Name: _____

GCSE (1 – 9)

Velocity Time Graphs

Instructions

- Use **black** ink or ball-point pen.
- Answer all questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**

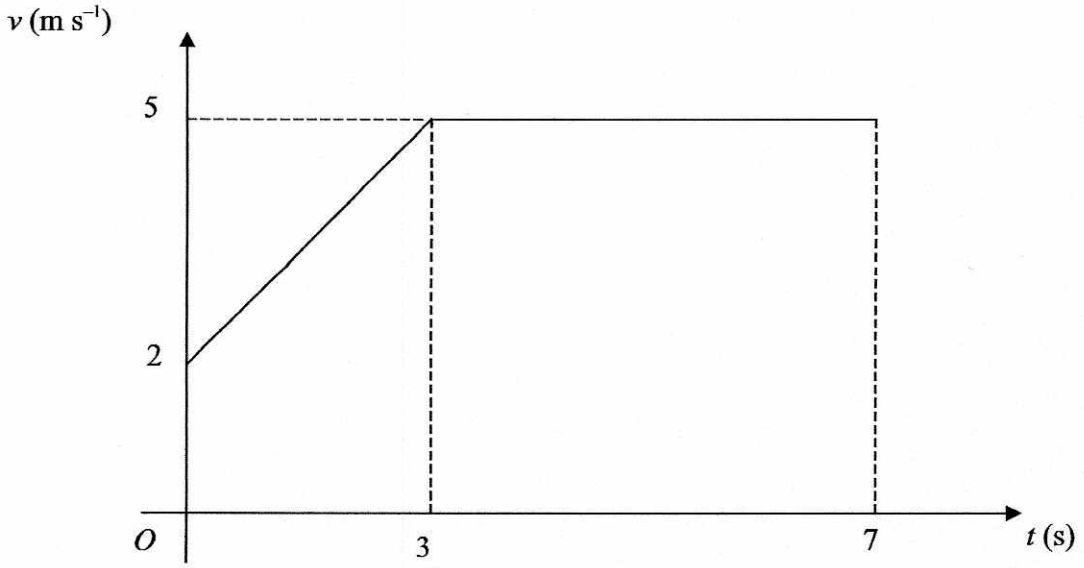
Information

- The marks for each question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end

1 Below is the sketch of a speed time graph for a cyclist moving on a straight road for 7 seconds.



(a) Work out the acceleration for the first 3 seconds.

acceleration = gradient

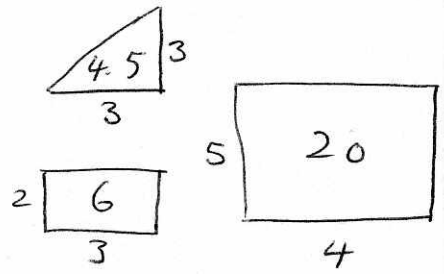
$\frac{\text{change in } y}{\text{change in } x} = \frac{5-2}{3-0} = \frac{3}{3} = 1$

1 ms^{-2}

(2)

(b) Calculate the total distance covered by the cyclist.

total distance = area under graph

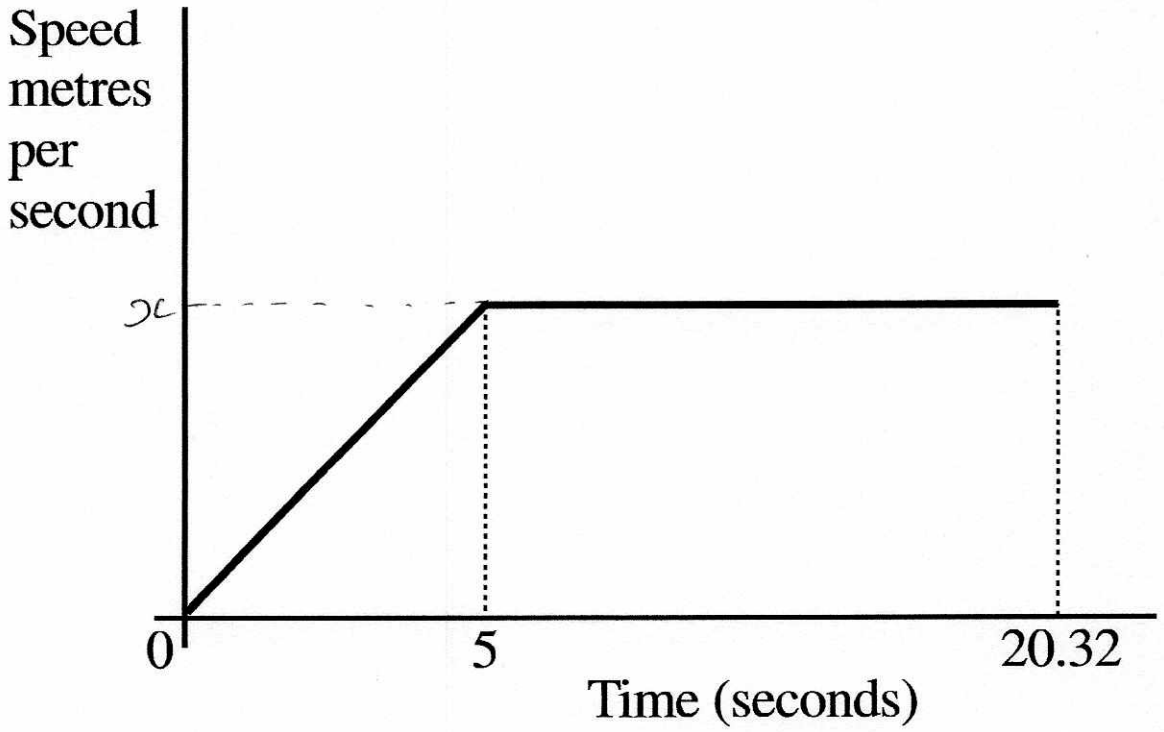


30.5 m

(2)

(Total for question 1 is 4 marks)

2 A sprinter runs a race of 200 m.
His total time for running the race is 20.32s.
Below is a sketch of the speed-time graph for the motion of the sprinter.



(a) Work out the maximum speed of the sprinter during the race.

Total area = 200m

Total area = distance under graph

$\frac{5x}{2}$ | 15.32x

$\frac{5x}{2} + 15.32x = 200$

$2.5x + 15.32x = 200$

$17.82x = 200$

$x = \frac{200}{17.82} = 11.2$ m/s (3sf)

11.2 ms^{-1}

(4)

(b) Calculate the distance covered by the sprinter in the first 5 seconds of the race.

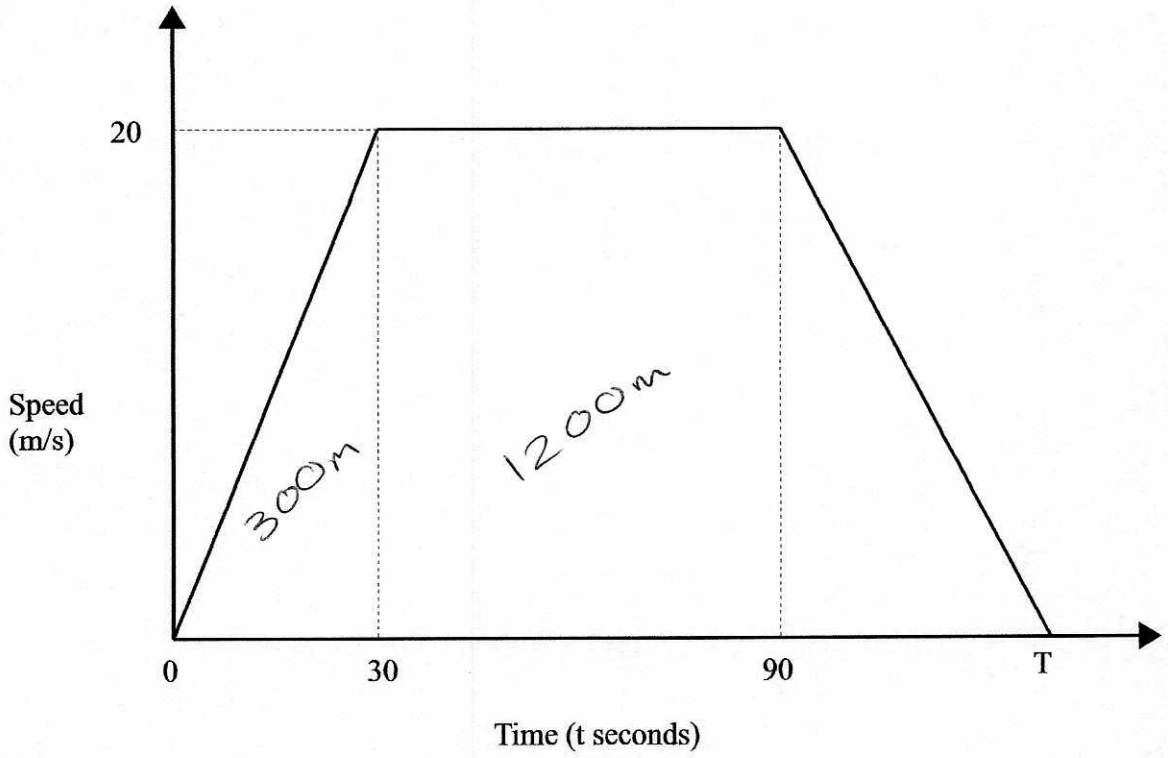
$\frac{5(11.2)}{2} = 28.1$ m (3sf)

28.1 m

(2)

(Total for question 2 is 6 marks)

3 Here is a speed-time graph for a train journey between 2 stations.



The train travelled 2km in T seconds.

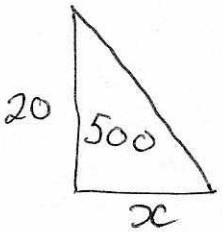
Work out the value of T.

2000m

Total distance = area under graph

1500m in 90 seconds.

2000 - 1500 = 500m (left)



$\frac{20x}{2} = 500$

$10x = 500$

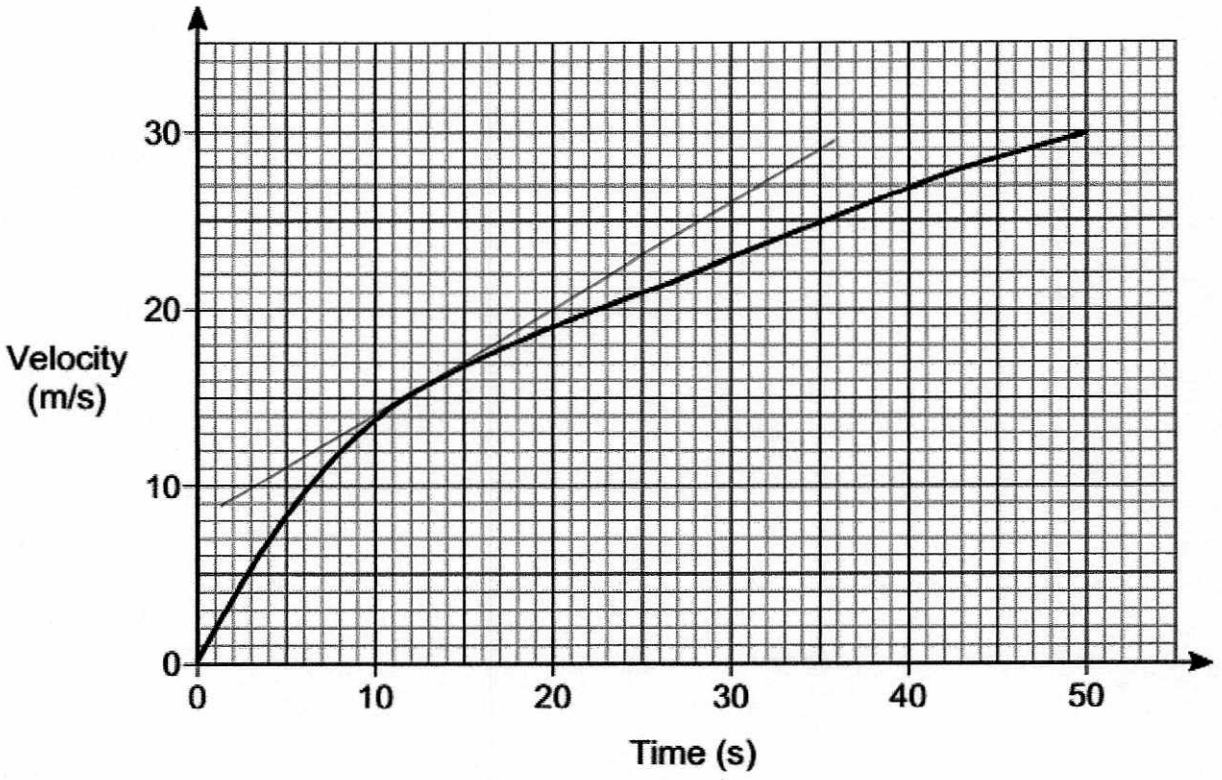
$x = 50$

90 + 50 = 140

140

(Total for question 3 is 3 marks)

4 Here is the velocity-time graph of a car for 50 seconds.



(a) Work out the average acceleration during the 50 seconds.

Give the units of your answer.

$\frac{30}{50} = 0.6\,ms^{-2}$

$0.6\,ms^{-2}$

(2)

(b) Estimate the time during the 50 seconds when the instantaneous acceleration = the average acceleration.
You must show your working on the graph.

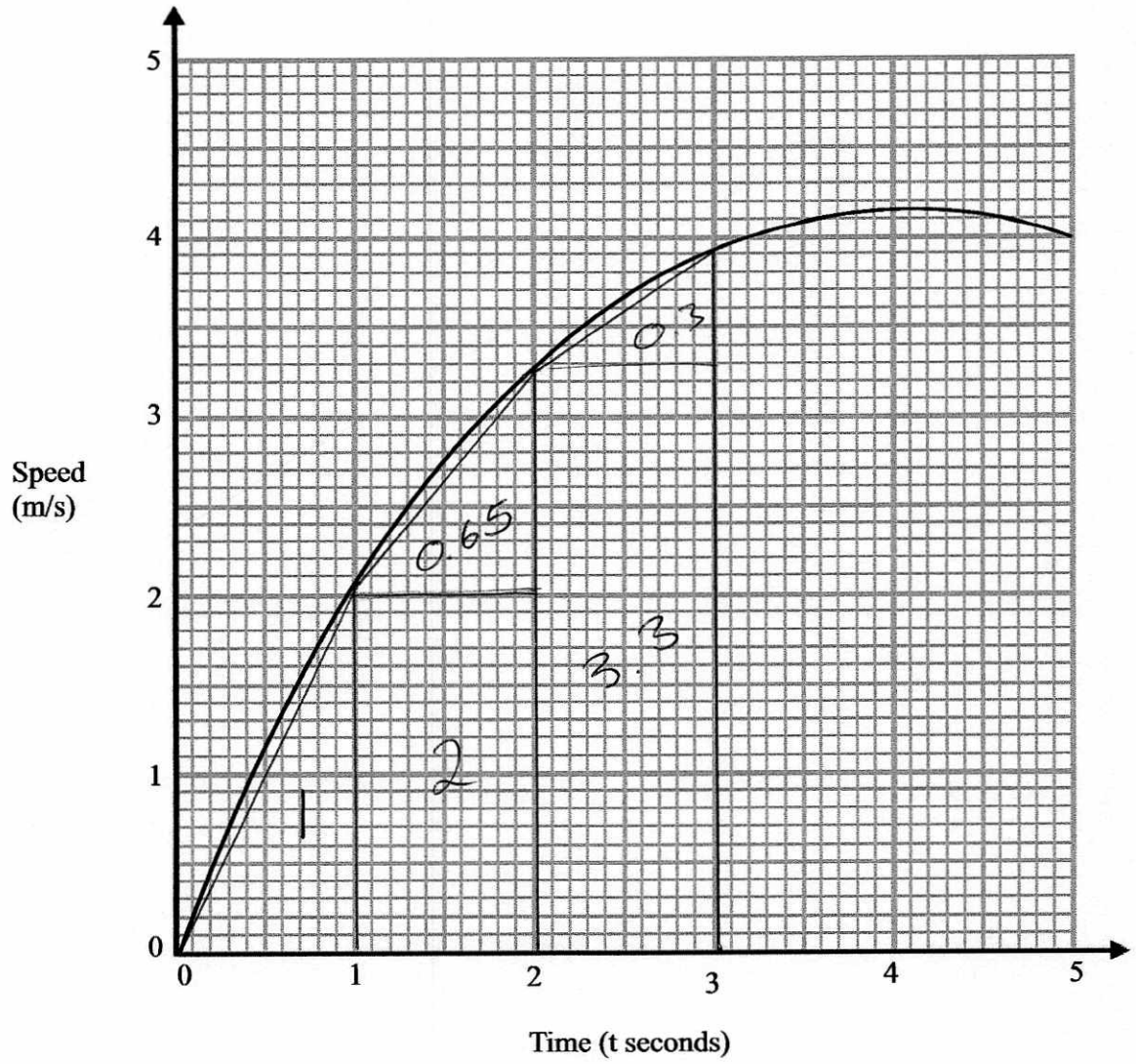
12 seconds

(2)

(11 - 13 seconds)

(Total for question 4 is 4 marks)

5 Here is a speed-time graph.



(a) Use 3 strips of equal width to find an estimate for the area under the graph for the first 3 seconds.

7.25

(3)

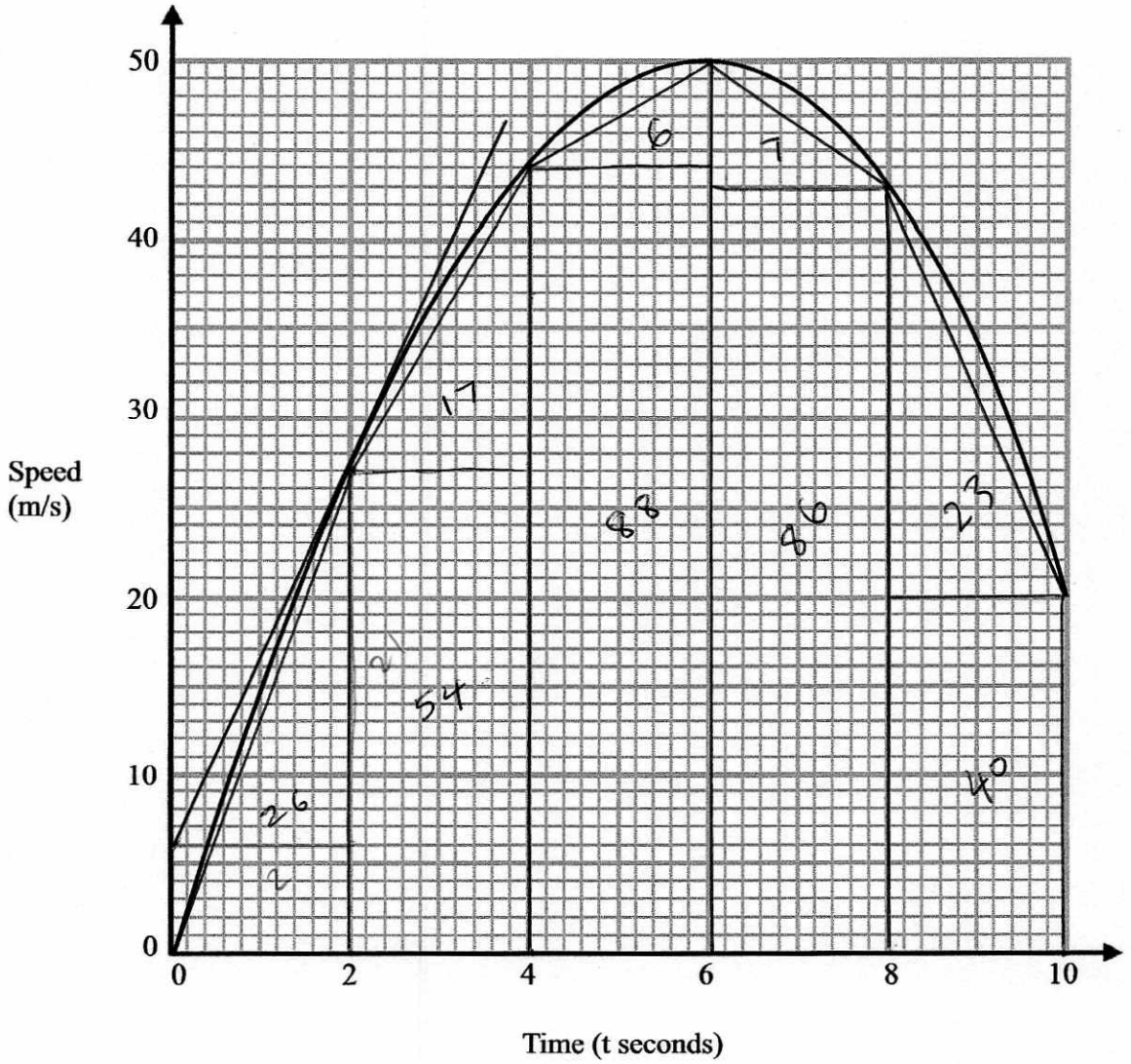
(b) Describe what your answer to part a represents.

The distance travelled in the first 3 seconds. 7.25m.

(1)

(Total for question 5 is 4 marks)

6 Here is a speed-time graph.



(a) Work out an estimate for the acceleration when t = 2.

$\frac{21}{2}$

10.5 ms^{-2}

(2)

(b) Use 5 strips of equal width to find an estimate for the distance travelled in 10 seconds.

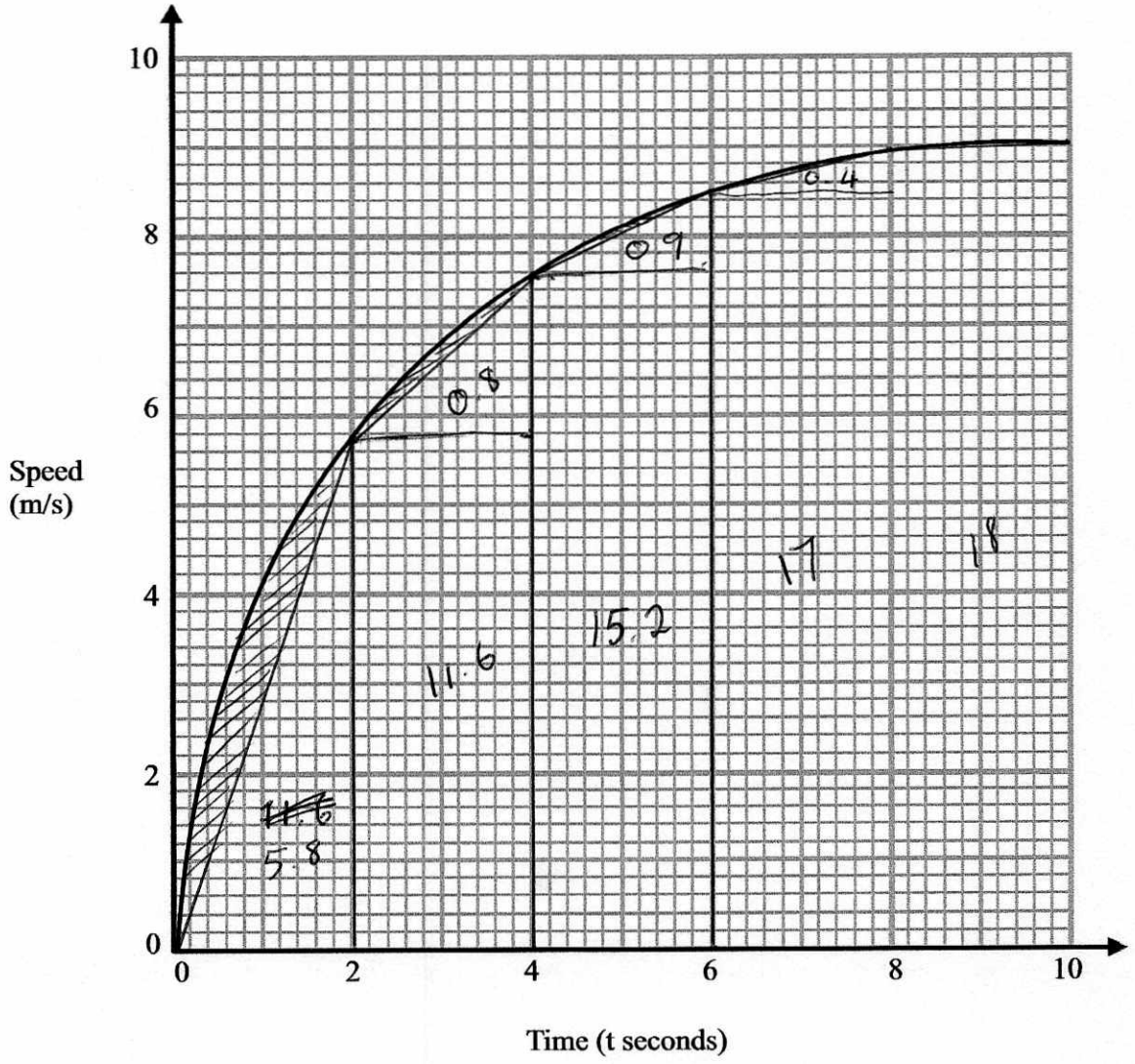
26 + 54 + 17 + 88 + 6 + 86 + 7 + 40 + 23

347 m

(3)

(Total for question 6 is 5 marks)

7 Here is a speed-time graph.



(a) Use 5 strips of equal width to find an estimate for the distance travelled in 10 seconds.

69.7 m

(3)

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

underestimate. The actual area under the curve is greater, approximation does not include shaded area above.

(1)

(Total for question 7 is 4 marks)