Speed, Distance & Time & Rates of Change (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. On a journey from Dover to Sheffield, Liam drove at an average speed of 40mph for the first three hours of his journey.

   The remaining 120miles of his journey were completed at an average speed of 30mph.

   Liam told his friend that he had completed the whole journey at an average speed of 35mph.

   Check to see if Liam is correct.

   [6]

2. Laura has her own car.

   During April

   - Laura drove a total distance of 560miles in her car.
   - For each gallon of petrol, Laura's car travelled 37·8miles.
   - Petrol cost £1.48 per litre.
   - Laura spent 10 hours 45 minutes driving her car.

(a) 1 gallon is approximately 4·55 litres.

   Calculate the cost of petrol that Laura used during April.

   You must show all your working.

   [5]

(b) Select which of the following best describes the roads on which Laura travelled during April.

You must show working to support your answer.

You must give a reason for your answer.

      A. Mainly small narrow country lanes

      B. Mainly inner city roads with lots of traffic lights

      C. Mainly motorways and dual carriageways

      D. Mainly roads with speed limits of 30mph

[4]

3. An engineer carried out an experiment.

   He recorded the velocity of a particle during the first 5 seconds of the experiment.

Velocity (metres per second)

Time (seconds)
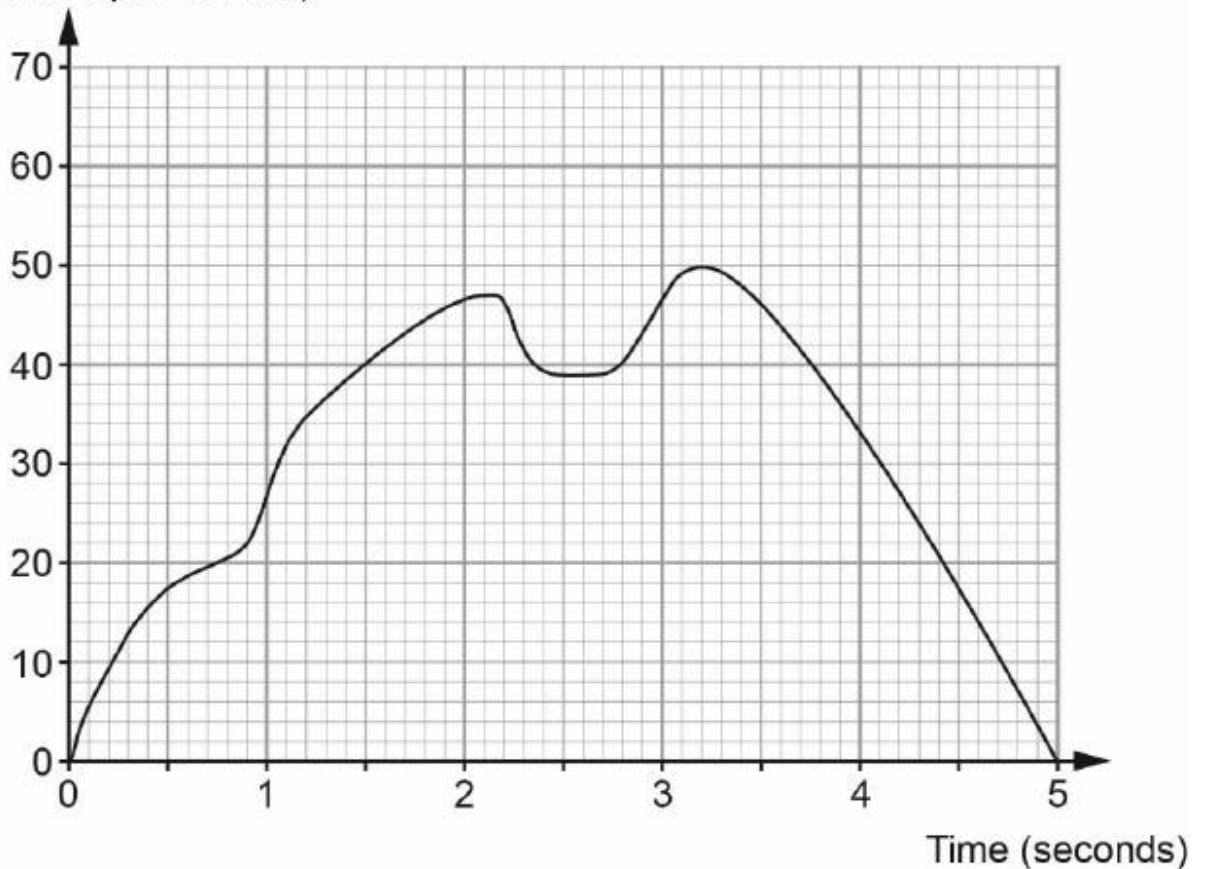
(a) Calculate the acceleration of the particle at 3 seconds.

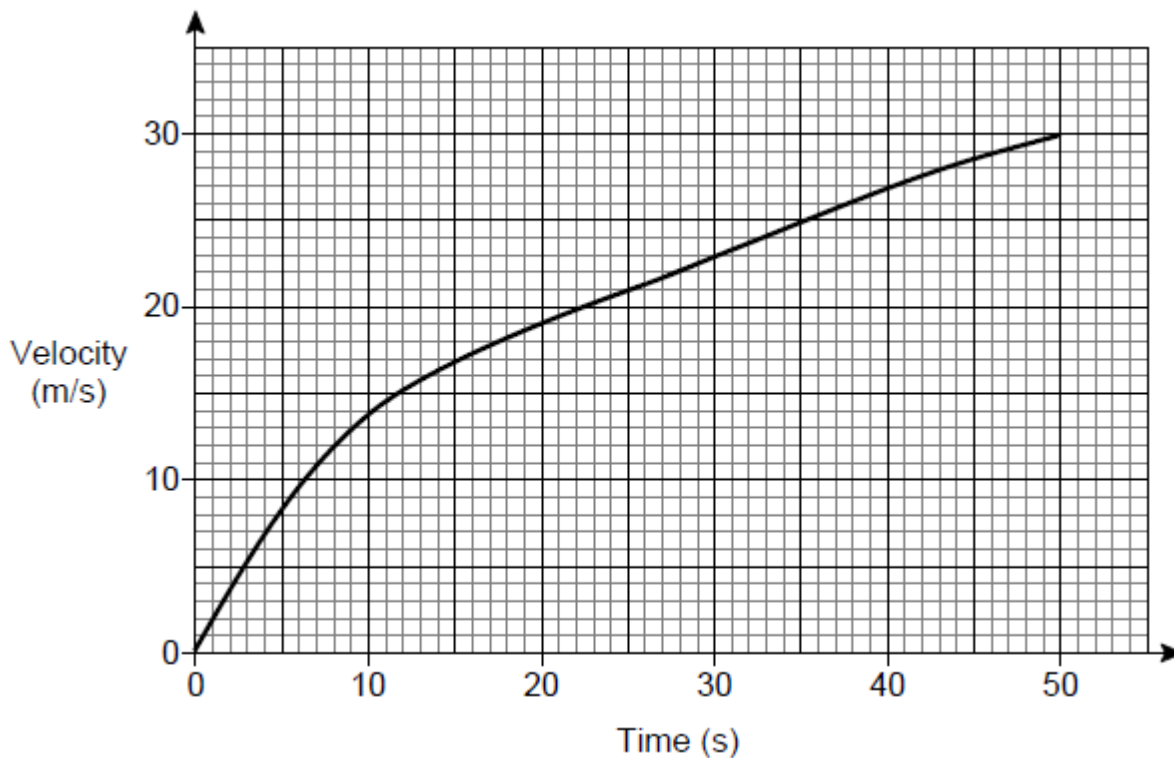   You must state the units of your answer.

[4]

(b) Calculate an estimate for the distance travelled by the particle in the 5 second period.

[4]

(c) Suggest how you could improve the method you used in (b) to find a more accurate approximation of the actual distance travelled?

[1]

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.

[2]

(b) Estimate the time during the 50 seconds when the instantaneous acceleration = the average acceleration

You must show your working on the graph.

[2]

5. Gary drove from London to Sheffield.
   It took him 3 hours at an average speed of 80km/h.

   Lyn drove from London to Sheffield.
   She took 5 hours.

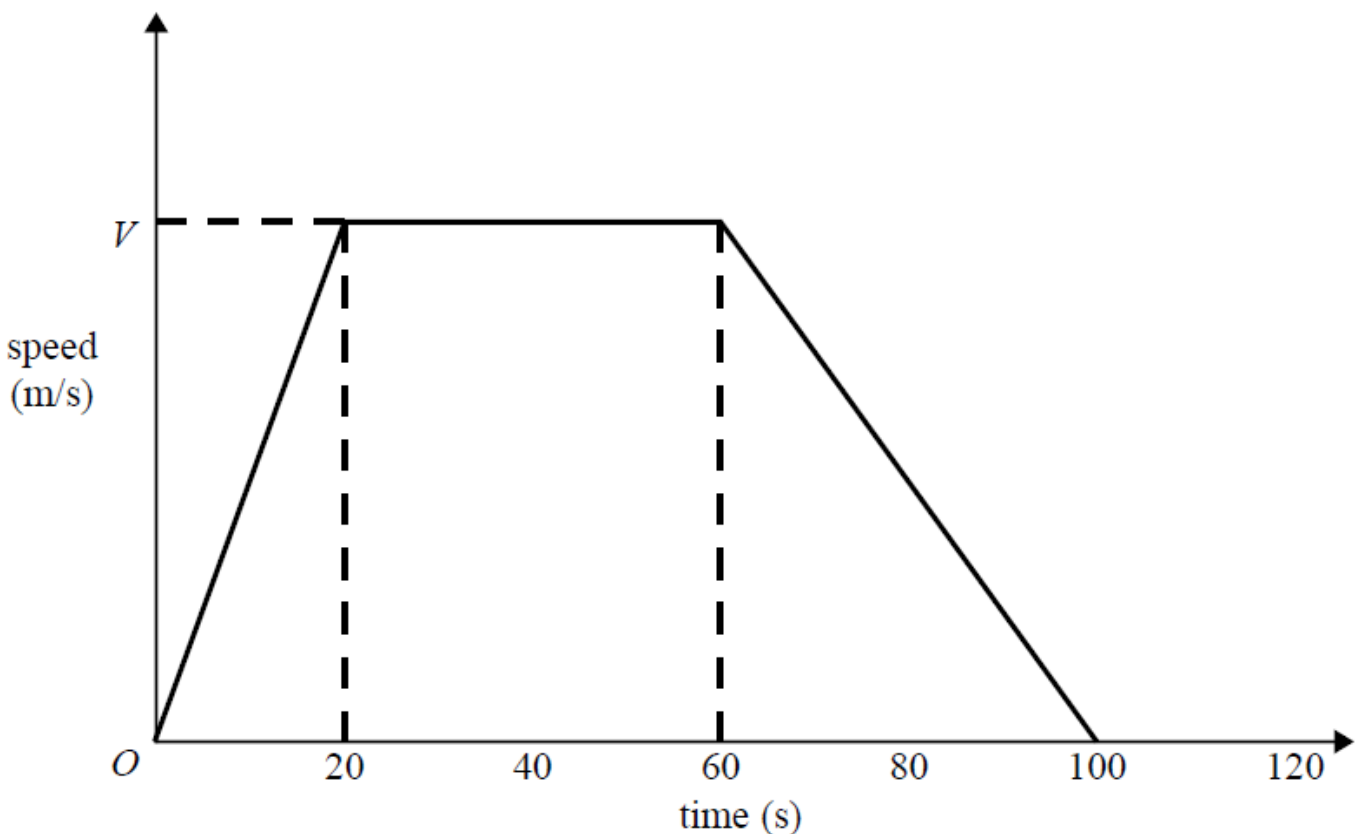   Assuming that Lyn drove along the same roads as Gary and did not take a break,

(a) work out Lyn's average speed from London to Sheffield.

....km/h [3]

(b) If Lyn did not drive along the same roads as Gary, explain how this could affect your answer to part (a).

[1]

6. Here is a speed-time graph for a car journey.

The journey took 100 seconds.

The car travelled 1.75km in the 100 seconds.

(a) Work out the value of V.

....

[3]

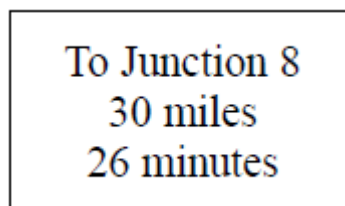(b) Describe the acceleration of the car for each part of this journey.

[2]

7. Axel and Lethna are driving along a motorway.

They see a road sign.

The road sign shows the distance to Junction 8

It also shows the average time drivers take to get to Junction 8

To Junction 8
30 miles
26 minutes

The speed limit on the motorway is 70 mph.

Lethna says:

"We will have to drive faster than the speed limit to drive 30 miles in 26 minutes."

Is Lethna right?

You must show how you get your answer.

[3]

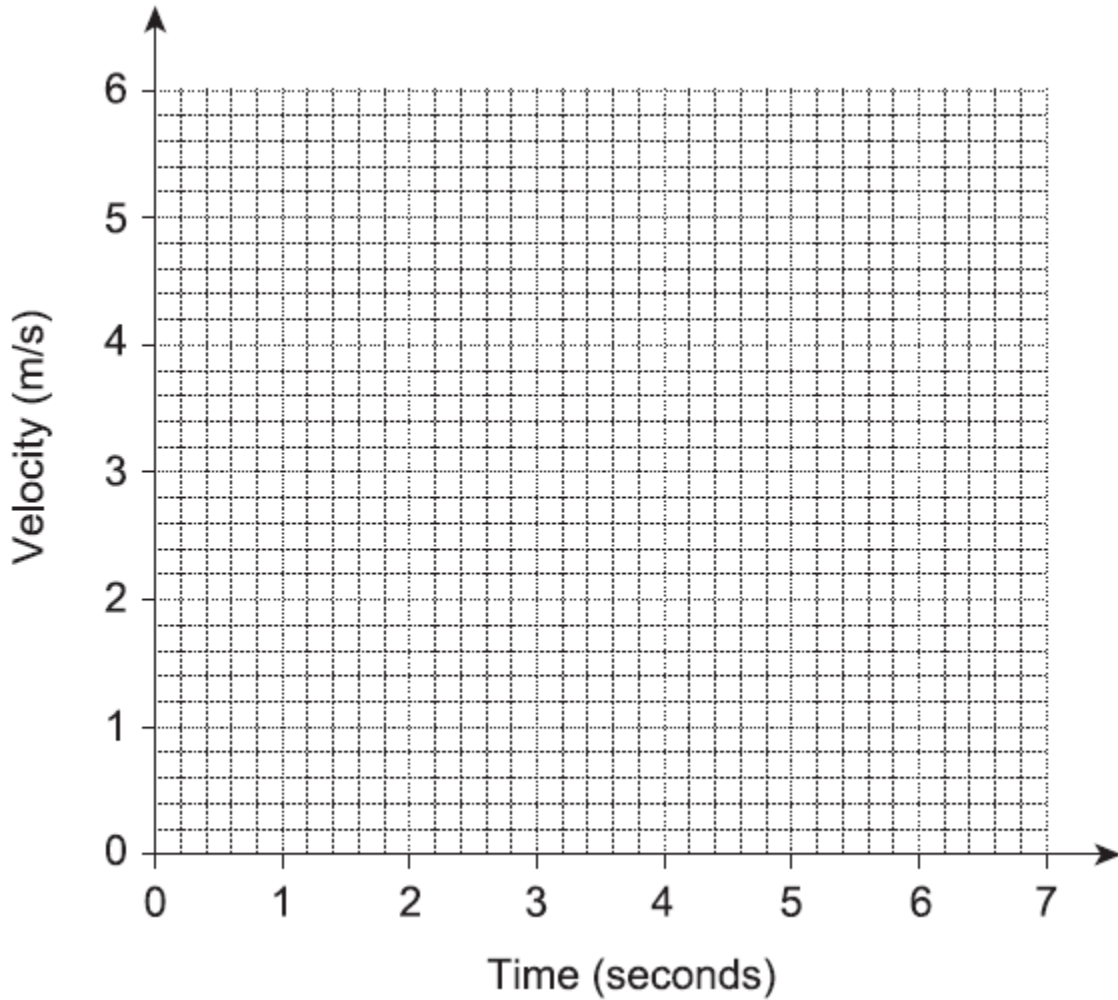8. A toy car is placed on the floor of a sports hall.

It moves in a straight line starting from rest.

It travels with constant acceleration for 4 seconds reaching a velocity of 5 m/s.

It then slows down with constant deceleration of 1 m/s^2 for 2 seconds.

It then hits a wall and stops.

a) Draw a velocity-time graph for the toy car.

[3]
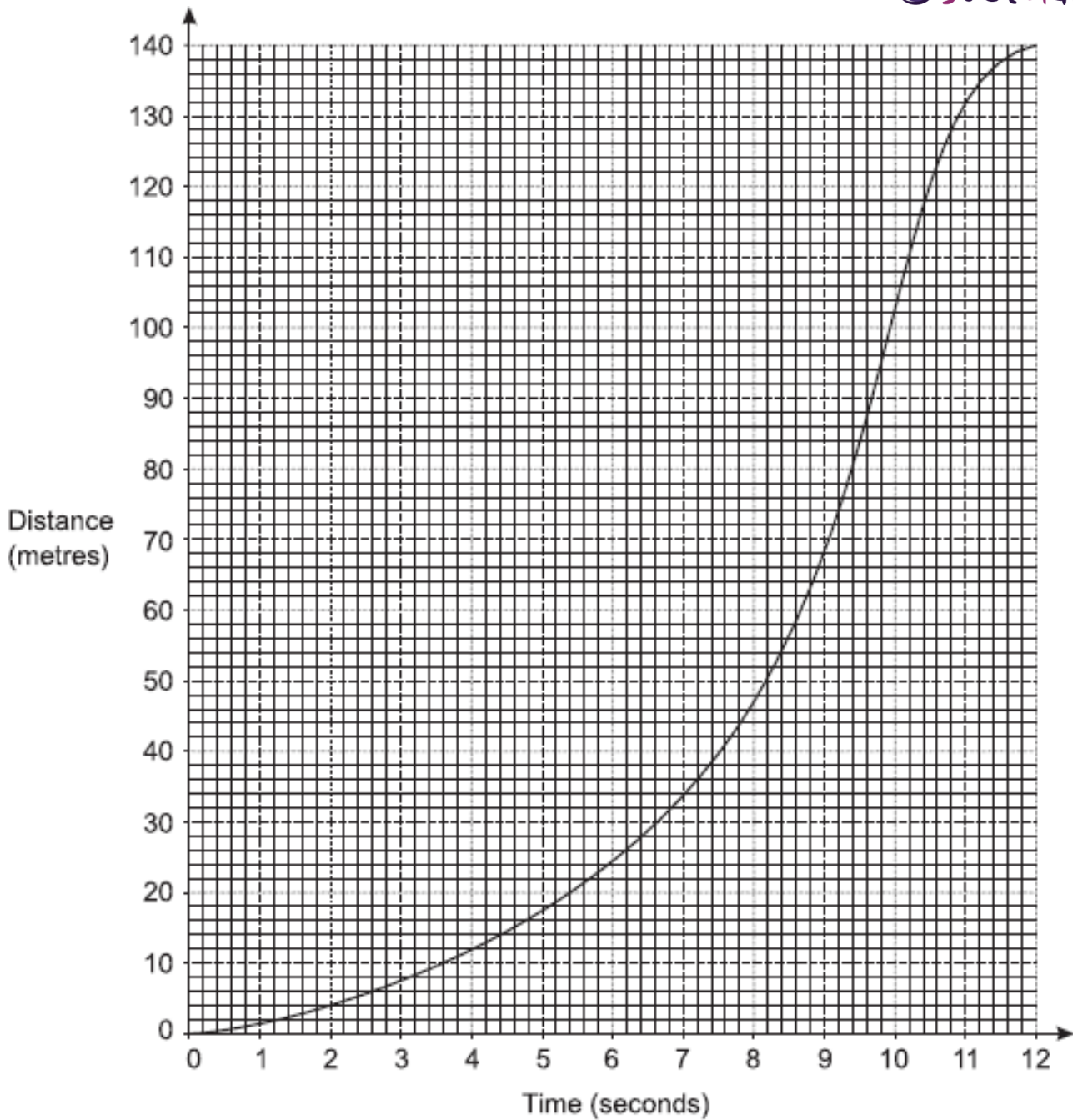
b) Work out the total distance travelled by the toy car.

(b) .... m [3]

9. The graph shows the distance travelled by an animal over 12 seconds.

a) Work out the average speed between 2 and 8 seconds.

a) .... m/s [2]

b) Estimate the speed of the animal at 6 seconds.

b) .... m/s [4]

c) Nuri says

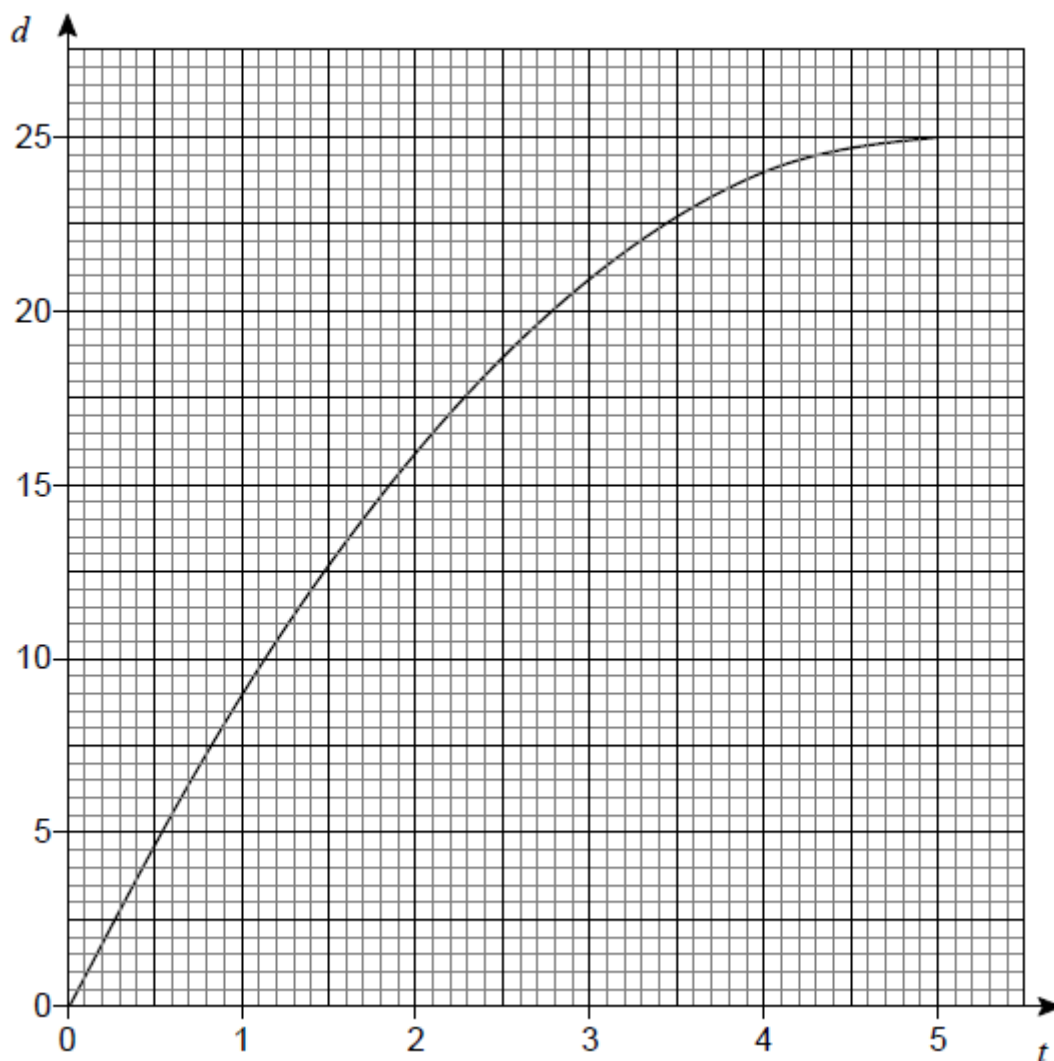*I think this animal must be able to move at over 20 m/s!*

Do you agree with Nuri?

Explain your decision.

[2]

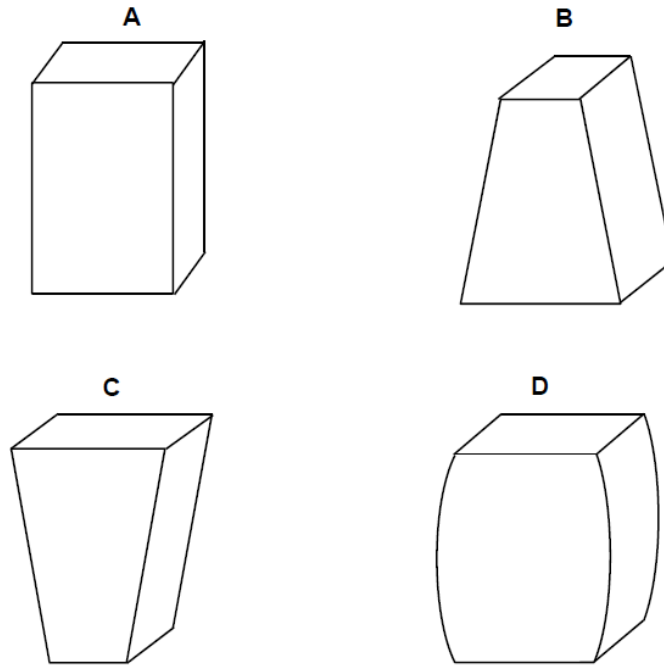10. A container is filled with water in 5 seconds.

The graph shows the depth of water, *d* cm, at time t seconds.

a) The water flows into the container at a constant rate.

Which diagram represents the container?

A   B

C   D
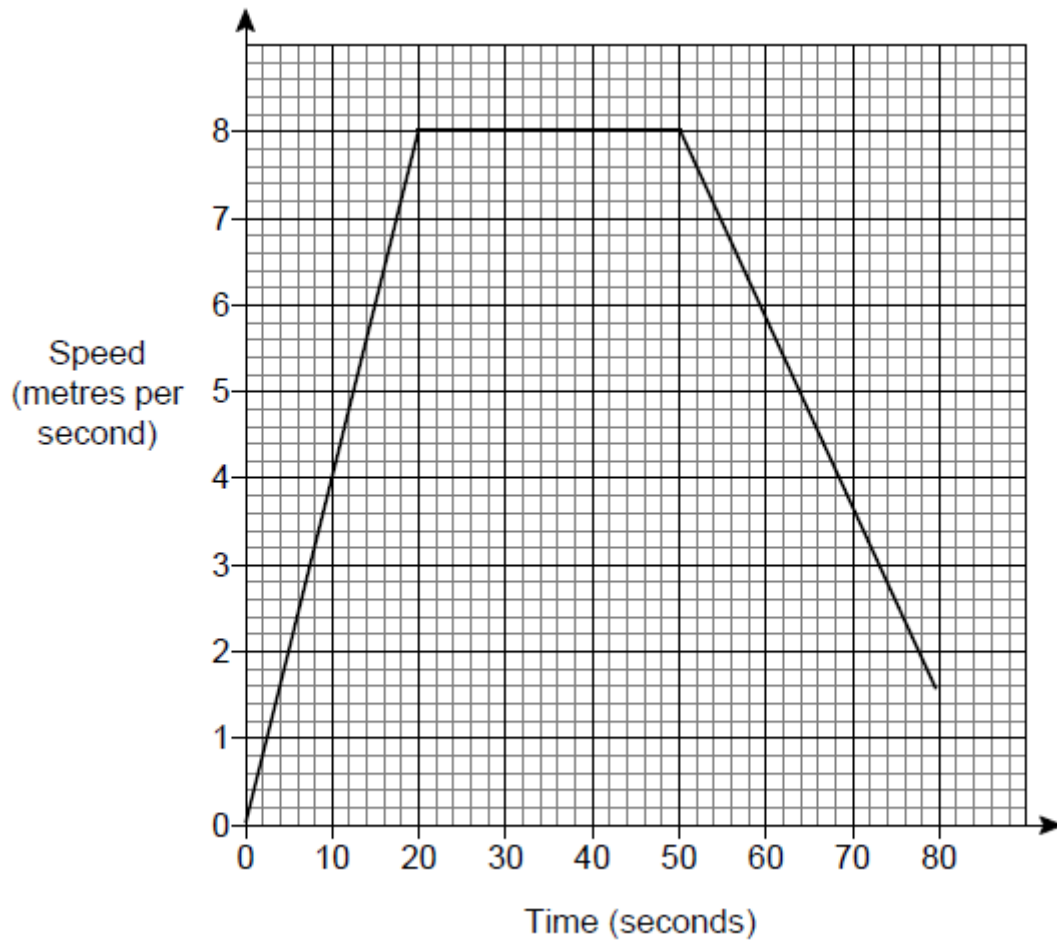
Circle the correct letter.

[1]

b) Use the graph to estimate the rate at which the depth of water is increasing at 3 seconds.

You must show your working.

[2]

11. Amina and Ben had a cycle race.

Here is Amina's speed-time graph from the start of the race.

The distance of the race was 400 metres.

Ben cycled the 400 metres in 64 seconds.
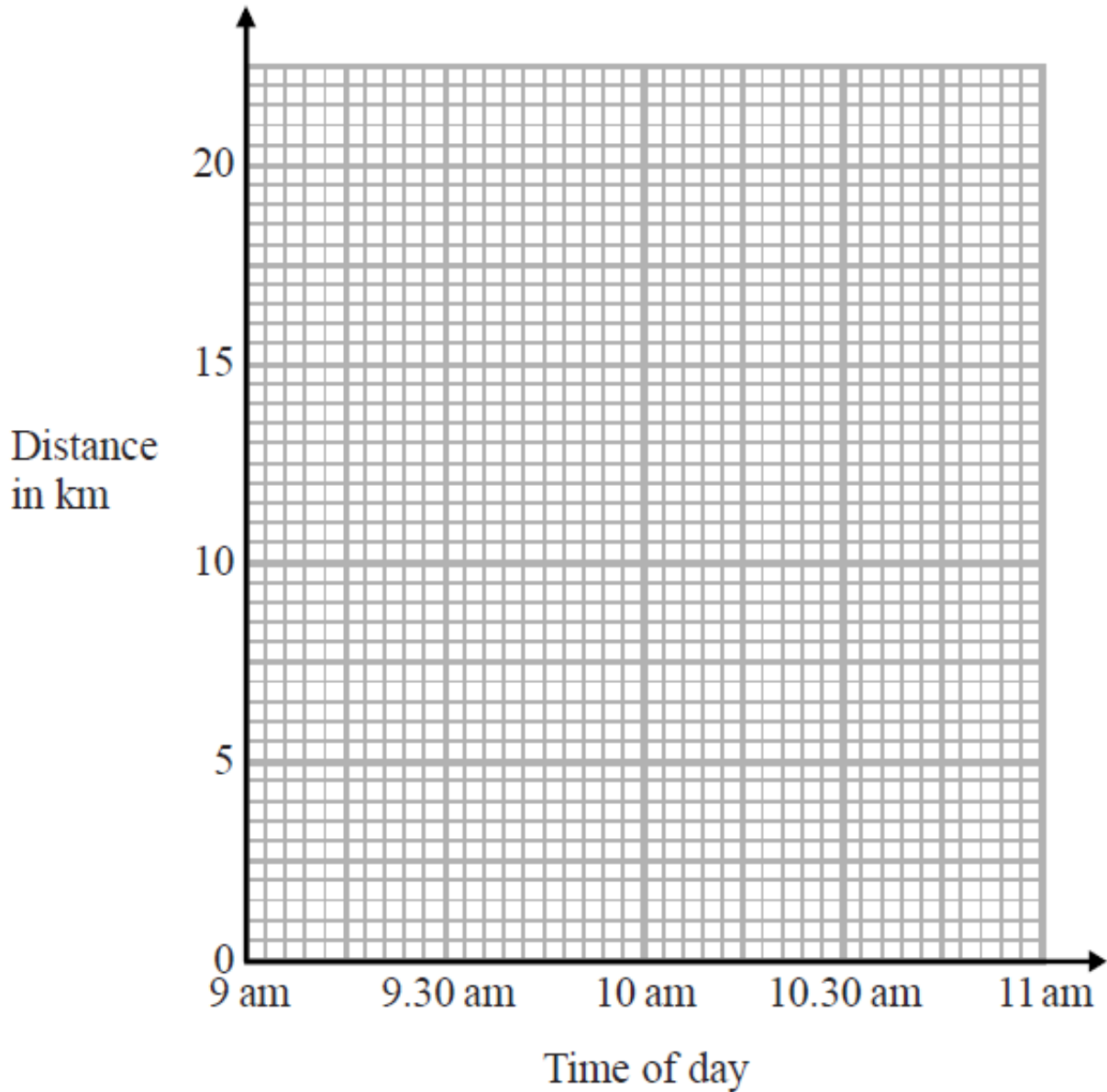
Who won the race?

You must show your working.

[4]

12. At 9 am, Bradley began a journey on his bicycle.

From 9 am to 9.36 am, he cycled at an average speed of 15 km/h.

From 9.36 am to 10.45 am, he cycled a further 8 km.

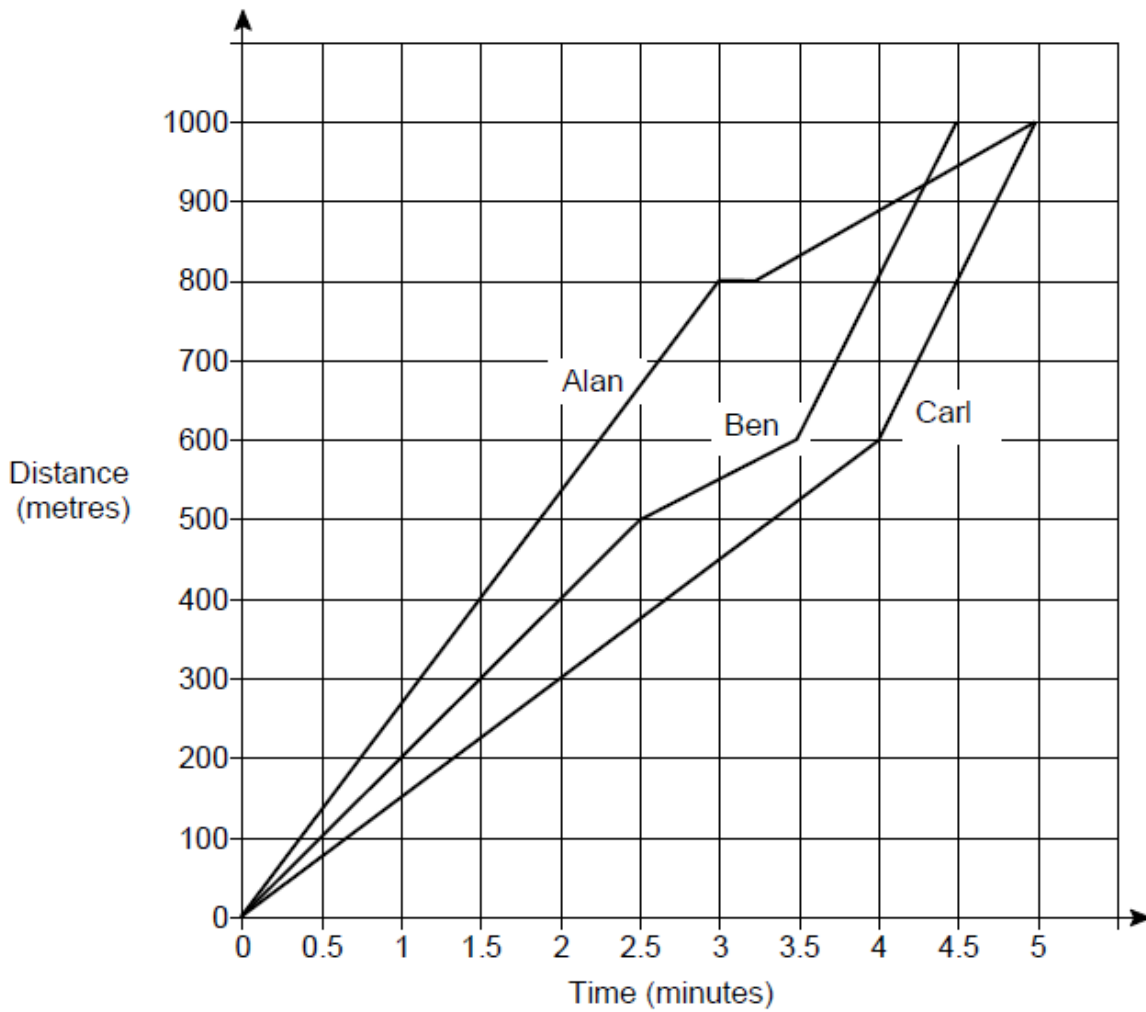(a)   Draw a travel graph to show Bradley's journey.

[3]

From 10.45 am to 11 am, Bradley cycled at an average speed of 18 km/h.

(b) Work out the distance Bradley cycled from 10.45 am to 11 am.

.... km [2]

13. Alan, Ben and Carl ran a 1000 metre race.

The distance-time graph shows the race.

(a) Who won the race?
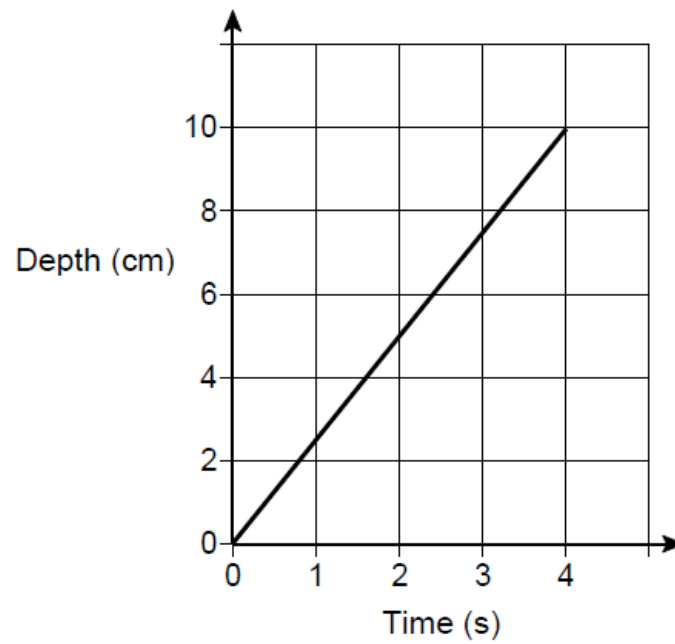
Give a reason for your answer.

[1]

(b) Describe the race.

[4]

14. Water is poured into a glass for 4 seconds.

The graph shows the depth of the water in the glass.

What is the rate of change of the depth of the water?
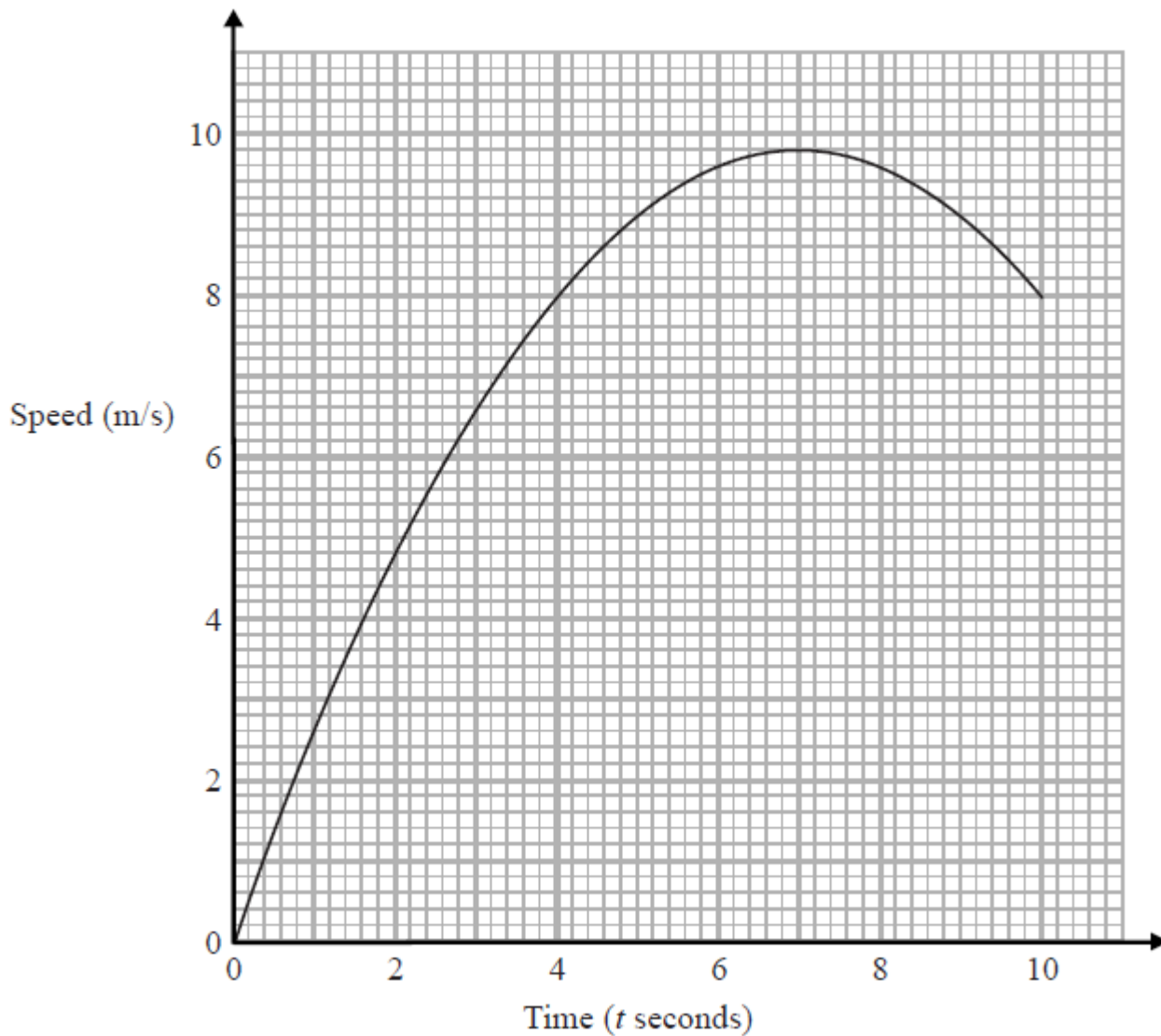
Circle your answer.

    0.4 cm/s   1.25 cm/s   2.5 cm/s   10 cm/s

[1]

The graph shows her speed, in metres per second, t seconds after the start of the race.

a) Calculate an estimate for the gradient of the graph when t = 4

You must show how you get your answer.

.... [3]
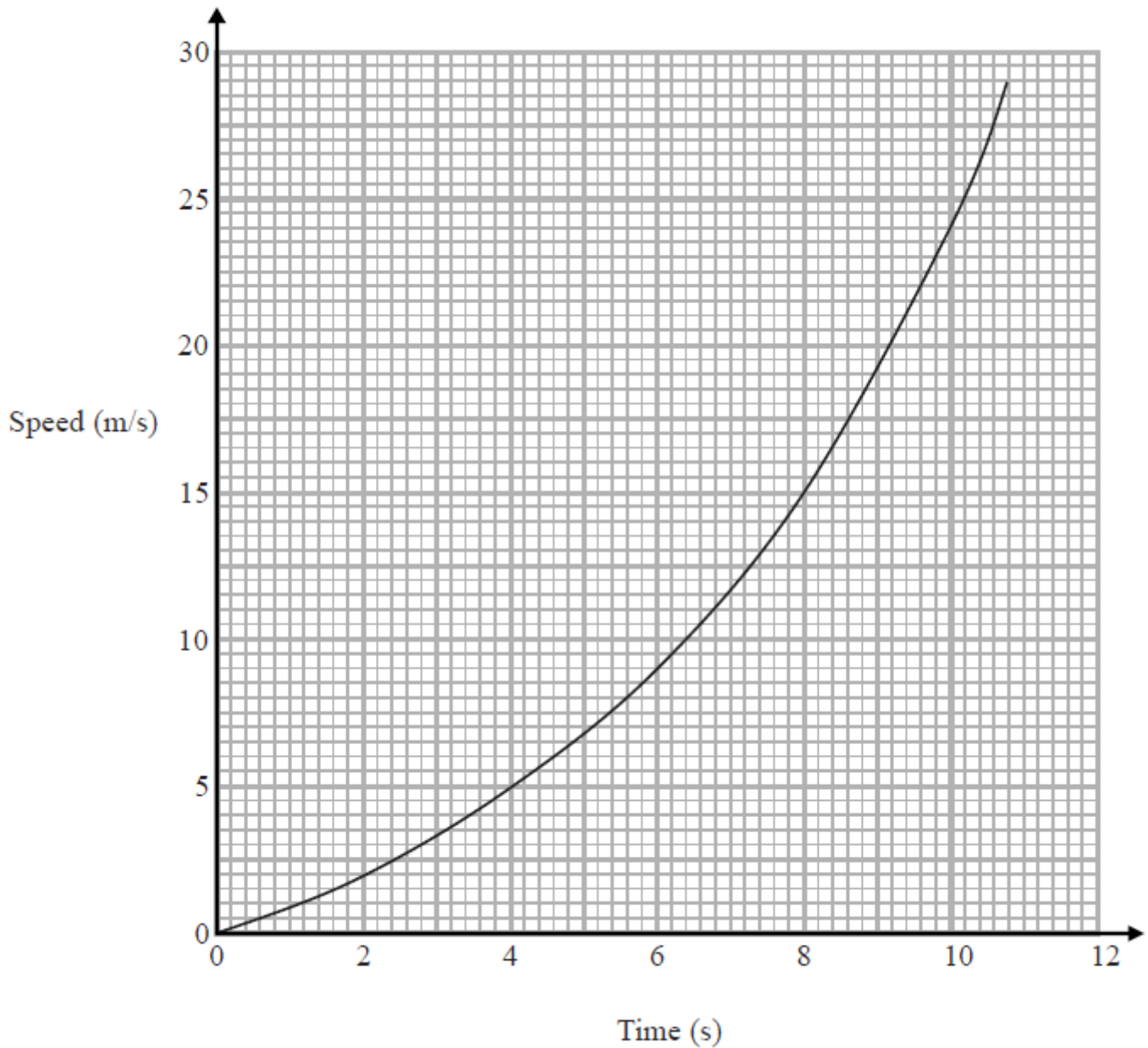
b) Describe fully what your answer to part (a) represents.

[2]

c) Explain why your answer to part (a) is only an estimate

[1]

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

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

   Use 5 strips of equal width.

   ....m [3]

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

   Give a reason for your answer.

   [1]

17 Sean drives from Manchester to Gretna Green.

He drives at an average speed of 50 mph for the first 3 hours of his journey.

He then has 150 miles to drive to get to Gretna Green.
Sean drives these 150 miles at an average speed of 30 mph.

Sean says,

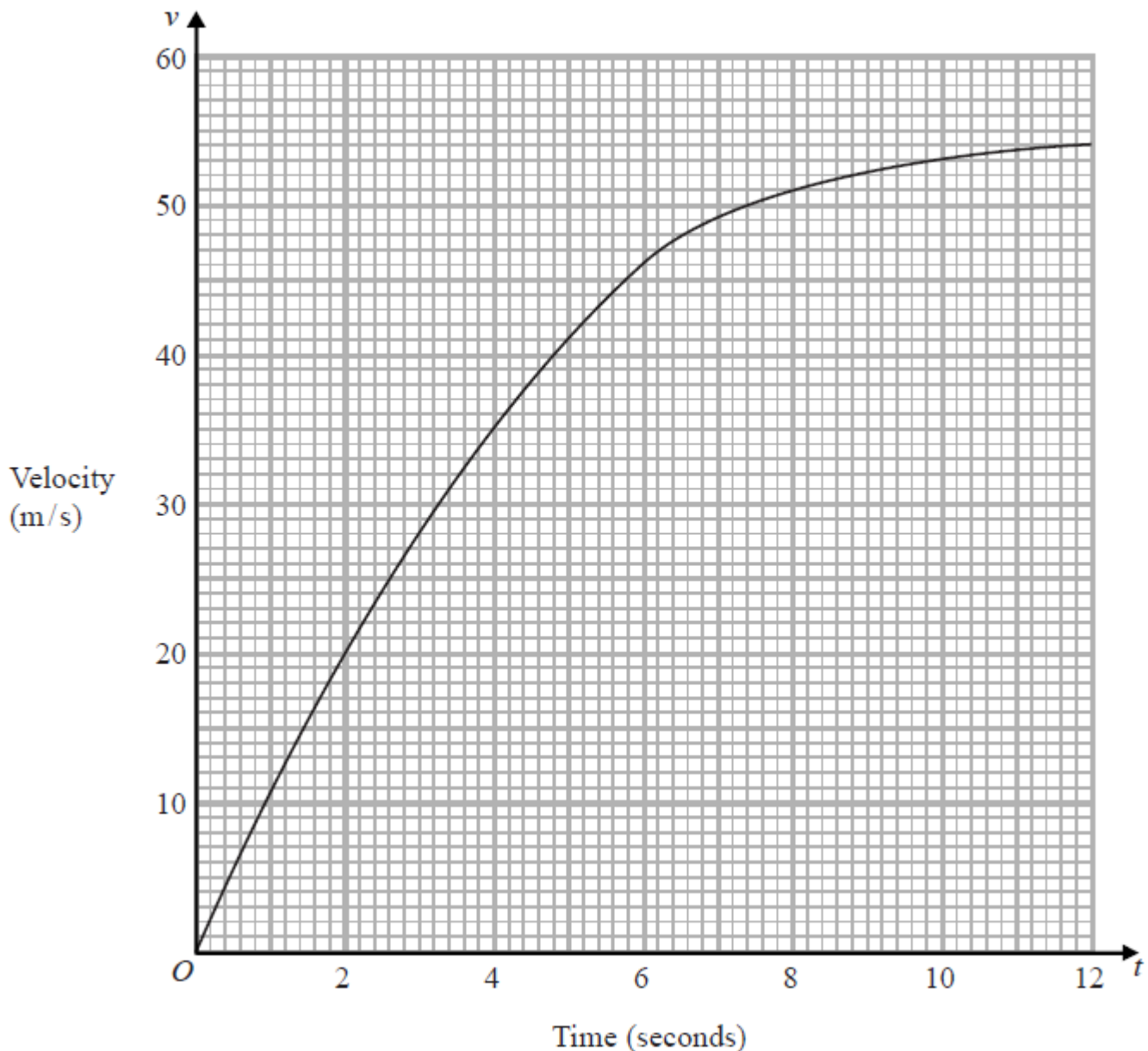"*My average speed from Manchester to Gretna Green was 40 mph.*"

Is Sean right?
You must show how you get your answer.

[4]

18 The graph shows information about the velocity, v m/s, of a parachutist t seconds after leaving a plane.

a) Work out an estimate for the acceleration of the parachutist at t = 6

.... m/s² [2]
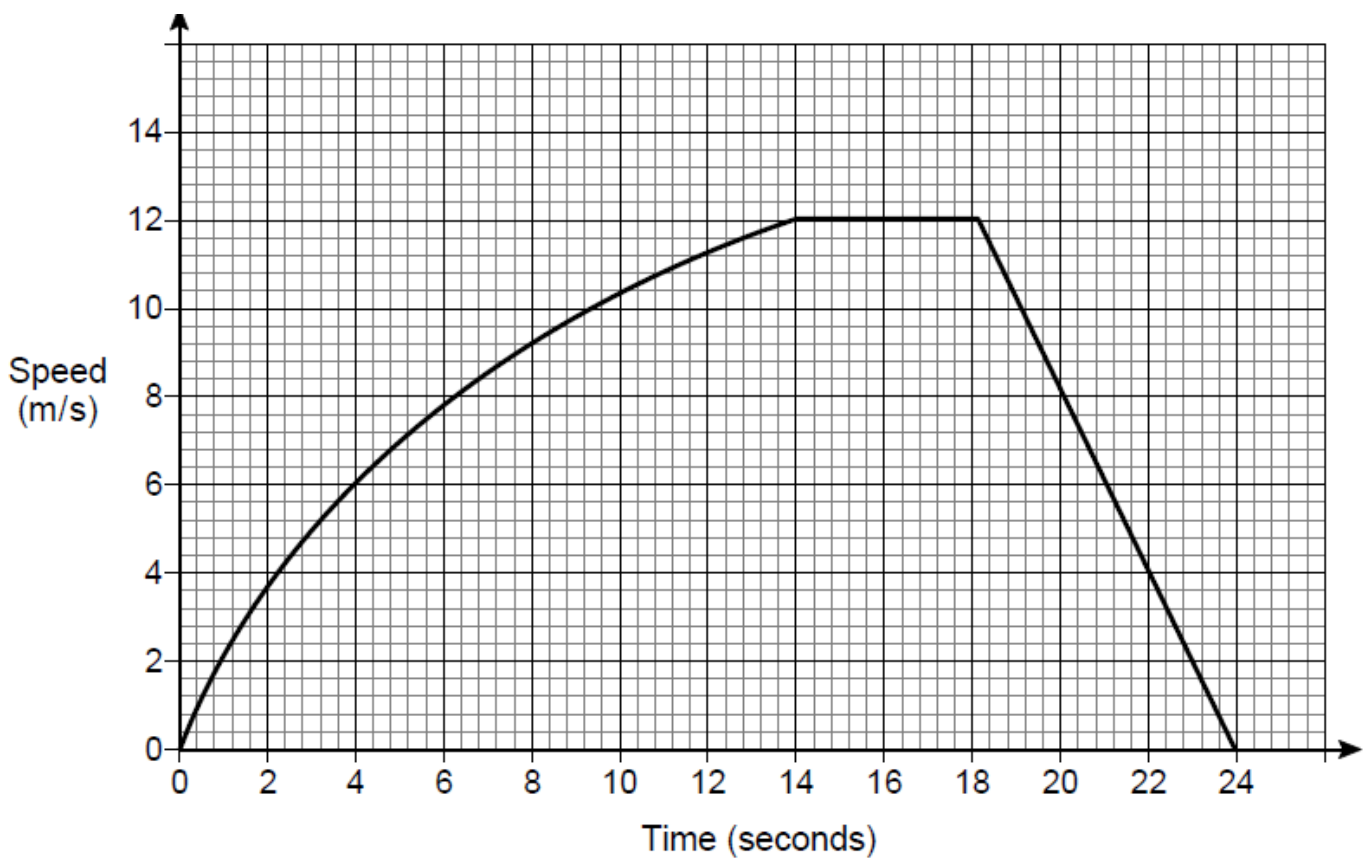
b) Work out an estimate for the distance fallen by the parachutist in the first

12 seconds after leaving the plane.

Use 3 strips of equal width.

.... m [3]

19. The speed-time graph for a car's journey is shown.

a) Estimate the acceleration at 6 seconds.

You must show your working.

.... m/s² [3]

b) Estimate the average speed of the car for the journey.

You must show your working.

.... m/s [4]

c) Evaluate your answer to part (b).
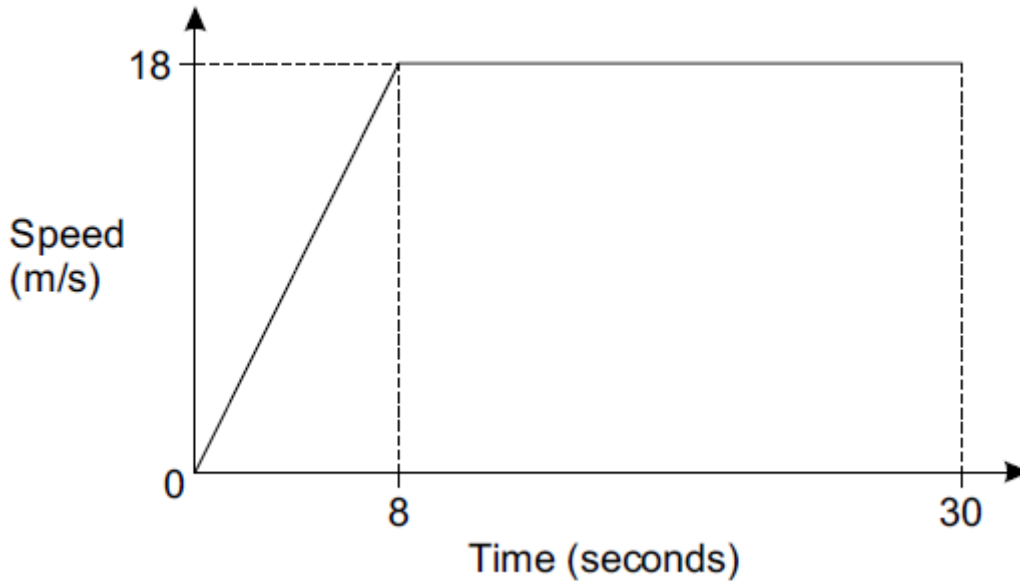
   Tick a box.

   ☐ underestimate   ☐ exact   ☐ overestimate

[1]

20. (a) The graph shows the speed of a car during the first 30 seconds of its journey.

i) State the acceleration of the car after 20 seconds.

(a)(i) .... m/s² [1]

ii) Find the total distance travelled by the car in the 30 seconds.
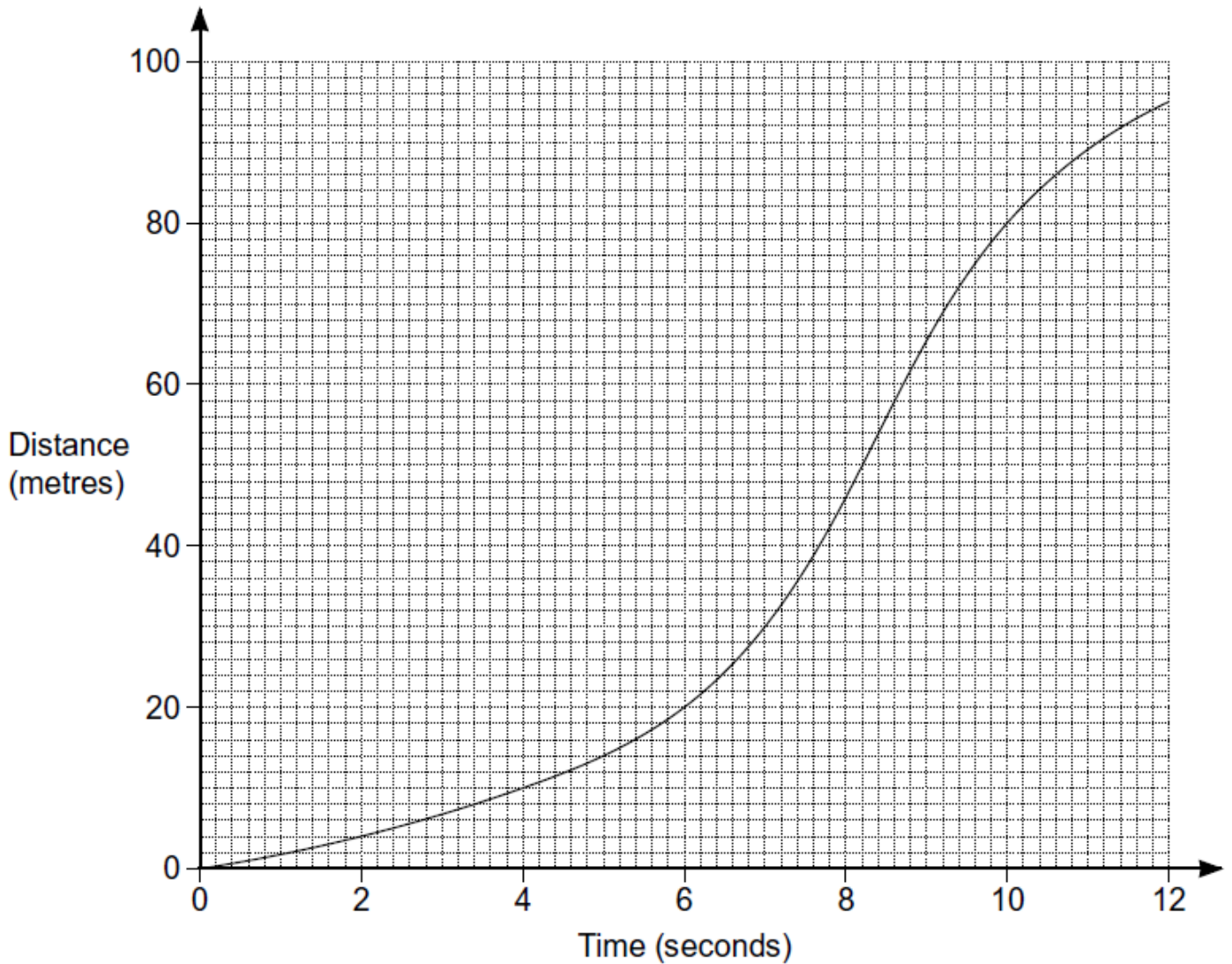
(ii) .... m [3]

b) The speed *v* of a train is 68 km/h, correct to the nearest km/h.

   Write down an inequality to show the error interval for *v* .

(b) .... [2]

c) The graph shows the distance travelled by a lorry in 12 seconds.

Estimate the speed of the lorry after 5 seconds.

(b)   .... m/s [4]

21. a) Rob is going to drive 130 miles from Hull to Liverpool. There are road works
    for 25 miles of the journey. He assumes his average speed will be   50 mph
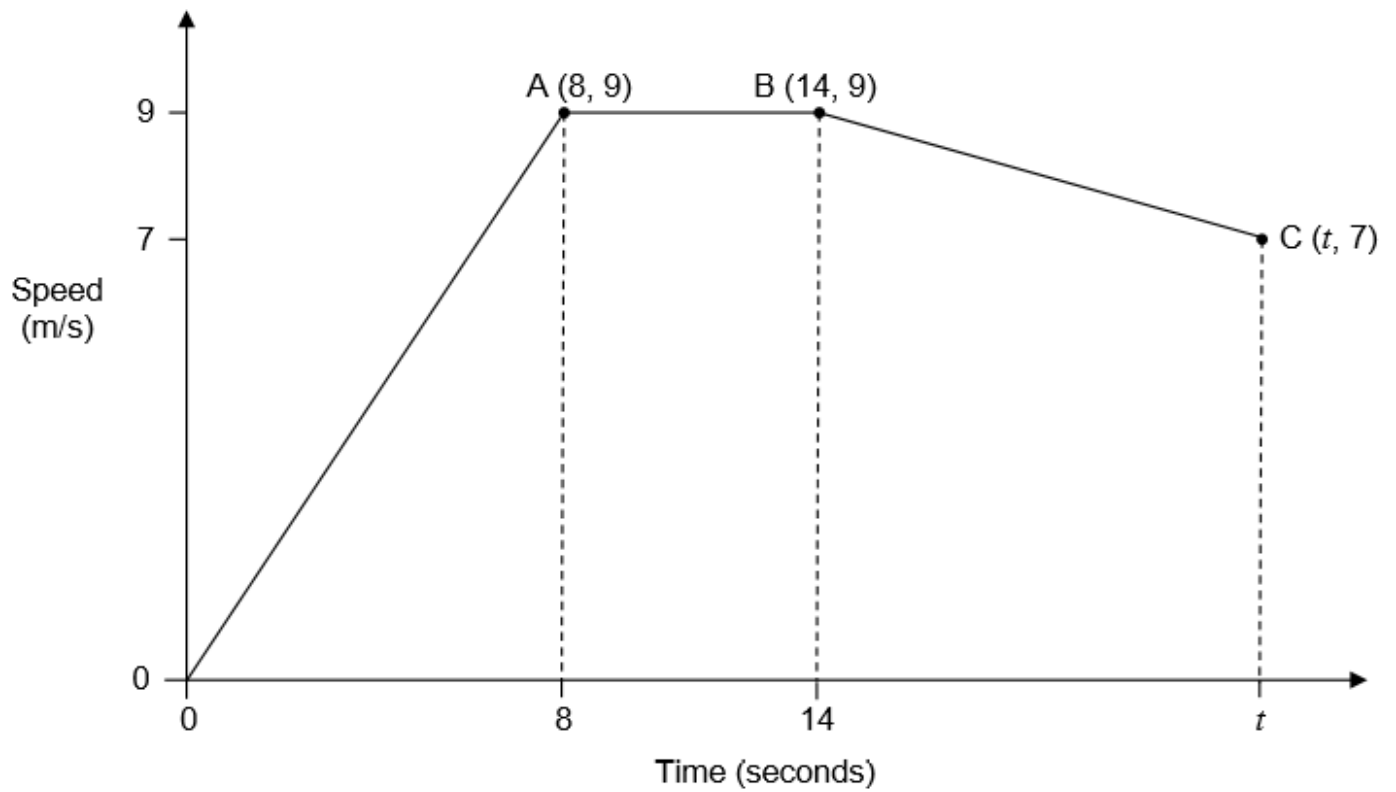   where there are road works   70 mph for the rest of the journey.

    Using his assumptions, work out his journey time.

[4]

b) Rob's assumptions about his average speeds are too high.   How does this affect
   his journey time?

[1]

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

The average speed from 0 to t seconds was 7.2 m/s

Work out the value of t.

[5]

CREDITS AND NOTES

Q	Awarding Body	Q	Awarding Body	Q	Awarding Body
1	WJEC Eduqas	11	AQA	21	AQA
2	WJEC Eduqas	12	Pearson Edexcel	22	AQA
3	WJEC Eduqas	13	AQA		
4	AQA	14	AQA		
5	Pearson Edexcel	15	Pearson Edexcel		
6	Pearson Edexcel	16	Pearson Edexcel		
7	Pearson Edexcel	17	Pearson Edexcel		
8	OCR	18	Pearson Edexcel		
9	OCR	19	AQA		
10	AQA	20	OCR		

Notes:

These questions have been retyped from the original sample/specimen assessment materials and whilst every effort has been made to ensure there are no errors, any that do appear are mine and not the exam board s (similarly any errors I have corrected from the originals are also my corrections and not theirs!).

Please also note that the layout in terms of fonts, answer lines and space given to each question does not reflect the actual papers to save space.

These questions have been collated by me as the basis for a GCSE working party set up by the GLOW maths hub - if you want to get involved please get in touch. The objective is to provide support to fellow teachers and to give you a flavour of how different topics "could" be examined. They should not be used to form a decision as to which board to use. There is no guarantee that a topic will or won't appear in the "live" papers from a specific exam board or that examination of a topic will be as shown in these questions.

Links:

AQA http://www.aqa.org.uk/subjects/mathematics/gcse/mathematics-8300

OCR http://ocr.org.uk/gcsemaths

Pearson Edexcel http://qualifications.pearson.com/en/qualifications/edexcel-gcses/mathematics-2015.html

WJEC Eduqas http://www.eduqas.co.uk/qualifications/mathematics/gcse/

Contents:

This version contains questions from:

AQA – Sample Assessment Material, Practice set 1 and Practice set 2

OCR – Sample Assessment Material and Practice set 1

Pearson Edexcel – Sample Assessment Material, Specimen set 1 and Specimen set 2

WJEC Eduqas – Sample Assessment Material