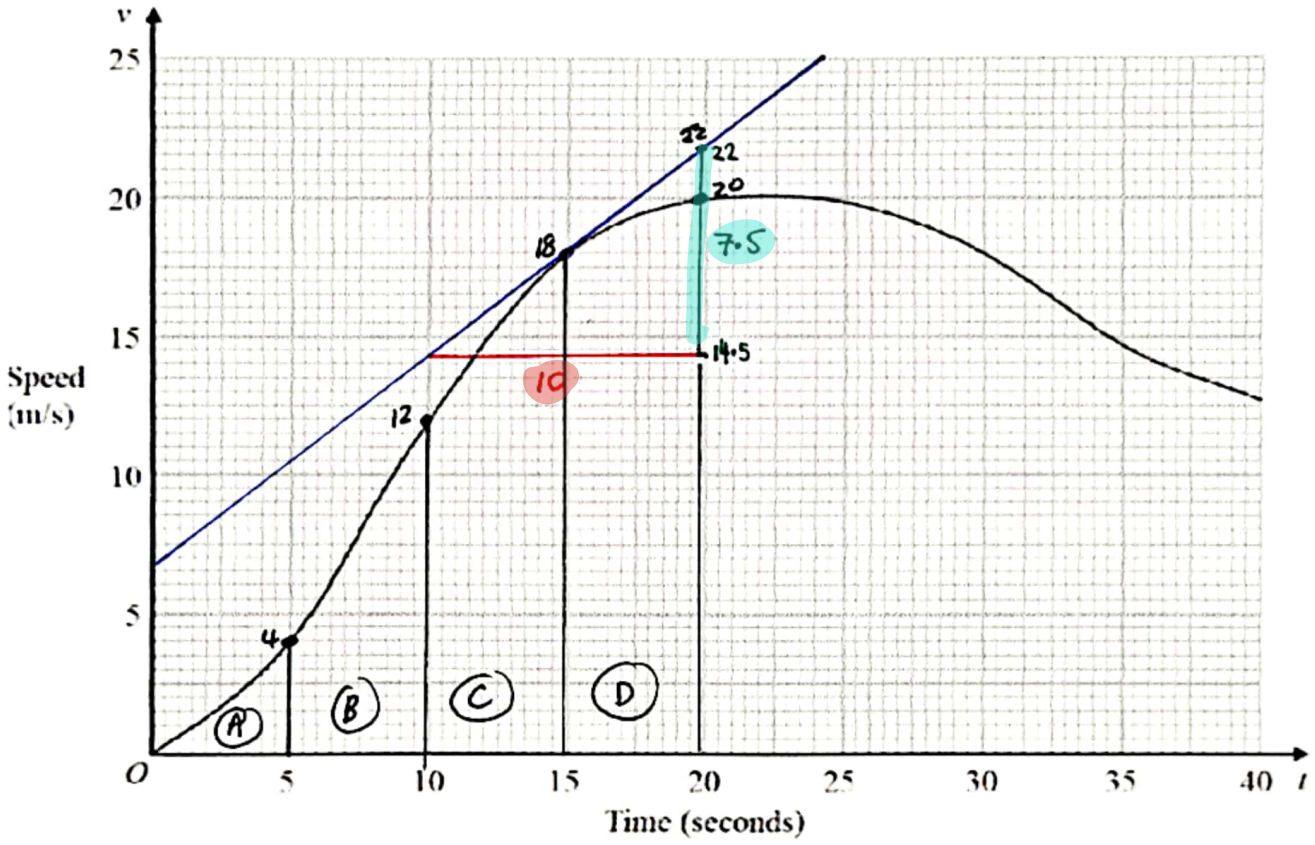
(Total for Question 15 is 4 marks)

[Edexcel, GCSE, Summer 2018, Paper 3H, Q15]

4

A car moves from rest.

The graph gives information about the speed, v metres per second, of the car t seconds after it starts to move.



(a) (i) Calculate an estimate of the gradient of the graph at $t = 15$

[0·6 to 1·0 accepted]

gradient = $\frac{7.5}{10}$ = 0·75

0·75

(3)

(ii) Describe what your answer to part (i) represents.

The rate of change of the speed — acceleration

(1)

(b) Work out an estimate for the distance the car travels in the first 20 seconds of its journey. Use 4 strips of equal width.

(A) = $\frac{5 \times 4}{2}$ = 10

(B) = $\frac{1}{2}(4+12) \times 5 = 40$

(C) = $\frac{1}{2}(12+18) \times 5 = 75$

(D) = $\frac{1}{2}(18+20) \times 5 = 95$

10 + 40 + 75 + 95 = 220 m

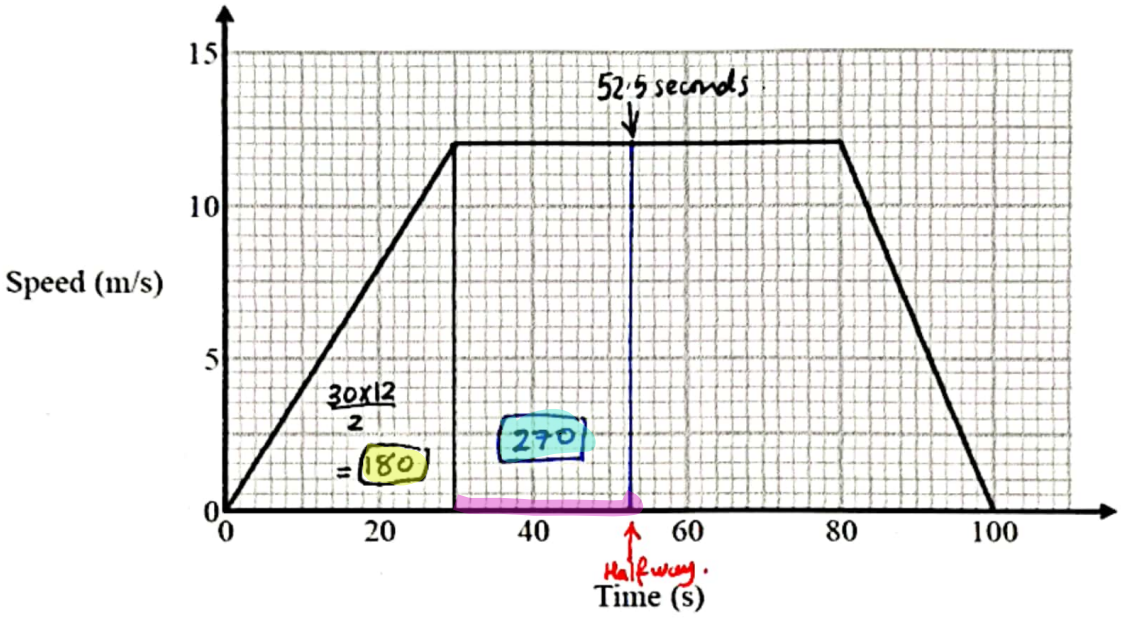
(3)

(Total for Question 14 is 7 marks)

[Edexcel, GCSE, Summer 2019, Paper 2H, Q14]

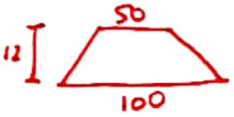
5

Here is a speed-time graph for a train journey between two stations.
The journey took 100 seconds.



(a) Calculate the time taken by the train to travel half the distance between the two stations.
You must show all your working.

Distance = $\frac{1}{2}(100+50)\times 12$ = 900m



Area of trapezium = distance

Half distance = $\frac{900}{2}$ = 450m (Need to find this area)

450 − 180 = 270

270 ÷ 12 = 22·5

30 + 22·5 = 52·5

..... seconds

(4)

(b) Compare the acceleration of the train during the first part of its journey with the acceleration of the train during the last part of its journey.

First part = $\frac{12}{30}$ = 0·4 m/s² (positive – so acceleration)

Second part = $\frac{-12}{20}$ = −0·6 m/s² (negative – so deceleration.

Acceleration is greater (rate of change) in the last part of the journey

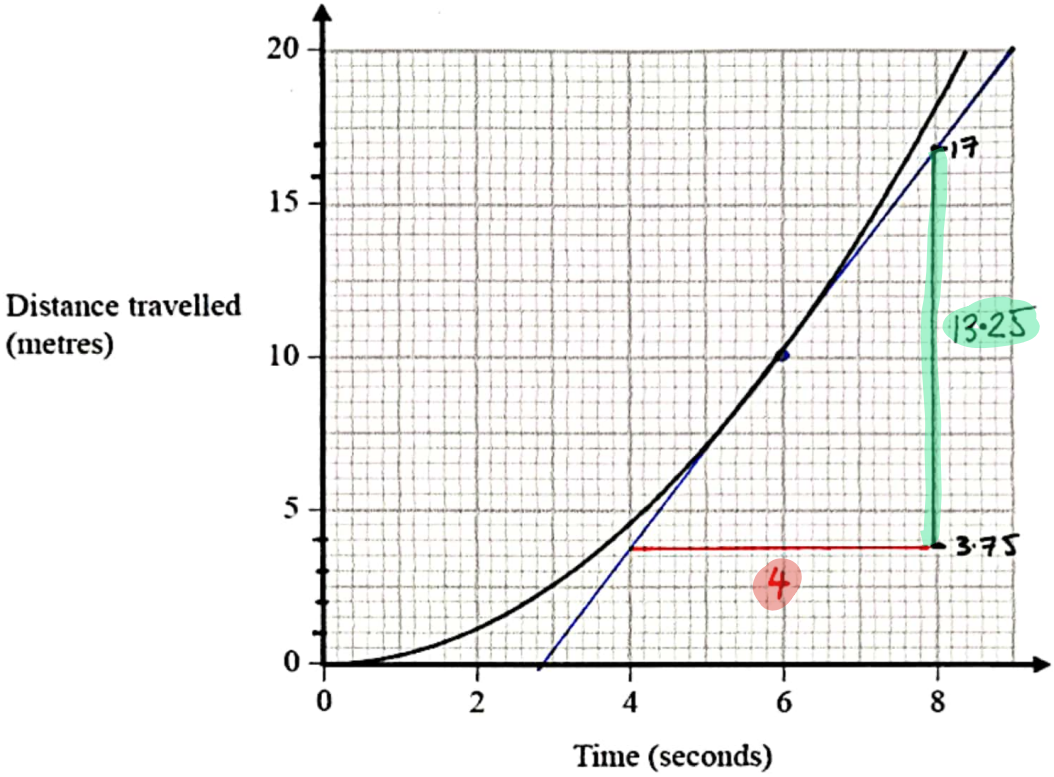
(1)

(Total for Question 21 is 5 marks)

[Edexcel, GCSE, Autumn 2019, Paper 2H, Q21]

6

The graph shows information about part of a cyclist's journey.



Work out an estimate of the speed, in m/s, of the cyclist at time 6 seconds.

[3·05 to 3·7 accepted]

Gradient = $\frac{13·25}{4}$ = 3·3125

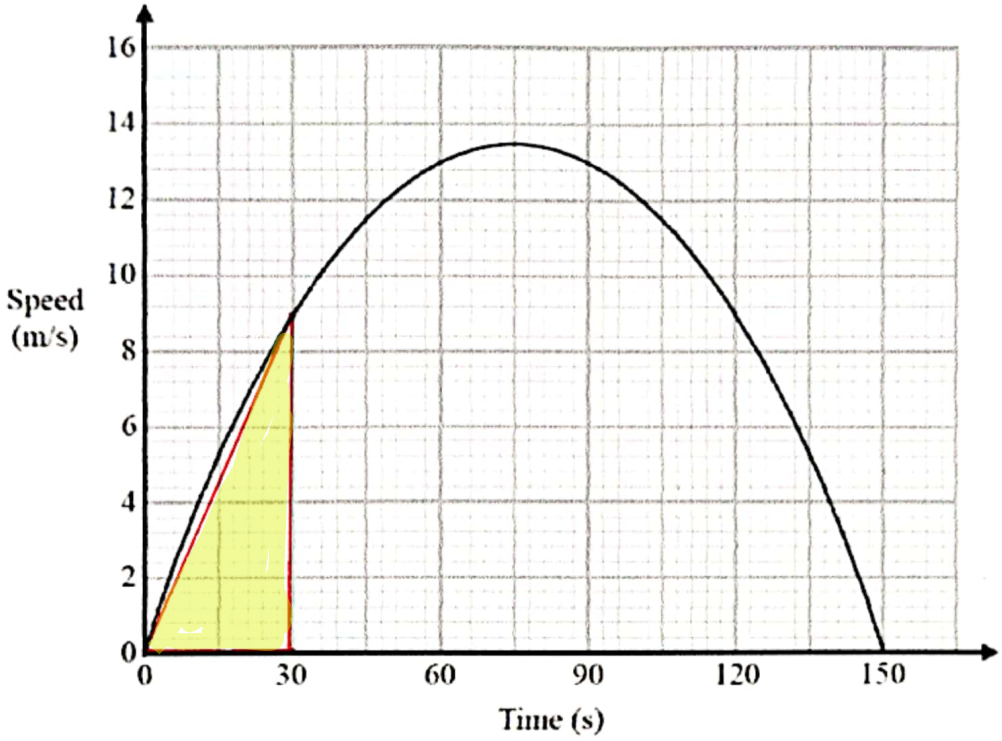
3·3125 m/s

(Total for Question 19 is 3 marks)

[Edexcel, GCSE, Autumn 2019, Paper 3H, Q19]

7

Here is a speed-time graph for a car.



(a) Work out an estimate for the distance the car travelled in the first 30 seconds.



Area = $\frac{1}{2}(30 \times 9) = 135$

135 m

(2)

[129 to 160 accepted]

(b) Is your answer to part (a) an underestimate or an overestimate of the actual distance the car travelled in the first 30 seconds?
Give a reason for your answer.

Underestimate area calculated smaller than curved area so actual distance travelled would be greater.

(1)

Julian used the graph to answer this question.

> Work out an estimate for the acceleration of the car at time 60 seconds.

Here is Julian's working.

$$\text{acceleration} = \text{speed} \div \text{time}$$

$$= 13 \div 60$$

$$= 0.21\dot{6} \text{ m/s}^2$$

Julian's method does not give a good estimate of the acceleration at time 60 seconds.

(c) Explain why.

This would give average acceleration over the first 60 seconds. He should draw a tangent at 60 seconds and work out the gradient of the tangent.

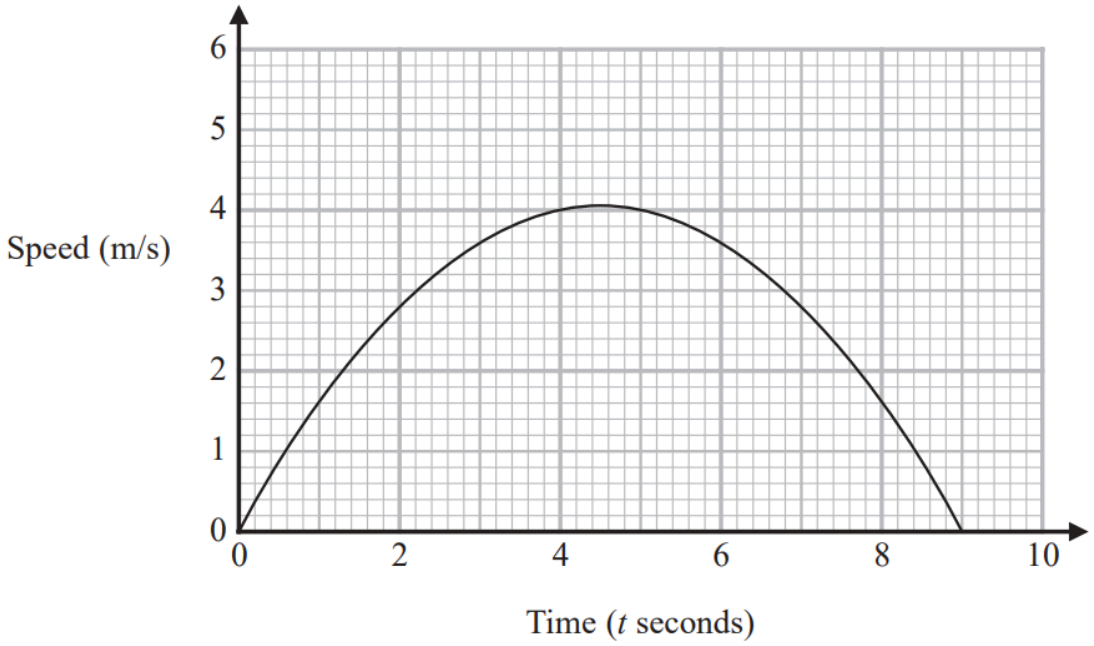
(1)

(Total for Question 16 is 4 marks)

[Edexcel, GCSE, Autumn 2020, Paper 3H, Q16]

8

Here is a speed-time graph.



(a) Work out an estimate of the gradient of the graph at $t = 2$

.....

(3)

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

.....

.....

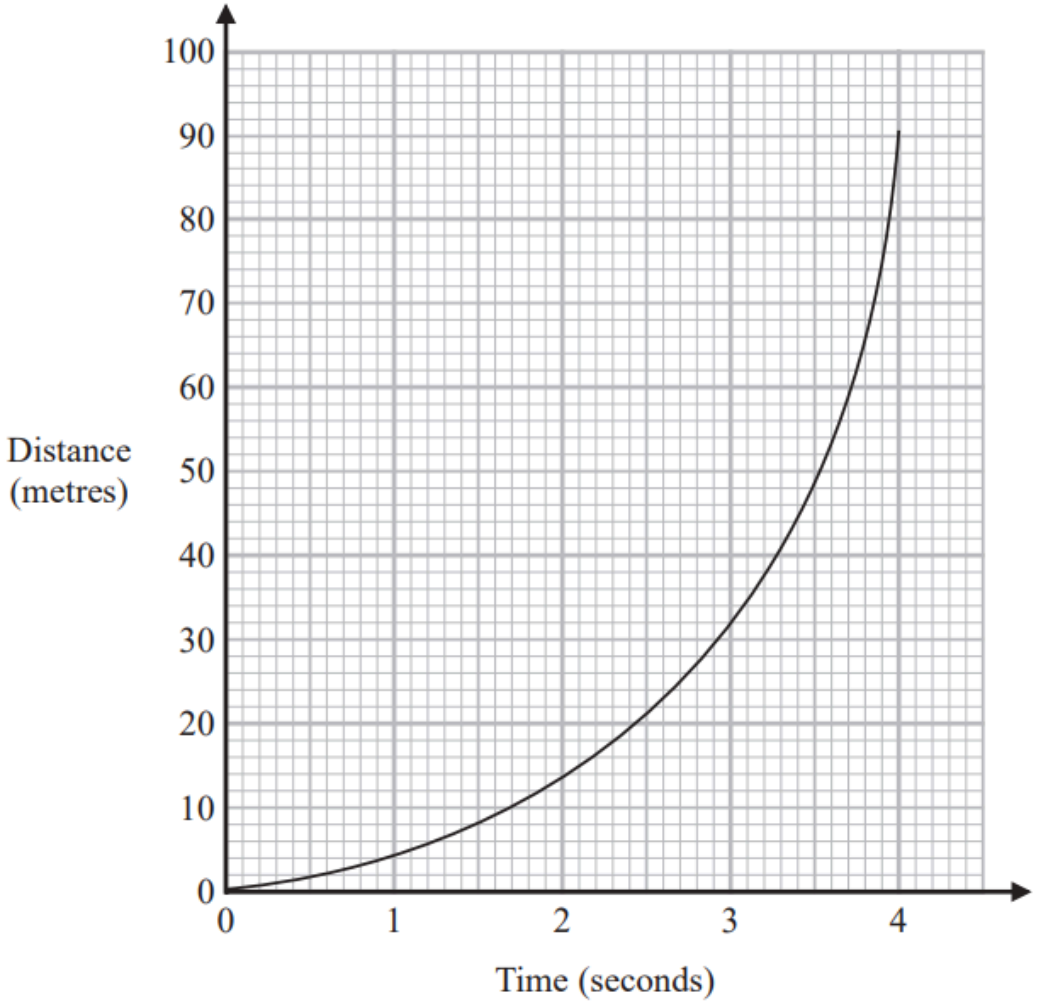
(1)

(Total for Question 14 is 4 marks)

[Edexcel, GCSE, Summer 2022, Paper 1H, Q14]

9

Here is a distance-time graph.



(a) Find an estimate of the gradient of the graph at time 2.5 seconds.
You must show how you get your answer.

.....

(3)

(b) What does the gradient of the graph represent?

.....

.....

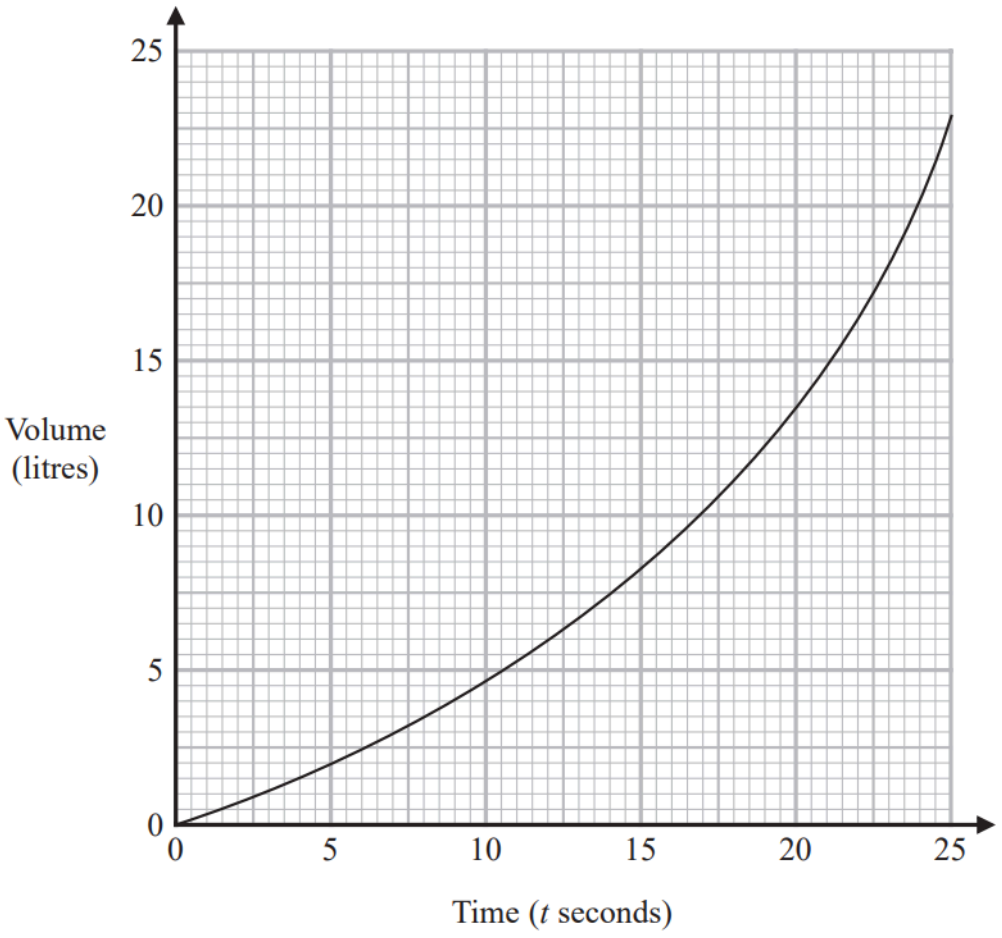
(1)

(Total for Question 17 is 4 marks)

[Edexcel, GCSE, Summer 2023, Paper 3H, Q17]

10

The graph below gives the volume, in litres, of water in a container t seconds after the water starts to fill the container.



(a) Calculate an estimate for the gradient of the graph when $t = 17.5$
You must show how you get your answer.

.....

(3)

(b) Describe fully what the gradient in part (a) represents.

.....

.....

.....

(1)

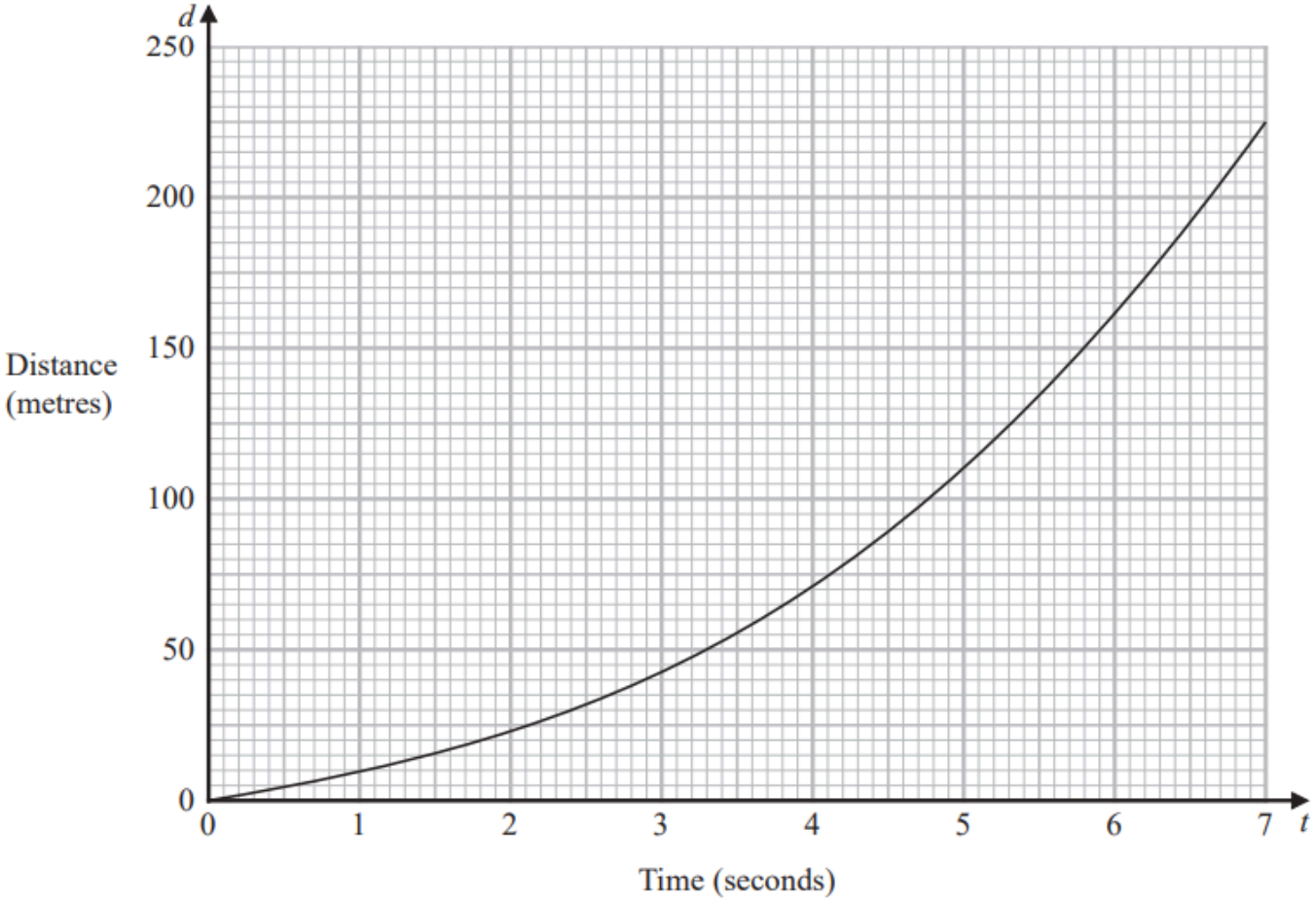
(Total for Question 21 is 4 marks)

[Edexcel, GCSE, November 2022, Paper 2H, Q21]

11

15 An object falls from rest.

Here is the distance-time graph for the distance (d metres) fallen by the object t seconds after it starts to fall.



Work out an estimate for the gradient of the graph at $t = 3$
You must show how you get your answer.

.....

(Total for Question 15 is 3 marks)

[Edexcel, GCSE, November 2023, Paper 1H, Q15]