

Name:.....

Total Marks:.....

GCSE (9-1) Grade 8/9

# Area under a curve



## Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name.
- Answer **all** questions.

Answer the questions in the spaces provided

– there may be more space than you need.

- **Show all your working out**

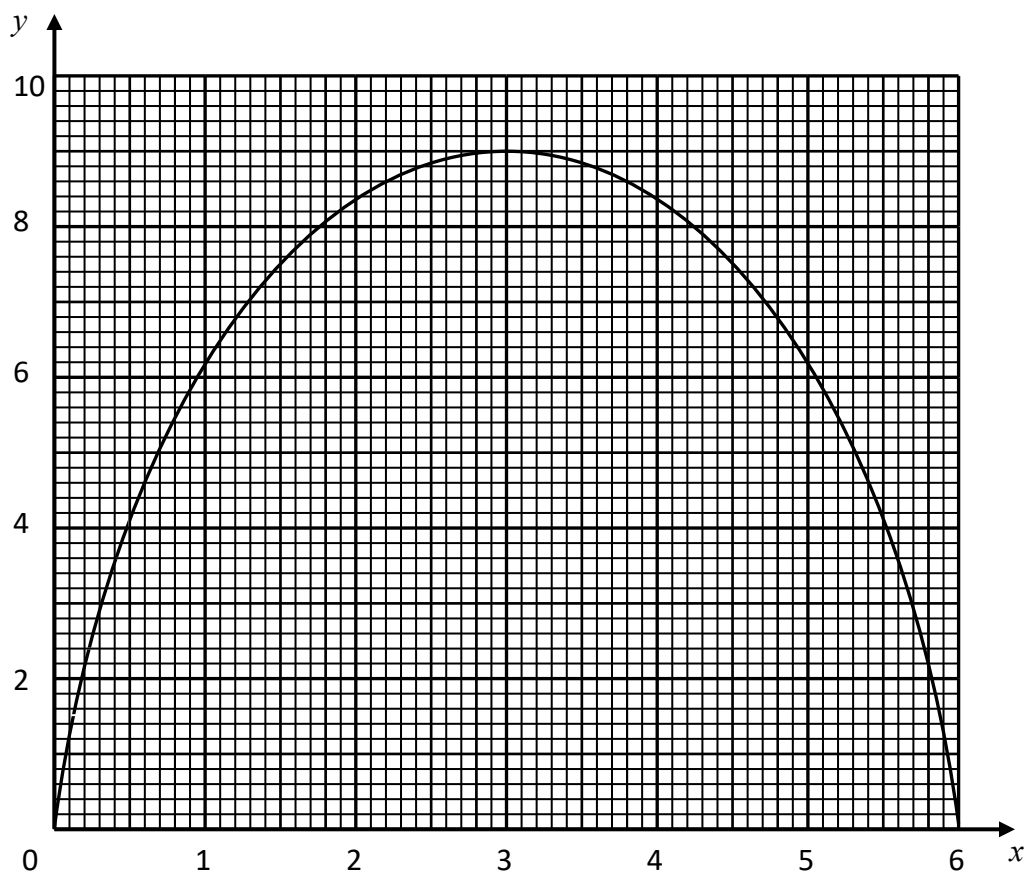
## Information

- The total mark for this paper is 73.
- The marks for **each** question are shown in brackets.
  - use this as a guide as to how much time to spend on each question.
- Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed

## Advice

- Read each question carefully before you start to answer it
- Attempt every question
- Check your answers if you have time at the end

1. The diagram shows the graph of  $y = 6x - x^2$



(a) Use 3 equal strips on the graph to estimate the area under the curve between  $x = 1$  and  $x = 4$

.....

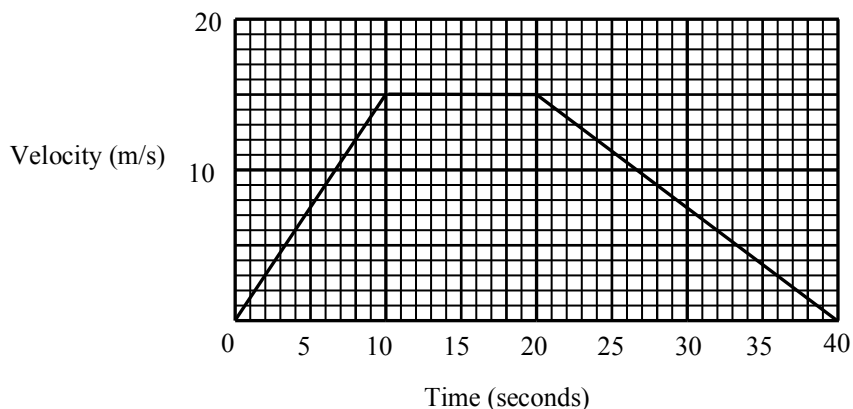
**(3 marks)**

(b) Is the answer to part (a) an over-estimate or an under-estimate? Justify your answer.

.....

**(1 mark)**

2. The velocity-time graph shows the velocity of a car for the first 40 seconds.

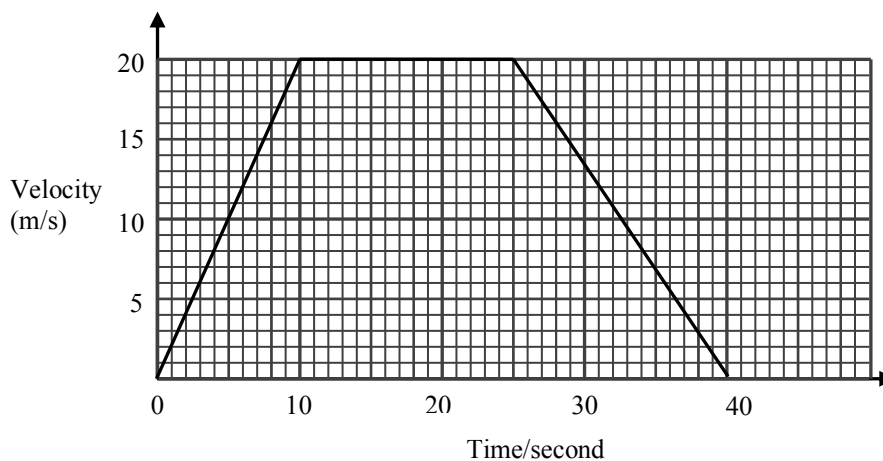


Work out the total distance travelled in the first 40 seconds

.....

**(2 marks)**

3. This graph shows a journey of a car.

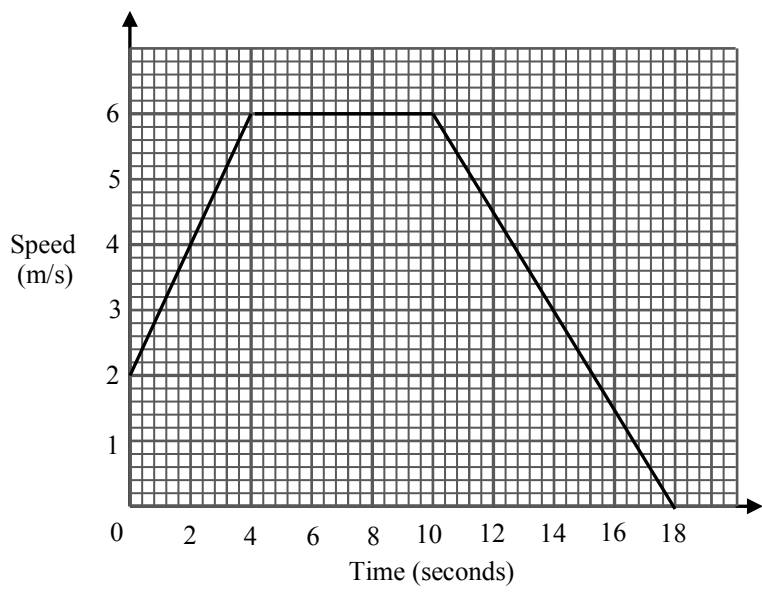


Work out the total distance travelled in the first 40 seconds

.....

**(2 marks)**

4. The diagram shows the speed-time graph for the last 18 seconds of Sandeep's cycle journey.



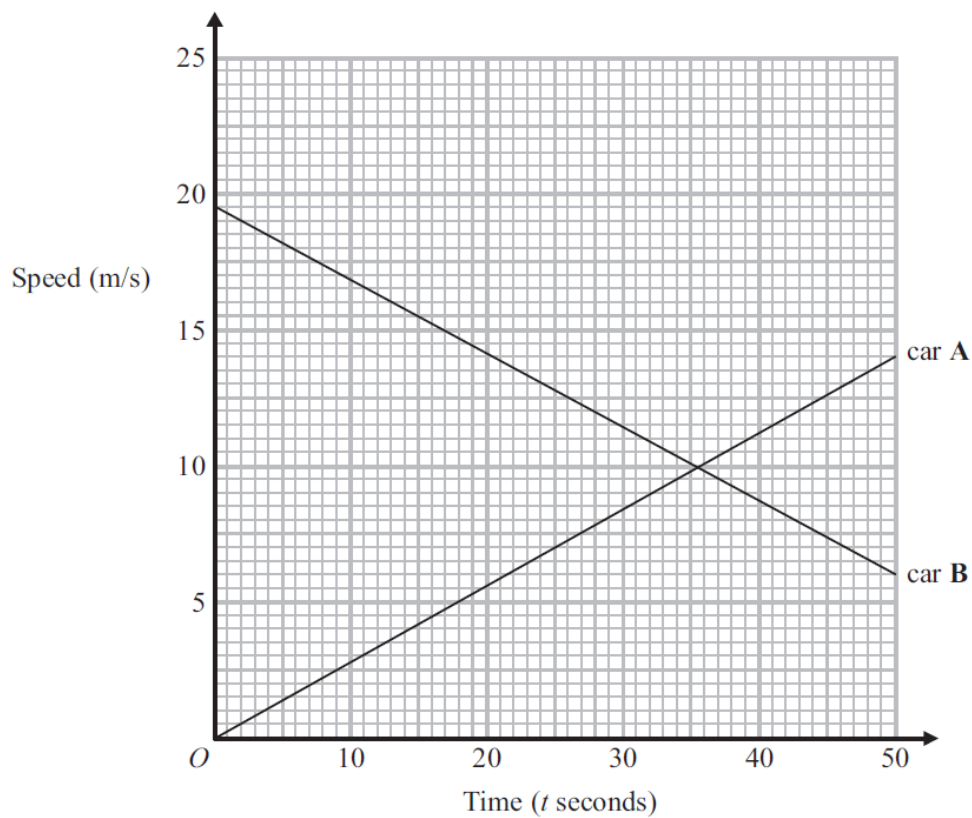
(a) Work out distance travelled in the first 4 seconds.

.....  
**(2 marks)**

(b) Hence, or otherwise, work out distance travelled in the last 18 seconds.

.....  
**(2 marks)**

5. The graph shows information about the speeds of two cars.



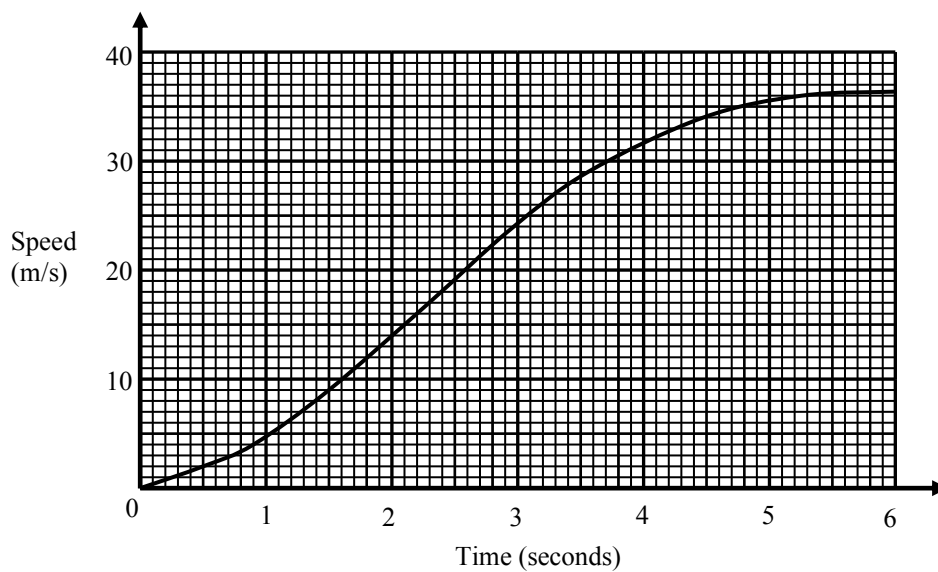
Which car travelled the furthest?

You must show your working.

.....

**(4 marks)**

6. The graph shows a car's speed, in m/s, varies in the first 6 seconds after the car moves from rest.



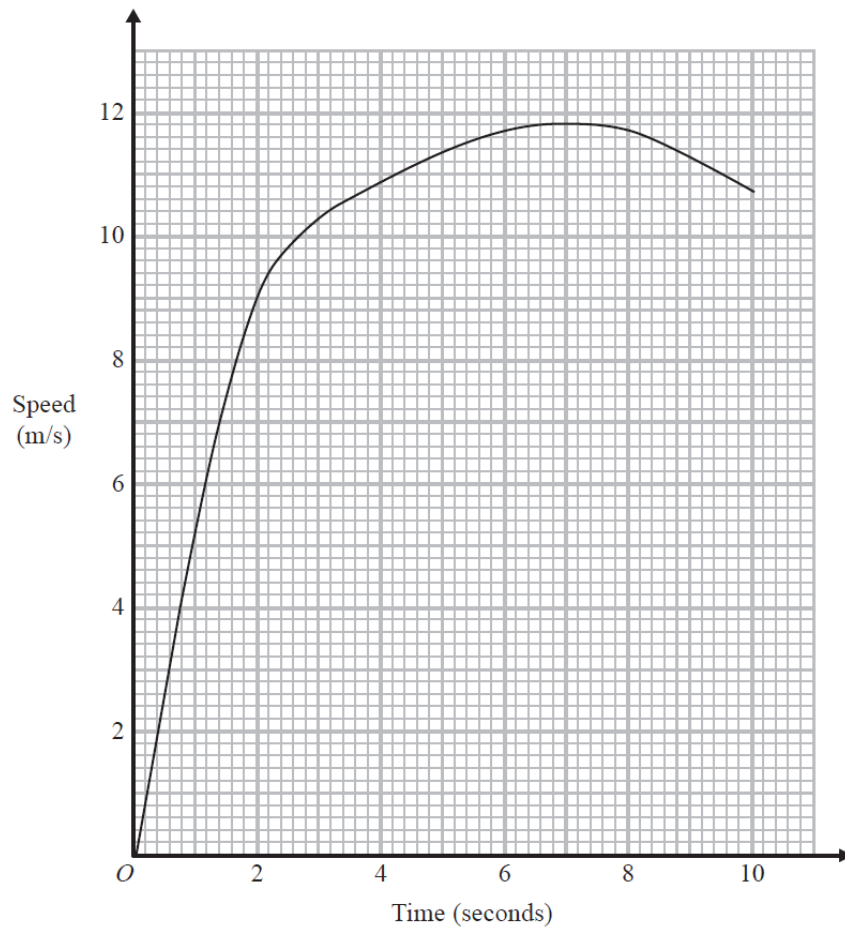
Use 3 equal strips on the graph to estimate the distance travelled in the first 6 seconds.

.....

**(3 marks)**

7. Usain runs in a race.

The graph shows his speed, in metres per second (m/s), during the first 10 seconds of the race.



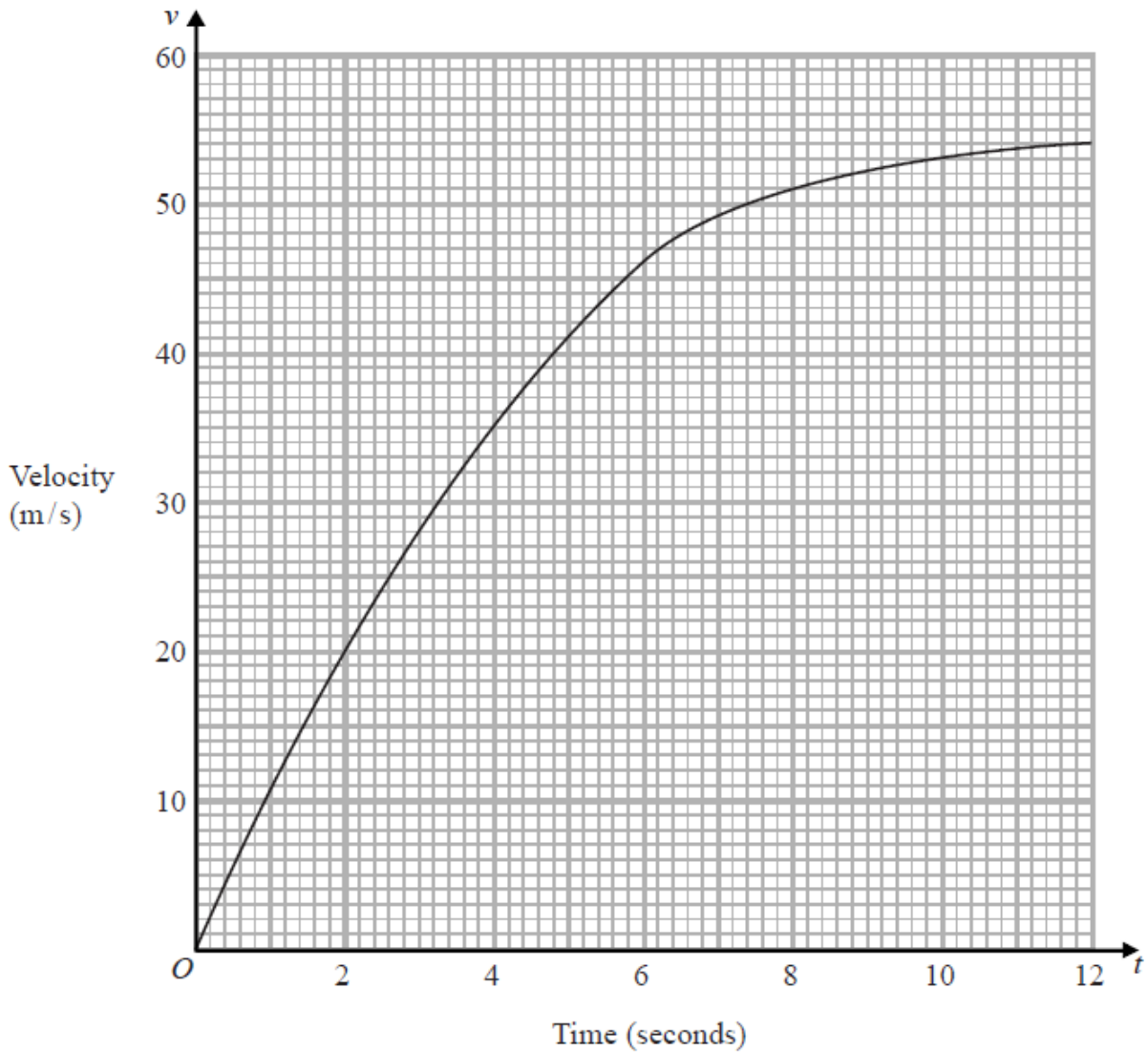
(a) Use 4 equal strips on the graph to estimate the total distance travelled in the first 10 seconds.

.....  
**(3 marks)**

(b) Is the answer to part (a) an over-estimate or an under-estimate? Justify your answer.

.....  
**(1 mark)**

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



- (a) Use 4 equal strips on the graph to estimate the total distance travelled in the first 12 seconds.

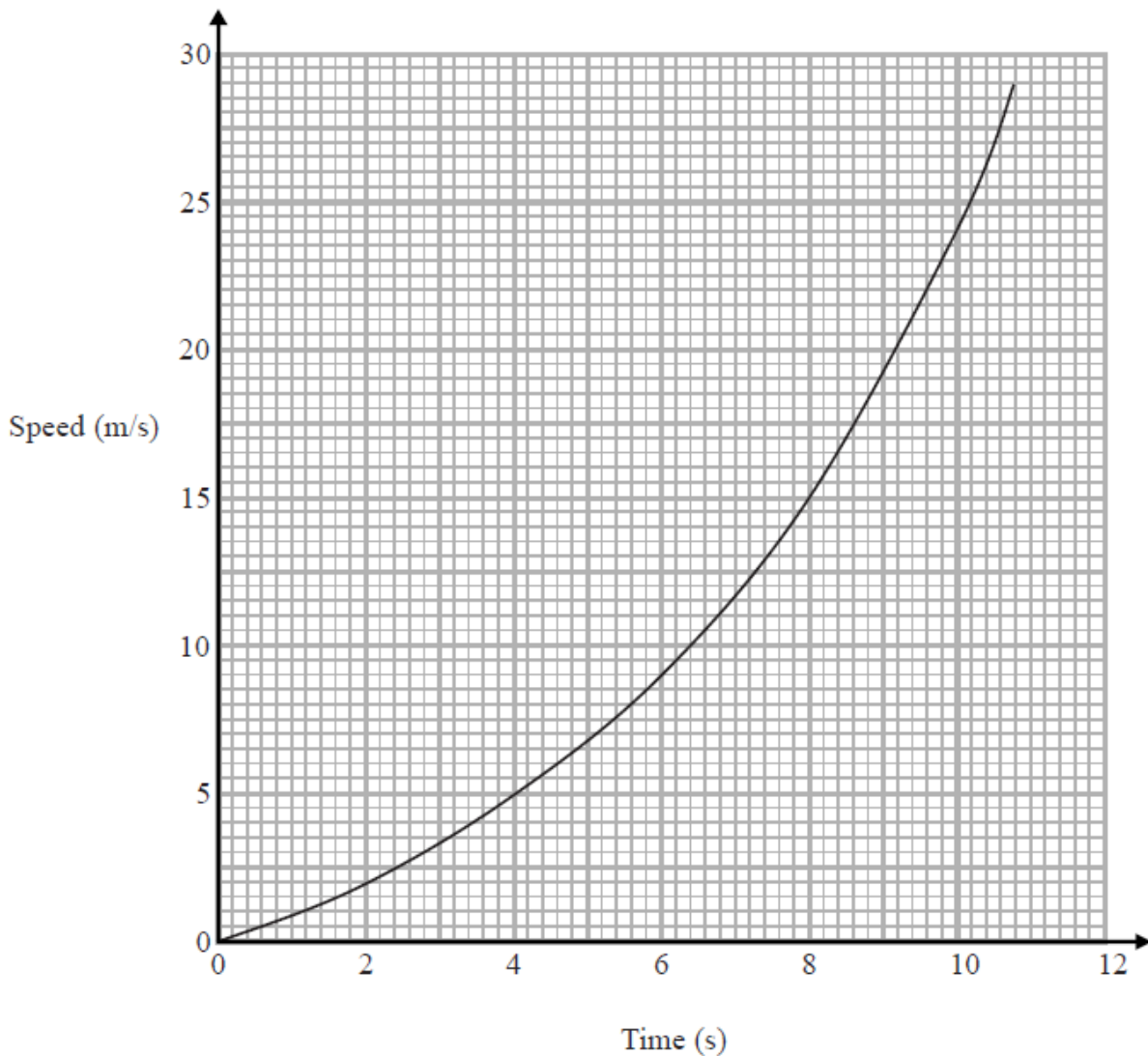
.....  
**(3 marks)**

- (b) Is the answer to part (a) an over-estimate or an under-estimate? Justify your answer.

.....  
**(1 mark)**



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



- (a) Use 3 equal strips on the graph to estimate the total distance travelled in the first 9 seconds.

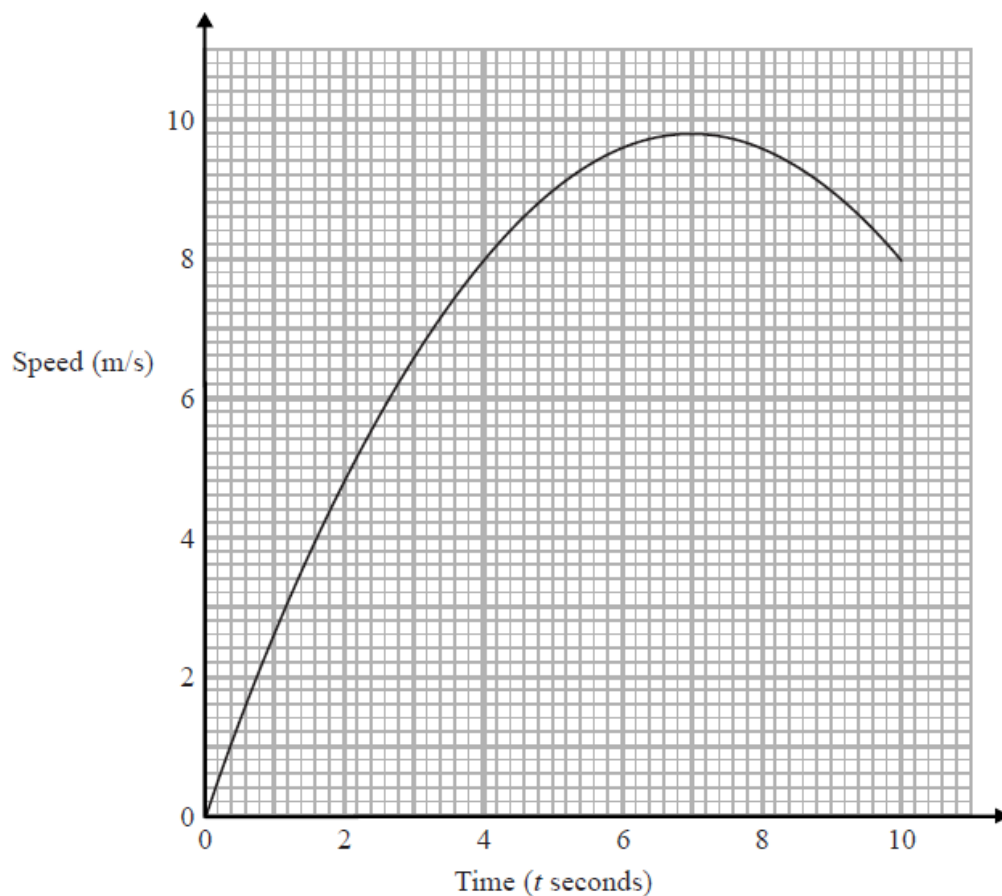
.....  
**(3 marks)**

- (b) Is the answer to part (a) an over-estimate or an under-estimate? Justify your answer.

.....  
**(1 mark)**

10. Karol runs in a race.

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



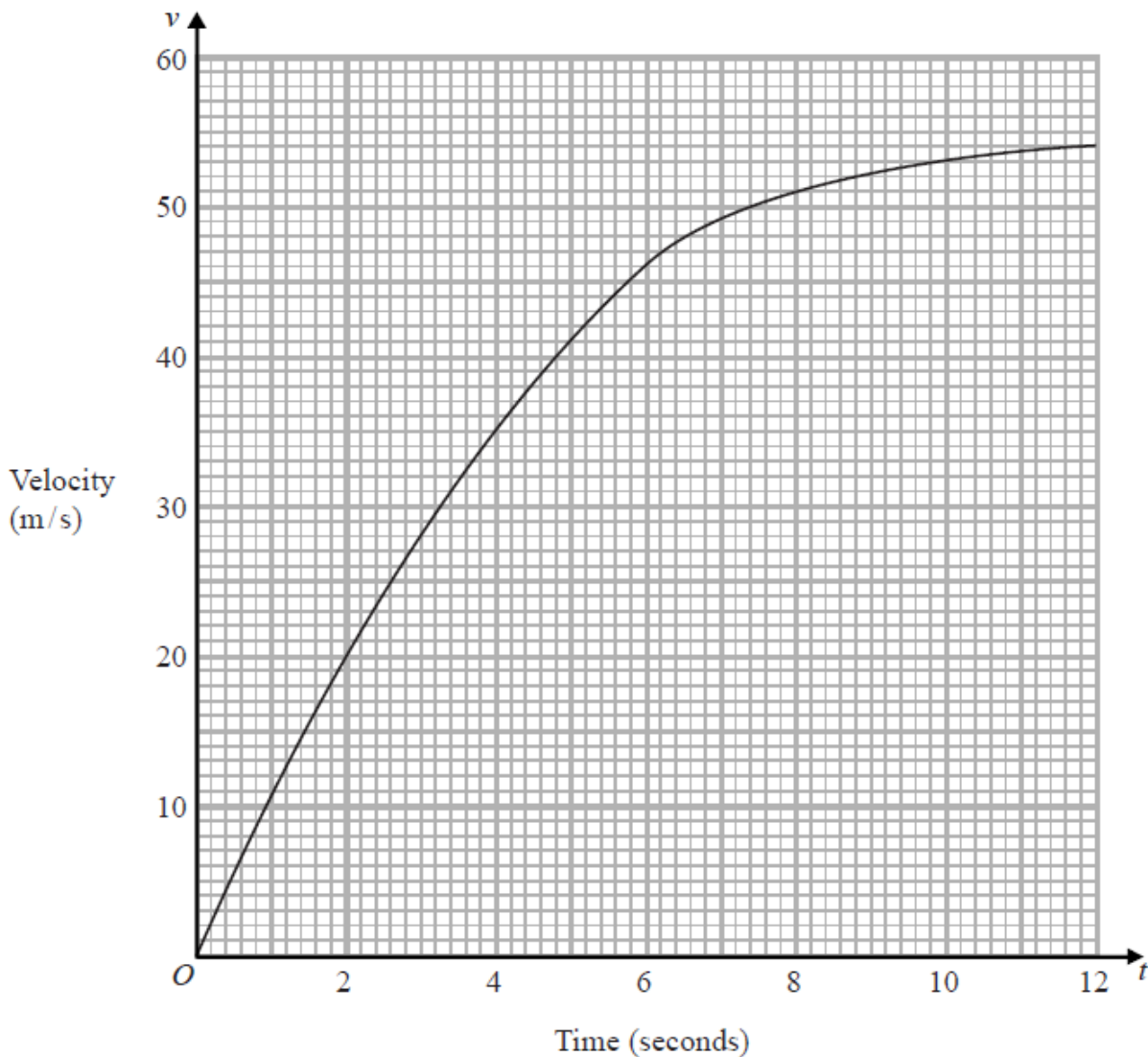
(a) Use 3 equal strips on the graph to estimate the total distance travelled in the first 9 seconds.

.....  
**(3 marks)**

(b) Is the answer to part (a) an over-estimate or an under-estimate? Justify your answer.

.....  
**(1 mark)**

11. 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  $t = 6$

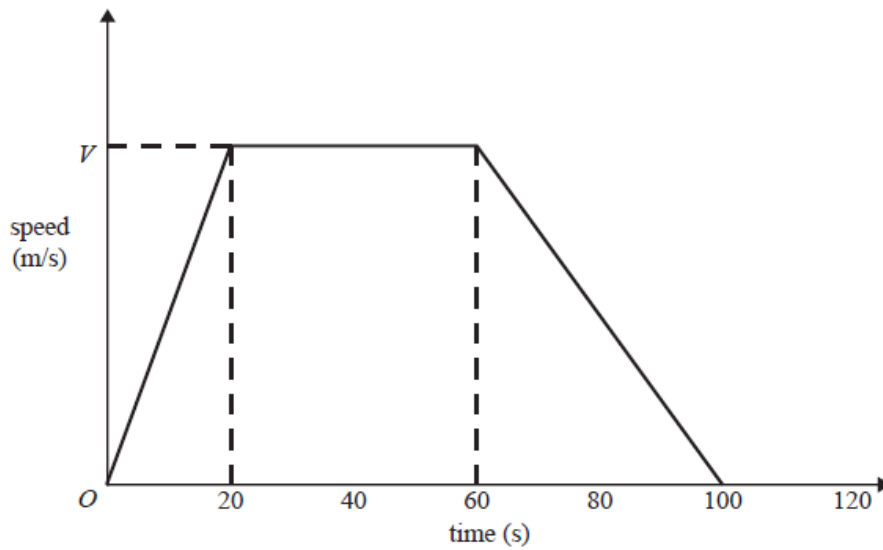
..... m/s<sup>2</sup>  
**(2 marks)**

- (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.

.....  
**(3 marks)**

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

The journey took 100 seconds.

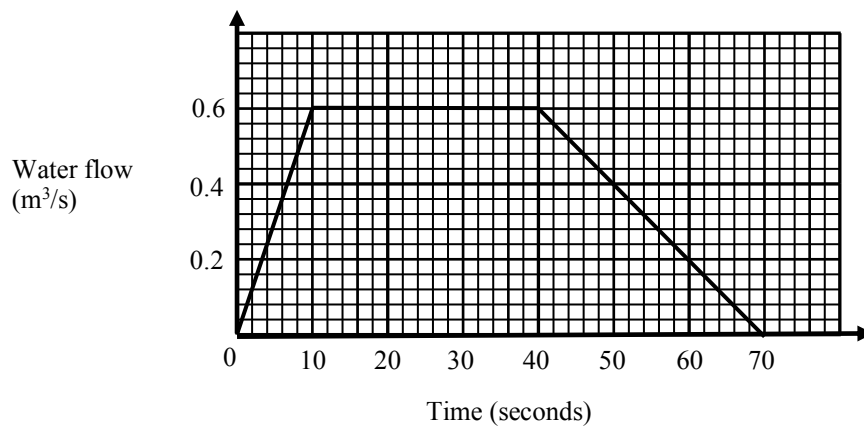


The car travelled 1.75 km in the 100 seconds.

Work out the value of  $V$ .

.....  
(4 marks)

13. The graph shows the rate at which water is flowing from a pipe.



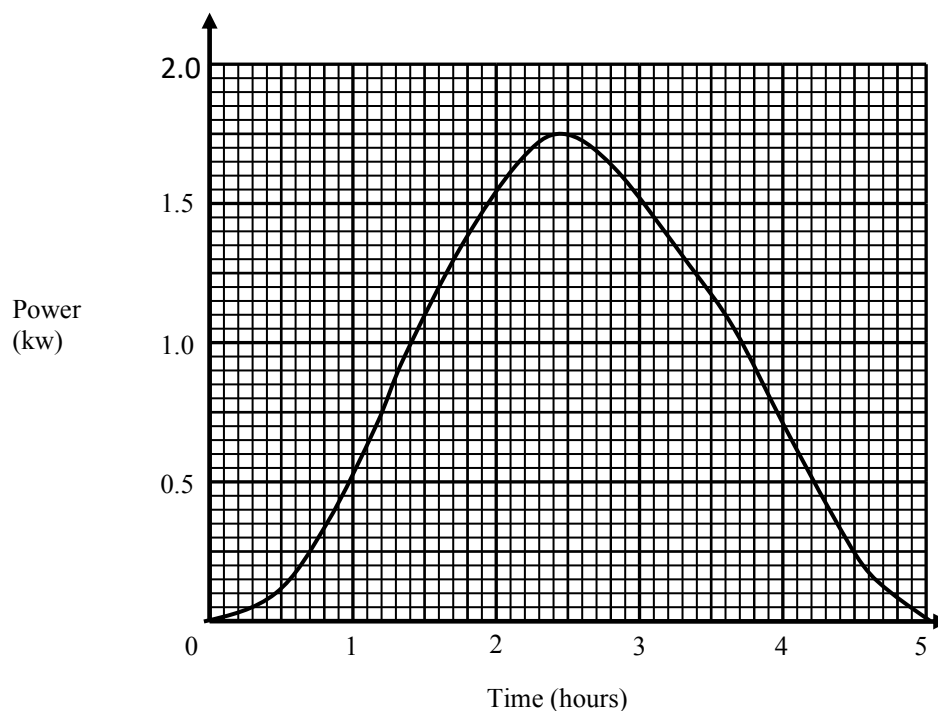
(a) Work out the area under the graph between  $t = 0$  and  $t = 70$

.....  
(2 marks)

(b) Give an interpretation to the value found in part (a).

.....  
(1 mark)

14. The graph shows the amount of power, in kilowatts, produced by a solar panel over a period of time, in hours.



The area under a power-time graph represents the amount of energy produced.

- a) Use 3 equal strips on the graph to estimate the amount of energy produced between  $t = 1$  and  $t = 4$

.....  
**(3 marks)**

- (b) Is the answer to part (a) an over-estimate or an under-estimate? Justify your answer.

.....  
**(1 mark)**



15. An athlete runs along a straight road.

She starts from rest and moves with constant acceleration for 5 seconds, reaching a speed of 8 m/s. This speed is then maintained for 50 seconds. She then decelerates at a constant rate until she stops. She has run for a total of 75 seconds.

(a) Sketch a speed-time graph to illustrate the motion of the athlete.

.....  
(3 marks)

(b) Work out the total distance, in m, run by the athlete.

.....  
(2 marks)



16. A girl runs a 450 m to a shop in a time of 90 s. It is assumed that, starting from rest, she moves with constant acceleration for 4 s, reaching a speed of  $V \text{ m s}^{-1}$ . She maintains this speed for 60 s and then moves with constant deceleration for 26 s until she stops.

(a) Sketch a speed-time graph for the motion of the girl during the whole race.

.....  
**(3 marks)**

(b) Work out the value of  $V$ .

.....  
**(3 marks)**





17. A car accelerates uniformly from rest for 20 seconds.

It moves at constant speed  $v \text{ m s}^{-1}$  for the next 40 seconds and then decelerates uniformly for 10 seconds until it comes to rest.

(a) For the motion of the car, sketch a speed-time graph,

.....  
**(3 marks)**

Given that the total distance moved by the car is 880 metres,

(b) find the value of  $v$

.....  
**(3 marks)**



18. A car is travelling along a straight horizontal road.

The car takes 120 s to travel between two sets of traffic lights which are 2145 m apart.

The car starts from rest at the first set of traffic lights and moves with constant acceleration for 30 s until its speed is  $22 \text{ m s}^{-1}$ .

The car maintains this speed for  $T$  seconds.

The car then moves with constant deceleration, coming to rest at the second set of traffic lights.

(a) Sketch a speed-time graph for the motion of the car between the two sets of traffic lights.

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(3 marks)

(b) Find the value of  $T$ .

.....  
(3 marks)

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TOTAL FOR PAPER IS 73 MARKS