Name:

Exam Style Questions

Area Under a Graph

Corbettmaths

Ensure you have: Pencil, pen, ruler, protractor, pair of compasses and eraser

You may use tracing paper if needed

Guidance

1. Read each question carefully before you begin answering it.
2. Don't spend too long on one question.
3. Attempt every question.
4. Check your answers seem right.
5. Always show your workings

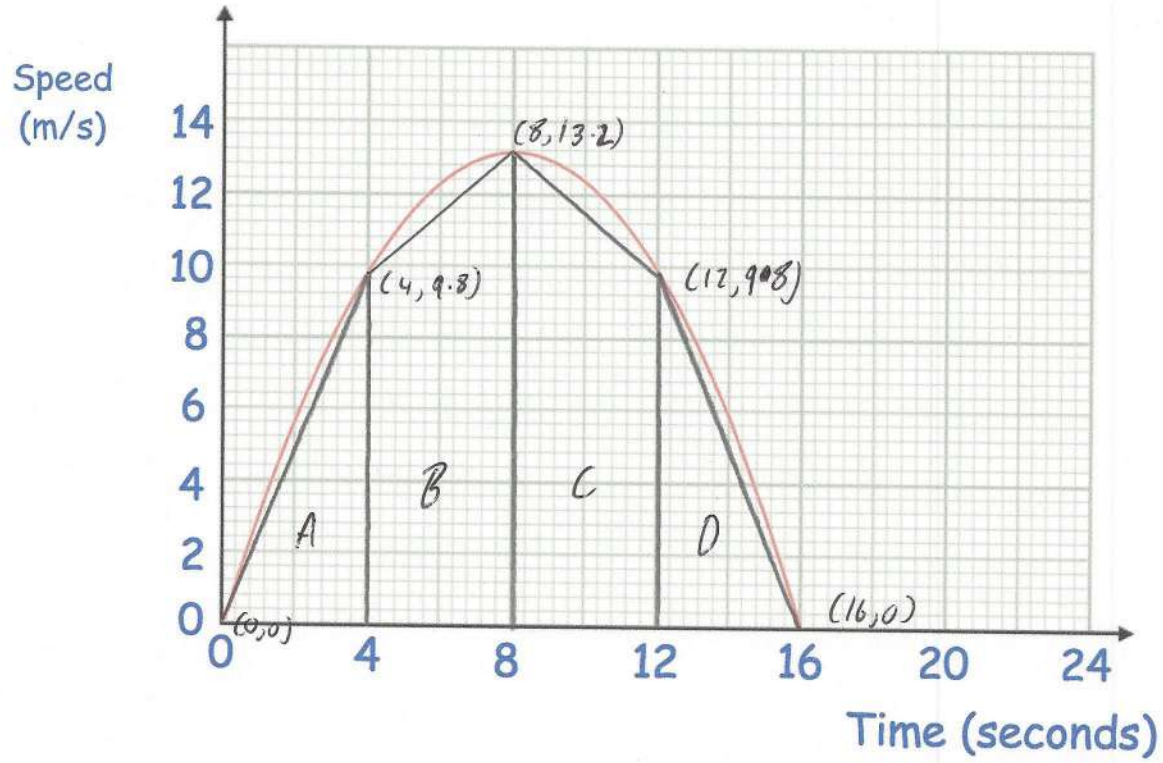
Revision for this topic

www.corbettmaths.com/contents

Video 389

* Answers may vary slightly and still be awarded full marks

1. Here is a speed-time graph for a toy rocket.



(a) Work out an estimate for the distance the rocket travelled in the 16 seconds.
Use 4 strips of equal width.

Area of A: $\frac{1}{2} \times 4 \times 9.8 = 19.6$

Area of B = $\frac{1}{2}(9.8 + 13.2) \times 4 = 46$

Area of C = $\frac{1}{2}(9.8 + 13.2) \times 4 = 46$

Area of D = $\frac{1}{2} \times 4 \times 9.8 = 19.6$

131.2 ..... m

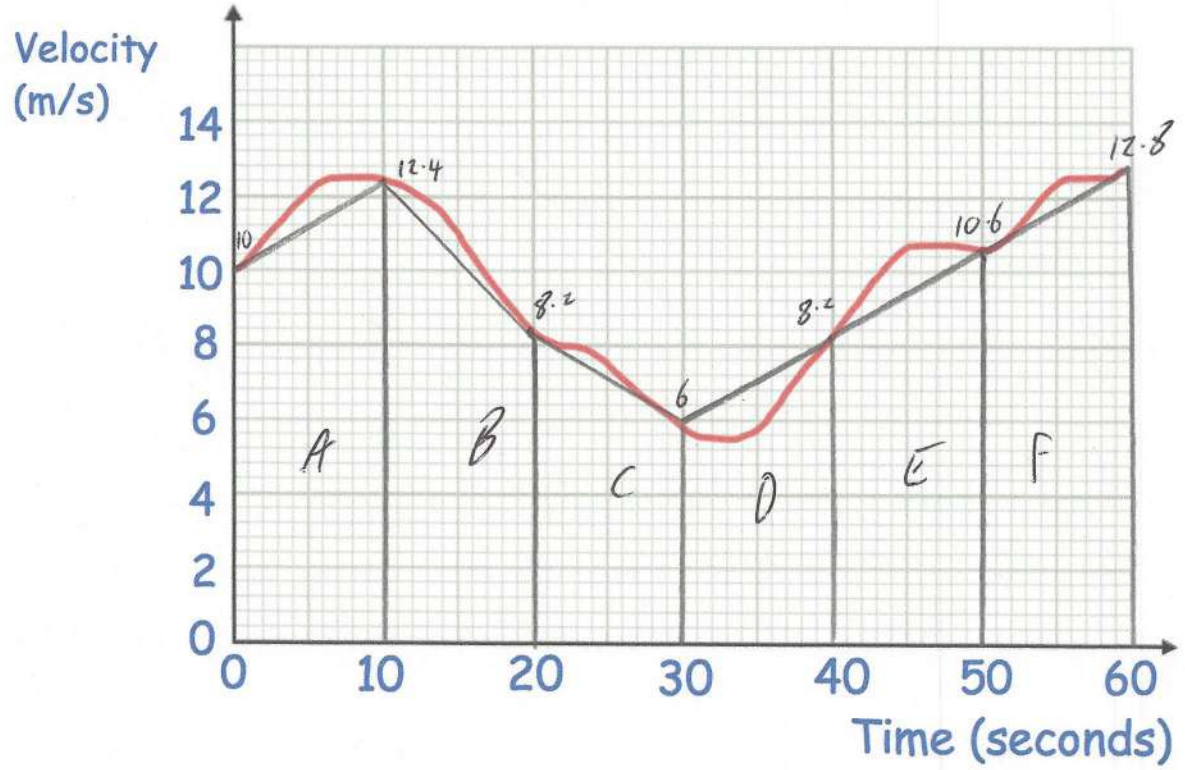
(3)

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

Underestimate as each shape (A-D) is entirely beneath the real line/graph

(1)

2. Here is a velocity time graph for the first 60 seconds of a journey.



Calculate an estimate for the total distance travelled in the 60 seconds.

A $\frac{1}{2}(10 + 12.4) \times 10 = 112$

B $\frac{1}{2}(12.4 + 8.2) \times 10 = 103$

C $\frac{1}{2}(8.2 + 6) \times 10 = 71$

D $\frac{1}{2}(6 + 8.2) \times 10 = 71$

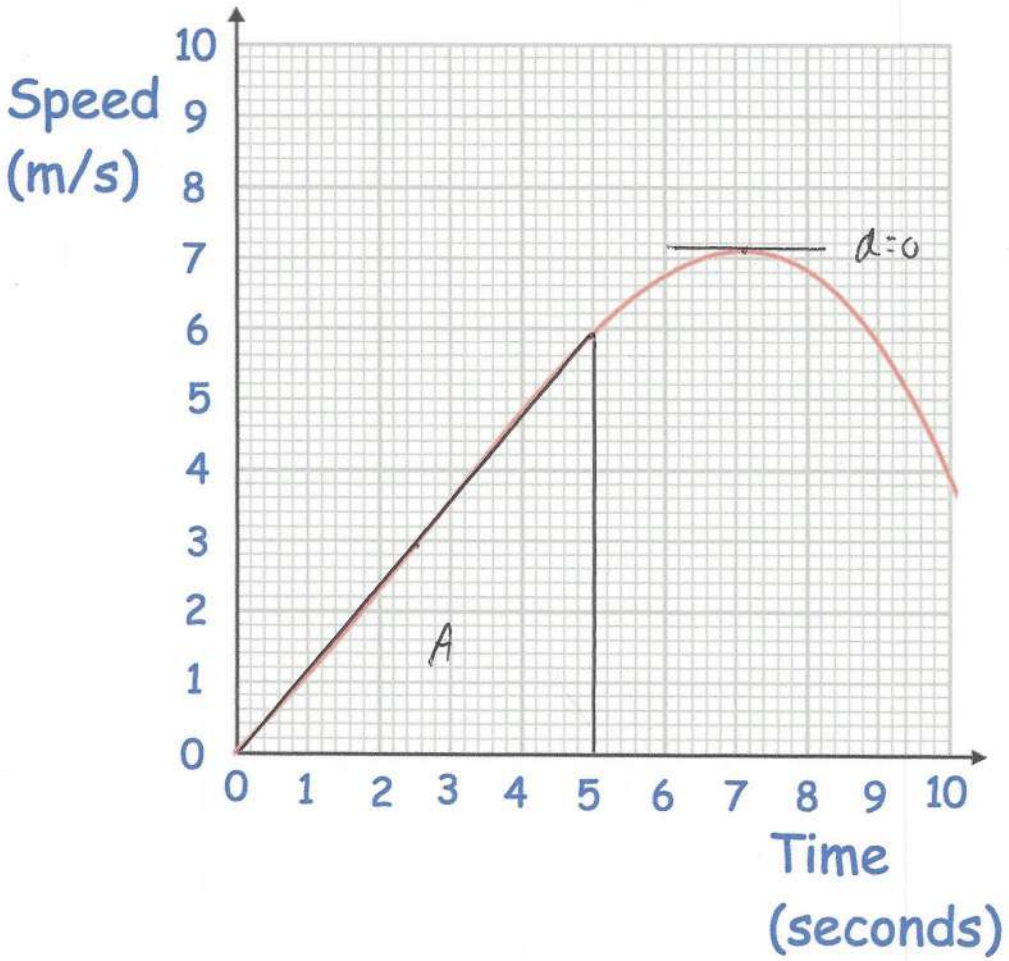
E $\frac{1}{2}(8.2 + 10.6) \times 10 = 94$

F $\frac{1}{2}(10.6 + 12.8) \times 10 = 117$

568 .....m

(5)

3. Here is a speed-time graph of a remote control car for 10 seconds.



(a) After how many seconds was the acceleration zero?

7.1 .....seconds

(1)

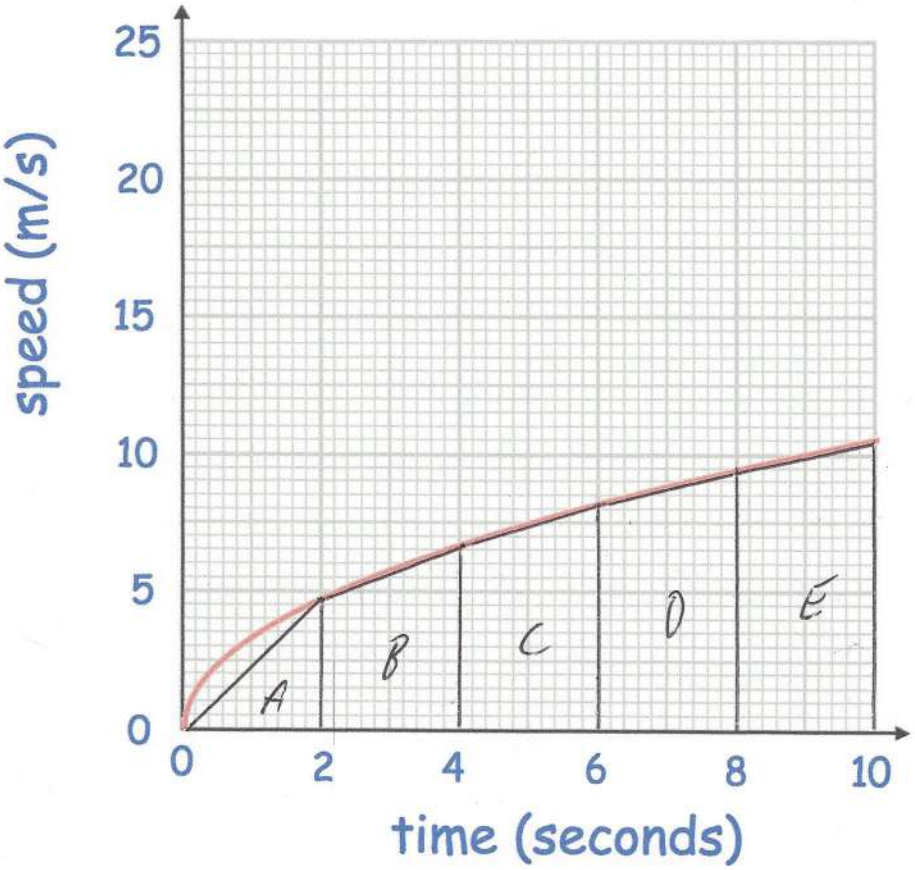
(b) Work out the distance travelled in the first 5 seconds

$\frac{1}{2} \times 5 \times 5.9$

14.75 .....metres

(2)

4. Here is a speed-time graph for first 10 seconds of the journey of a car.



(a) Work out an estimate for the distance the car travelled in the 10 seconds.

A : $\frac{1}{2} \times 2 \times 4.5 = 4.5$

B : $\frac{1}{2}(4.5 + 6.5) \times 2 = 11$

C : $\frac{1}{2}(6.5 + 8) \times 2 = 14.5$

D : $\frac{1}{2}(8 + 9.5) \times 2 = 17.5$

E : $\frac{1}{2}(9.5 + 10.5) \times 2 = 20$

67.5 .....m

(4)

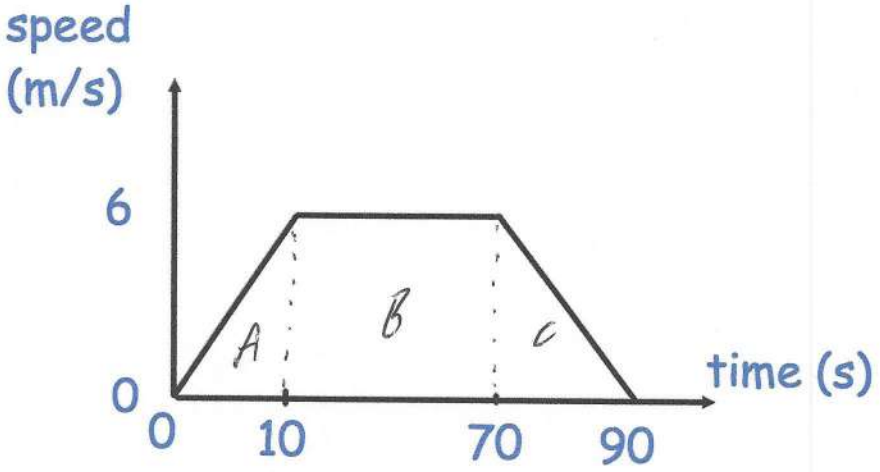
(b) Is your answer to (a) an underestimate or an overestimate of the actual distance the ~~rocket~~ car travelled?

Give a reason for your answer

Underestimate as each shape is beneath the red graph, so the actual area is slightly larger than what I have calculated.

(1)

5. The graph shows the speed of a bicycle between two houses.



Calculate the distance between the two houses.

A: $\frac{1}{2} \times 10 \times 6 = 30$ m

B = $60 \times 6 = 360$ m

C = $\frac{1}{2} \times 20 \times 6 = 60$ m

450

..... m

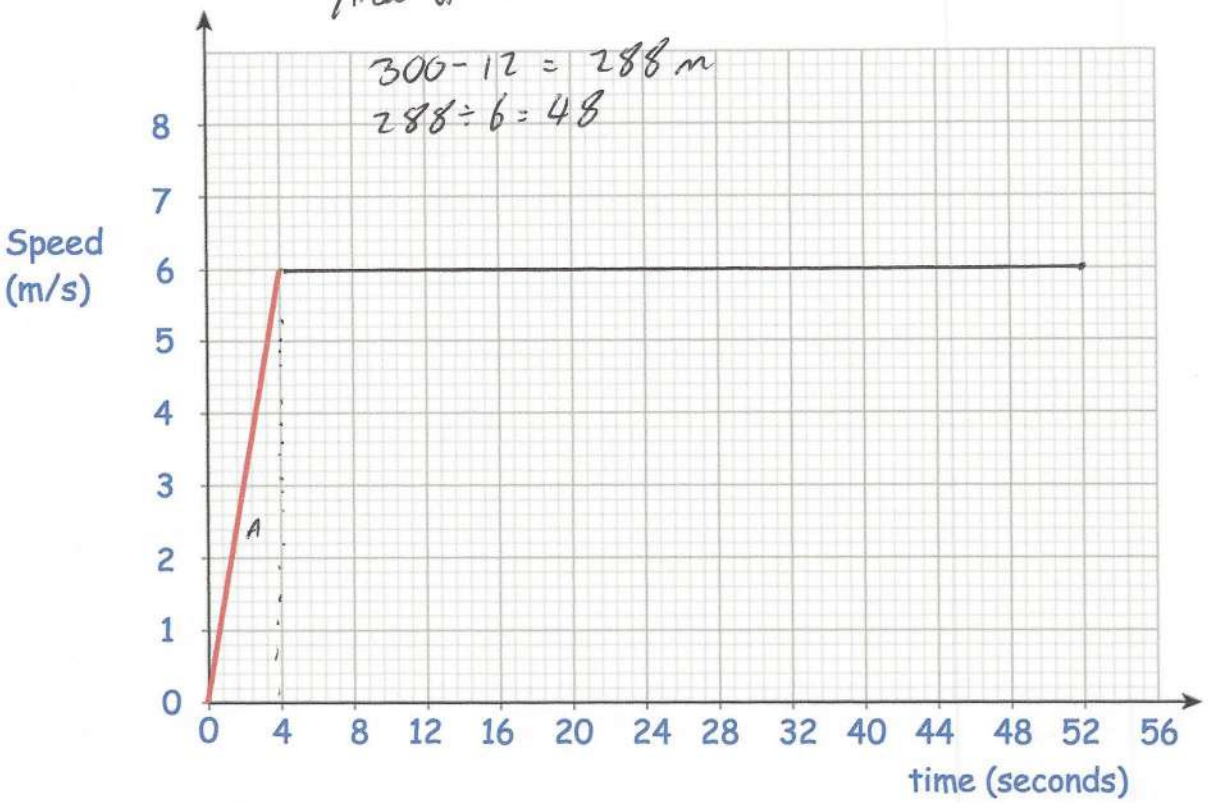
(2)

6. Harry and Jack ran a 300 metre race.

Here is a graph for the first 4 seconds of Harry's race.

Harry completed the race at a constant speed of 6 m/s

Area of A = $\frac{1}{2} \times 4 \times 6 = 12$



Jack completed the race in 51 seconds.

Did Harry finish before Jack?
You **must** show your working.

In the first 4 seconds, Harry ran 12m
He ran the remaining 288m at 6m/s.

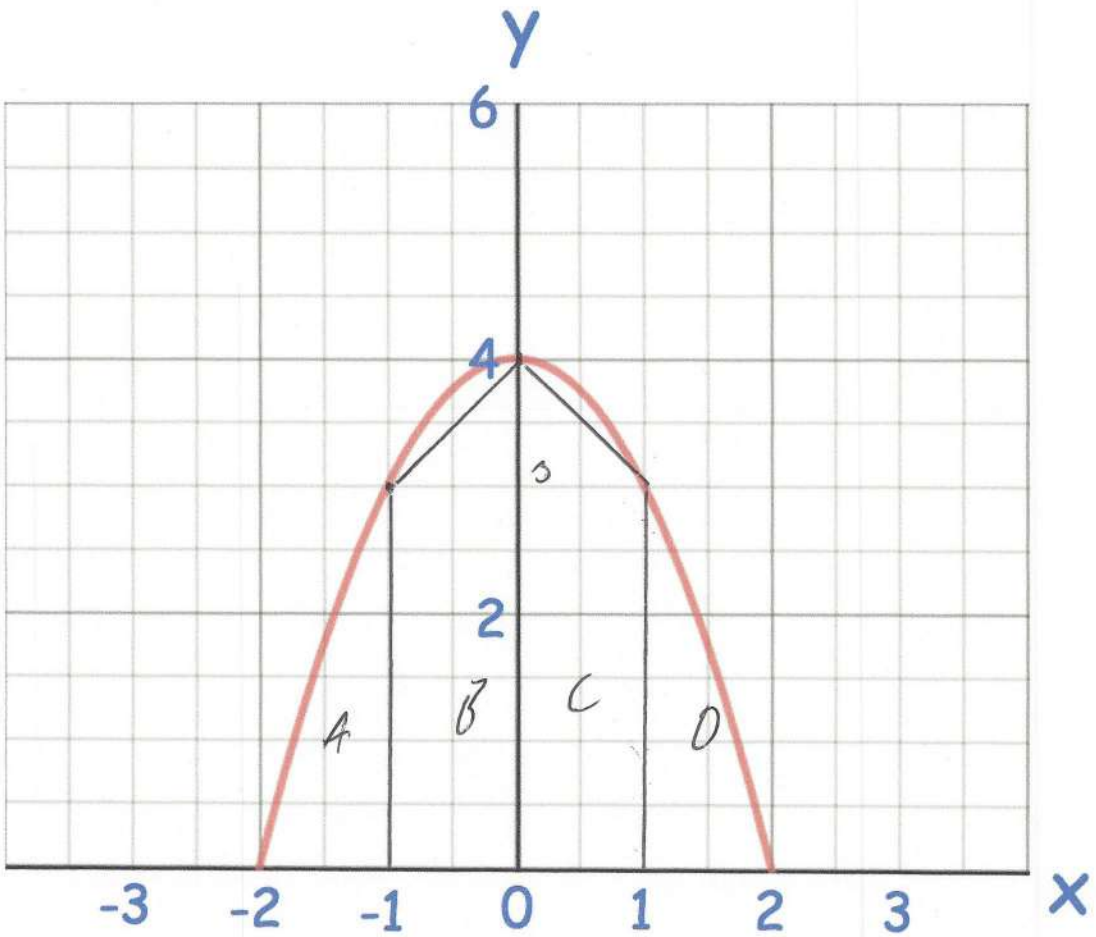
$t = \frac{d}{s}$ $t = \frac{288}{6} = 48s$

4 + 48 = 52 seconds

No, Jack finished 1 second before Harry

(3)

7. Here is a sketch of $y = 4 - x^2$



The graph is used to model the cross section of a tunnel.

Calculate an estimate of the area under the graph.

A: $\frac{1}{2} \times 1 \times 3 = 1.5$

B: $\frac{1}{2}(3+4) \times 1 = 3.5$

C: $\frac{1}{2}(4+3) \times 1 = 3.5$

D: $\frac{1}{2} \times 1 \times 3 = 1.5$

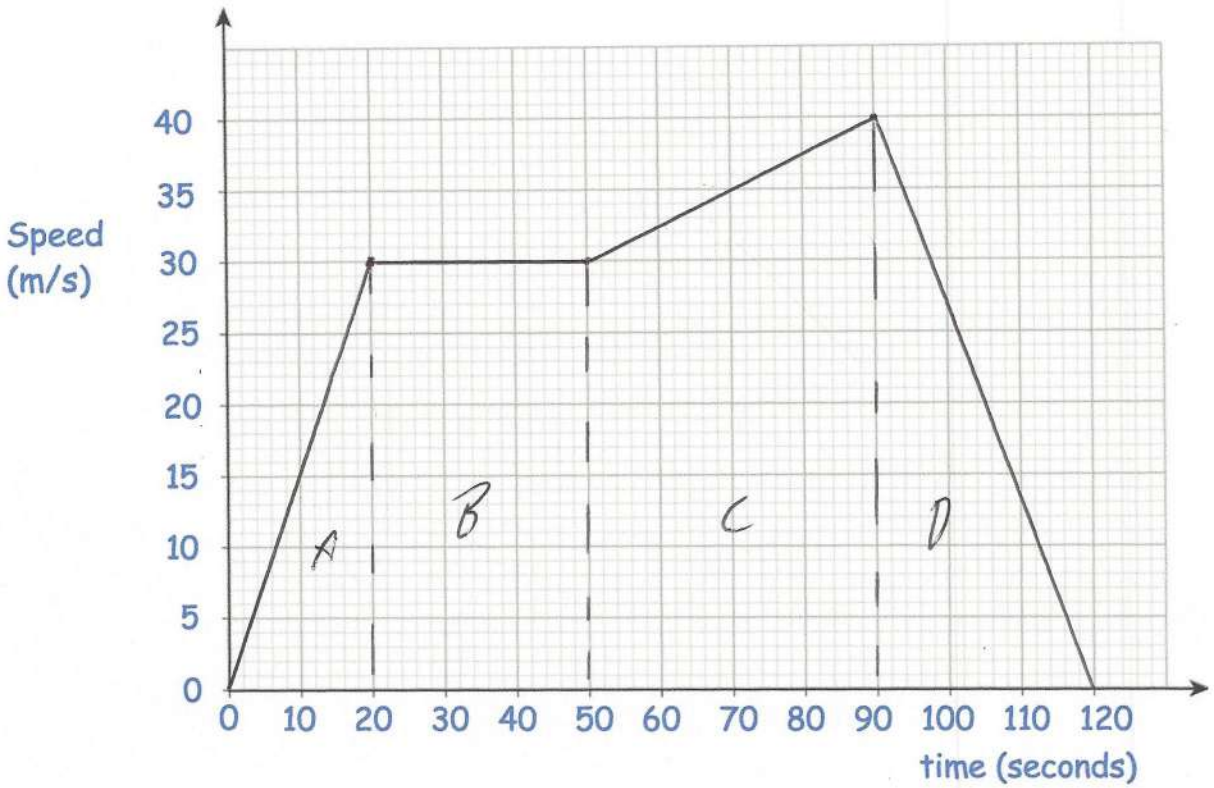
10

(3)

8. Siobhan is driving her car in a straight line.

The car begins at rest
She accelerates uniformly to a speed of 30m/s over 20 seconds.
Siobhan drives at the same speed for the next 30 seconds.
She then accelerates uniformly to a speed of 40m/s by 90 seconds.
The remainder of the 2 minute journey is spent decelerating to rest.

(a) Draw a speed-time graph for her journey.



(b) Write down the average speed for the total journey.

A: $\frac{1}{2} \times 20 \times 30 = 300m$

B: $30 \times 30 = 900m$

C: $\frac{1}{2}(30 + 40) \times 40 = 1400m$

D: $\frac{1}{2} \times 30 \times 40 = 600m$

$+ \quad 3200m$

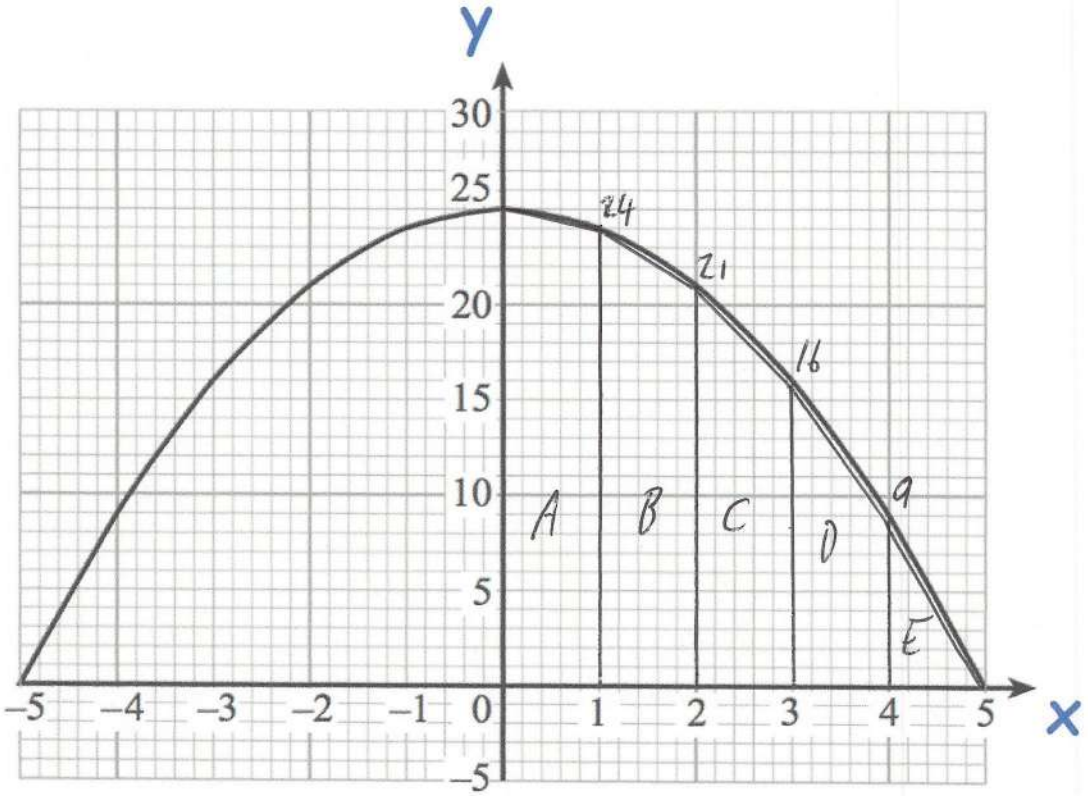
$S = \frac{d}{t} = \frac{3200}{120}$

$= 26.\dot{6}$

$26.\dot{6}$ .....m/s

(4)

9.



Find an estimate of the area between the curve and the x-axis between $x = 0$ and $x = 5$.

$A: \frac{1}{2}(25+24) \times 1 = 24.5$

$B: \frac{1}{2}(24+21) \times 1 = 22.5$

$C: \frac{1}{2}(21+16) \times 1 = 18.5$

$D: \frac{1}{2}(16+9) \times 1 = 12.5$

$E: \frac{1}{2} \times 1 \times 9 = 4.5$

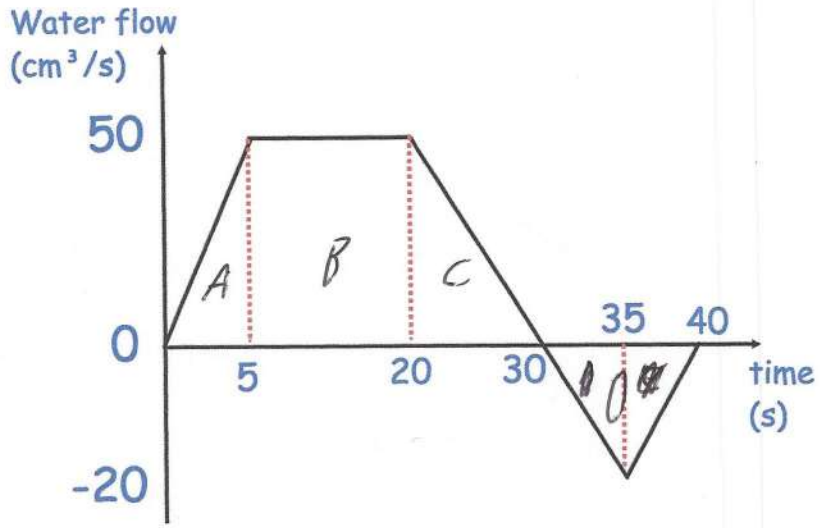
$+$

82.5

.....

(3)

10. The graph below shows information on how an empty container is being filled with water.



How much water is in the container after 40 seconds?

Poured in
A : $\frac{1}{2} \times 5 \times 50 = 125$
B : $15 \times 50 = 750$
C : $\frac{1}{2} \times 10 \times 50 = 250$

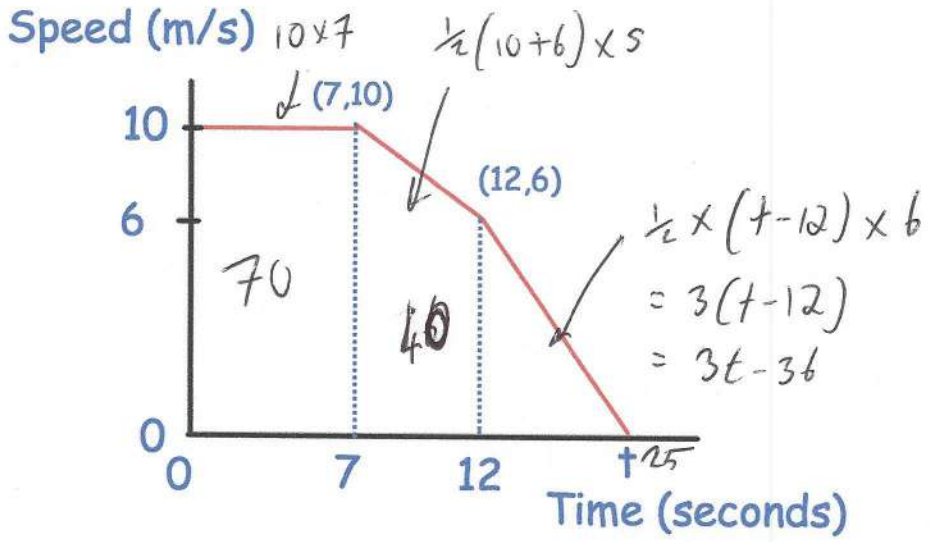
Poured out
D = $\frac{1}{2} \times 10 \times 20 = 100$

$125 + 750 + 250 = 1125$

$1125 - 100 = 1025$

1025 .....cm³
(3)

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



The average speed from 0 to t seconds was 5.96m/s.

(a) Work out the value of t.

distance travelled = 70 + 40 + 3t − 36 = 74 + 3t

$s = \frac{d}{t}$ $5.96 = \frac{74+3t}{t}$ $5.96t = 74 + 3t$ $2.96t = 74$ $t = 25$

25 .....seconds

(5)

(b) Find the rate of deceleration from 12 to t seconds.

$\frac{\text{rise}}{\text{run}} = \frac{-6}{13} = -0.4615$

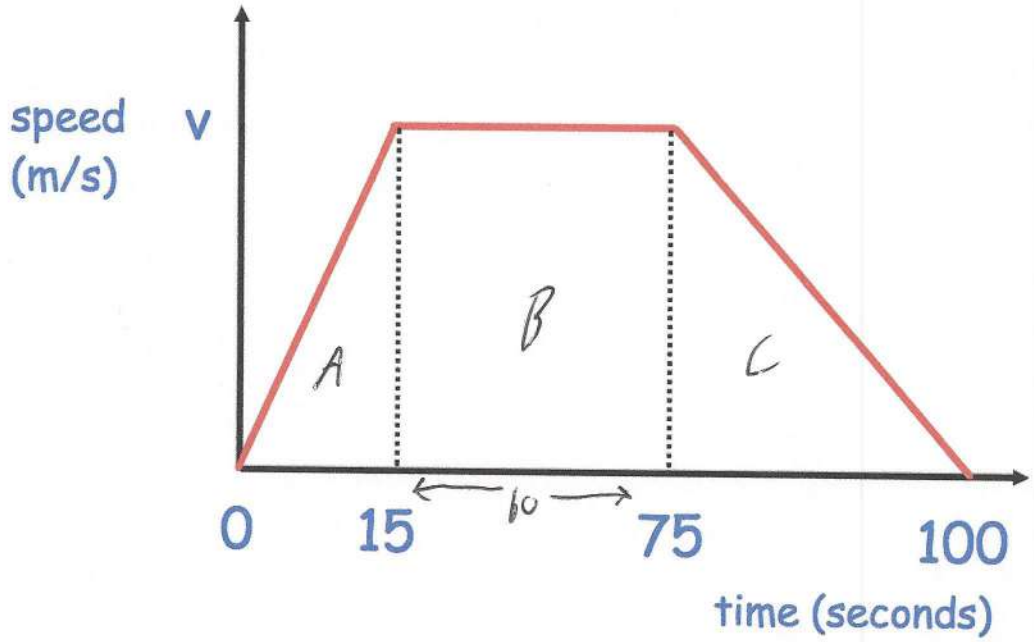
0.4615 .....m/s²

(2)

acceleration = −0.4615 m/s²

deceleration = 0.4615 m/s²

12. Here is a speed-time graph for a train journey.



The journey took 100 seconds

1920m

The train travelled 1.92km in the 100 seconds.

Work out the value of v.

$A: \frac{1}{2} \times 15 \times v = 7.5v$

$B = 60v$

$C = \frac{1}{2} \times 25 \times v = 12.5v$

Total area $= 80v$

$80v = 1920$

$v = 24$

24 .....m/s

(3)