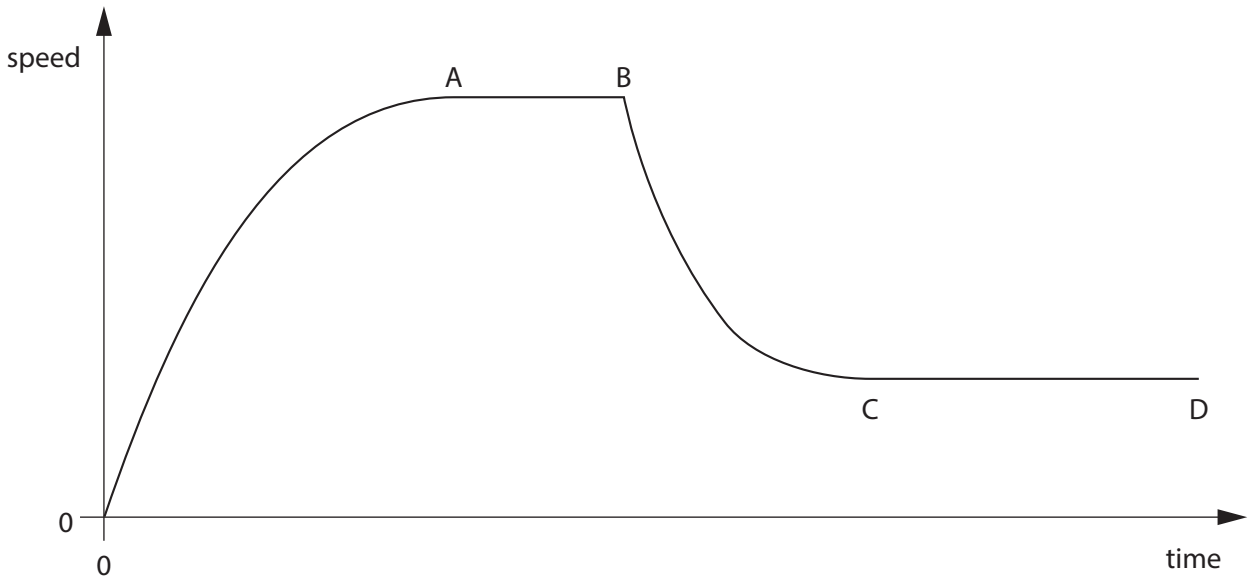
1 A free-fall parachutist jumps from a helium balloon, but does not open his parachute for some time.

The figure shows the speed-time graph for his fall. Point B indicates when he opens his parachute.



(a) State the value of the gradient of the graph immediately after time $t = 0$.

gradient = ... [1]

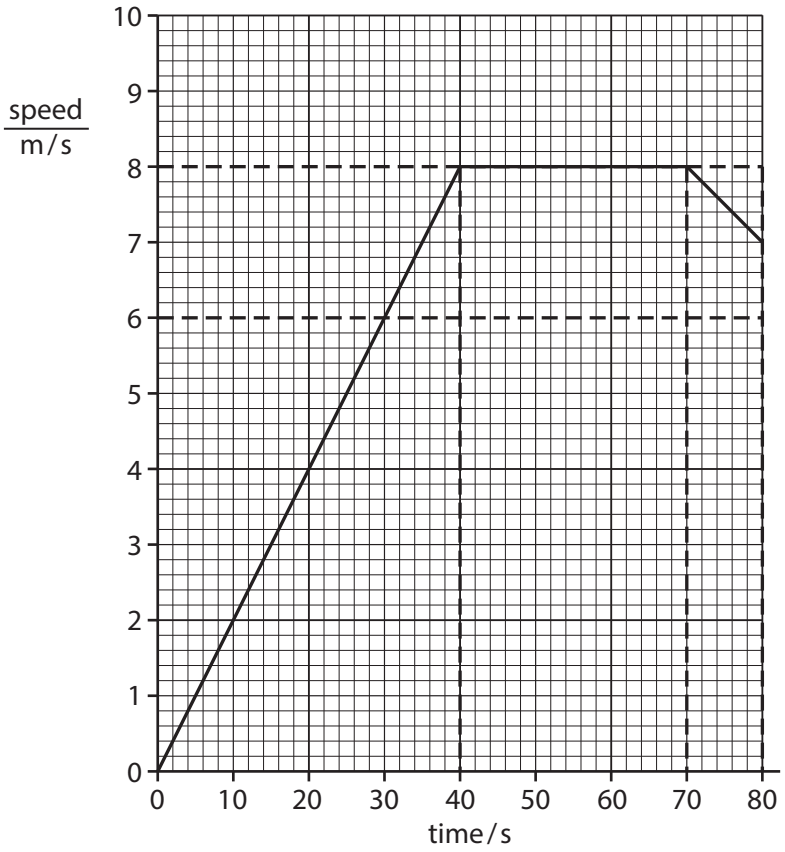
(b) Explain why the gradient has this value.

.....

..... [1]

[Total: 2]

2 The figure is the speed-time graph for the motion of a bus along a road.



(a) Calculate the distance travelled by the bus in the first 40 s.

distance = ... m [3]

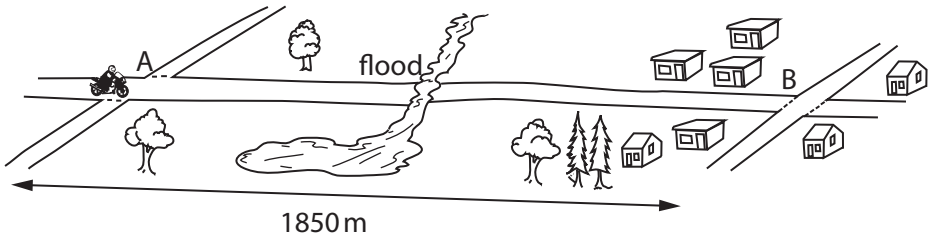
(b) The distance travelled between 40 s and 80 s is 315 m.

Calculate the average speed of the bus during the whole 80 s.

average speed = ... m/s [4]

[Total: 7]

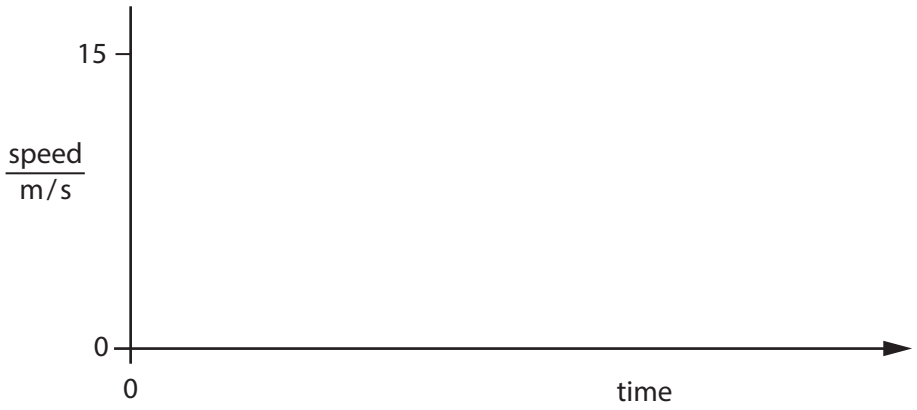
3 A motorcyclist travels from A to B along a straight road, as shown in the figure.



The motorcyclist passes over the minor crossroads at A at 15 m / s and, for most of the distance between A and B, he continues at 15 m / s.

The road is flooded at one point, so he has to slow down to ride through the water. He also slows down and stops at the major crossroads at B.

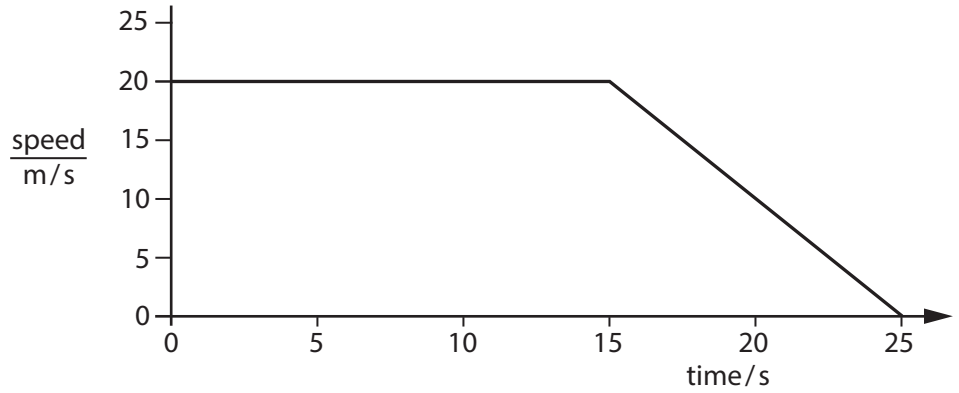
On the axes below, sketch the speed-time graph for the journey between A and B.



[5]

[Total: 5]

4 A motorcyclist completes a journey. The speed-time graph for this journey is shown in the figure.

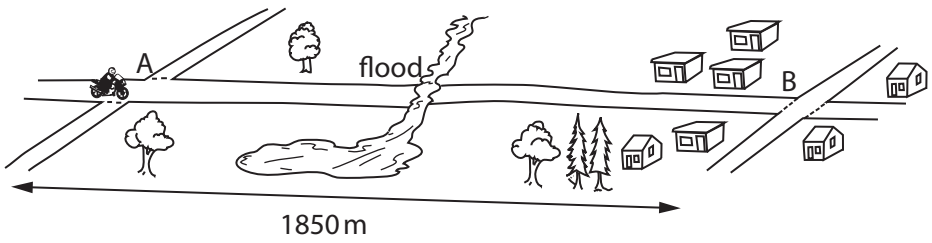


Use the graph to determine the distance travelled by the motorcyclist during this journey.

distance travelled = ... m [4]

[Total: 4]

5 A motorcyclist travels from A to B along a straight road, as shown in the figure.



The motorcyclist passes over the minor crossroads at A at 15 m/s and, for most of the distance between A and B, he continues at 15 m/s.

The road is flooded at one point, so he has to slow down to ride through the water. He also slows down and stops at the major crossroads at B.

(a) The distance between A and B is 1850 m.

If the motorcyclist had been able to maintain 15 m / s all the way from A to B, calculate the total time the ride would have taken.

time = ... s [3]

(b) Suggest how the actual time taken from A to B compares with your value in **(a)**. Tick one box.

greater than calculated ☐

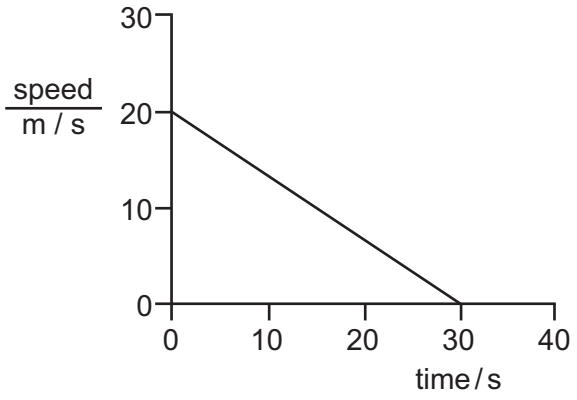
the same as calculated ☐

less than calculated ☐

[1]

[Total: 4]

6 The graph represents part of the journey of a car.



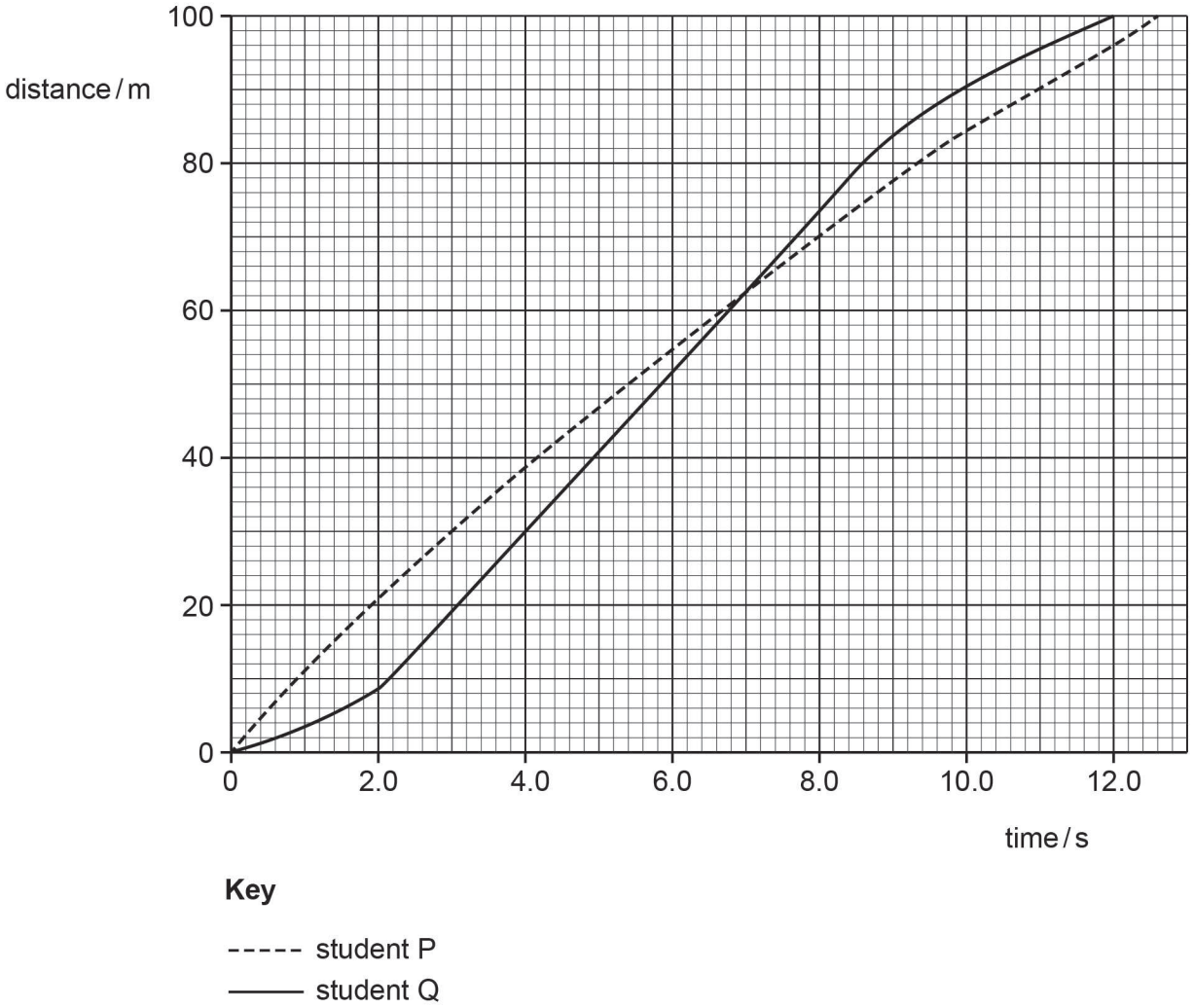
What distance does the car travel during this part of the journey?

A 150 m **B** 300 m **C** 600 m **D** 1200 m

[1]

[Total: 1]

7 Student P and student Q run in a 100 m race.
The diagram shows the distance–time graph for each student during the race.



(a) Calculate the average speed of student Q during the 100 m race.

average speed = ... m / s [3]

(b) State which student has the faster speed between 3.0 s and 6.0 s.

Explain how the distance-time graphs allows you to compare speeds without calculation.

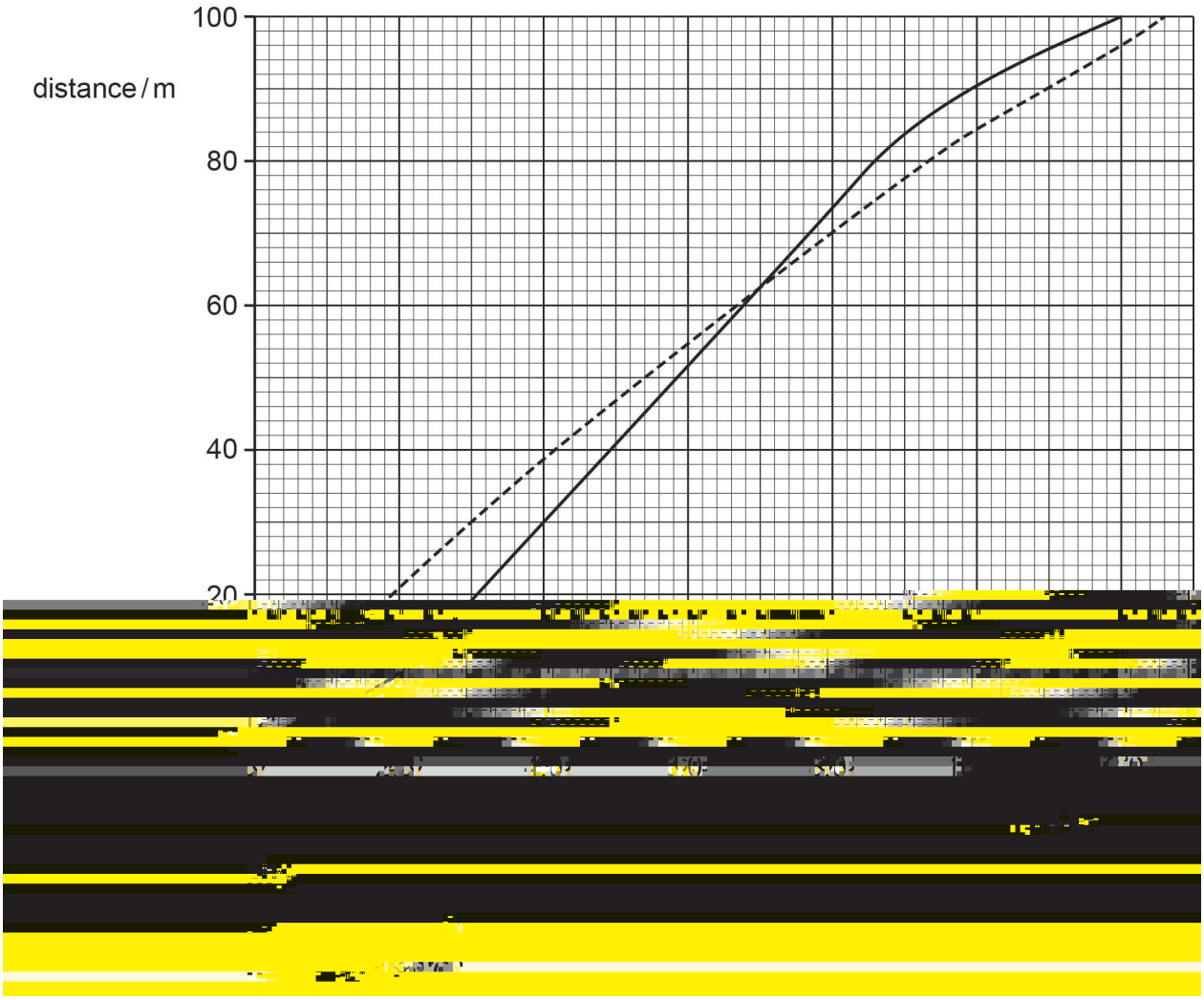
.....

.....

..... [1]

[Total: 4]

8 Student P and student Q run in a 100 m race.
The diagram shows the distance–time graph for each student during the race.



(a) Determine the time taken for student Q to run 100 m.

time = ... s [1]

(b) Determine the distance between the two students as Q reaches 100 m.

distance = ... m [1]

[Total: 2]

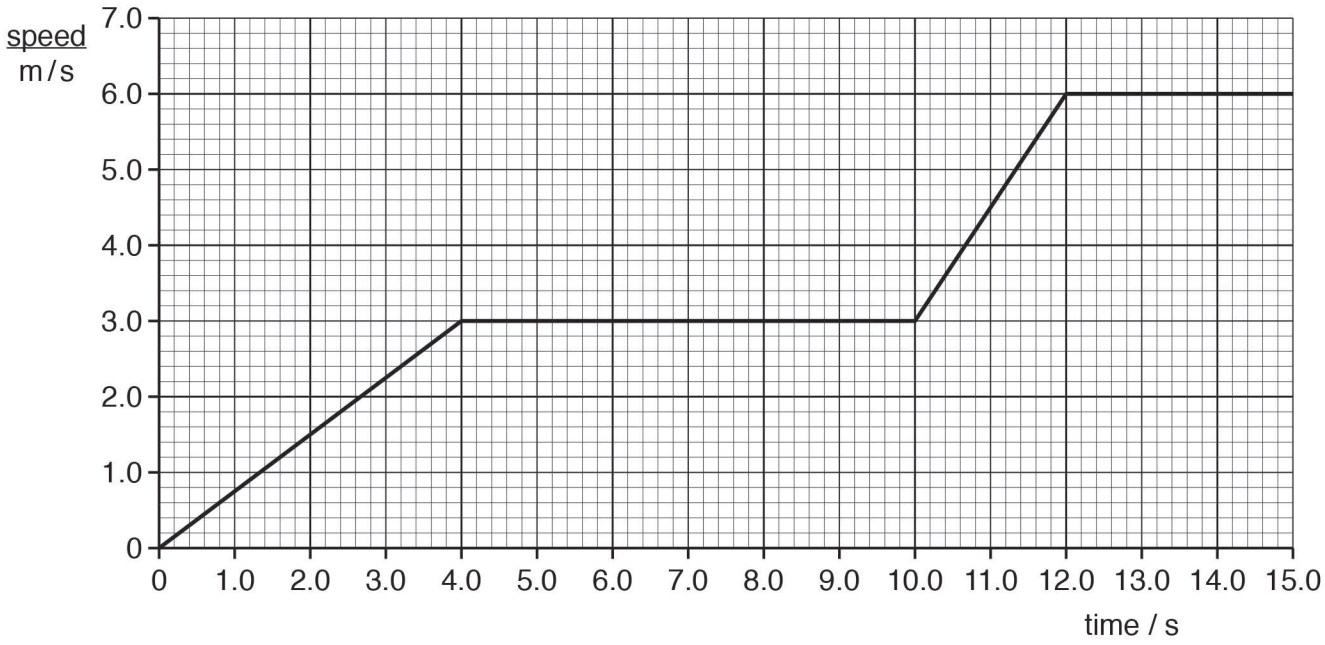
9 During part of a race, a skier travels a distance of 200 m in a time of 6.4 s.

Calculate the average speed of the skier.

average speed = ... m / s [3]

[Total: 3]

10 The graph is a speed-time graph for a footballer for the first 15.0 seconds of a game.



Use the graph to determine when the footballer is moving with greatest acceleration.

Between ..... s and ..... s

Give a reason for your answer.

.....

..... [2]

[Total: 2]

11 A student reviews some data about athletes and footballers.

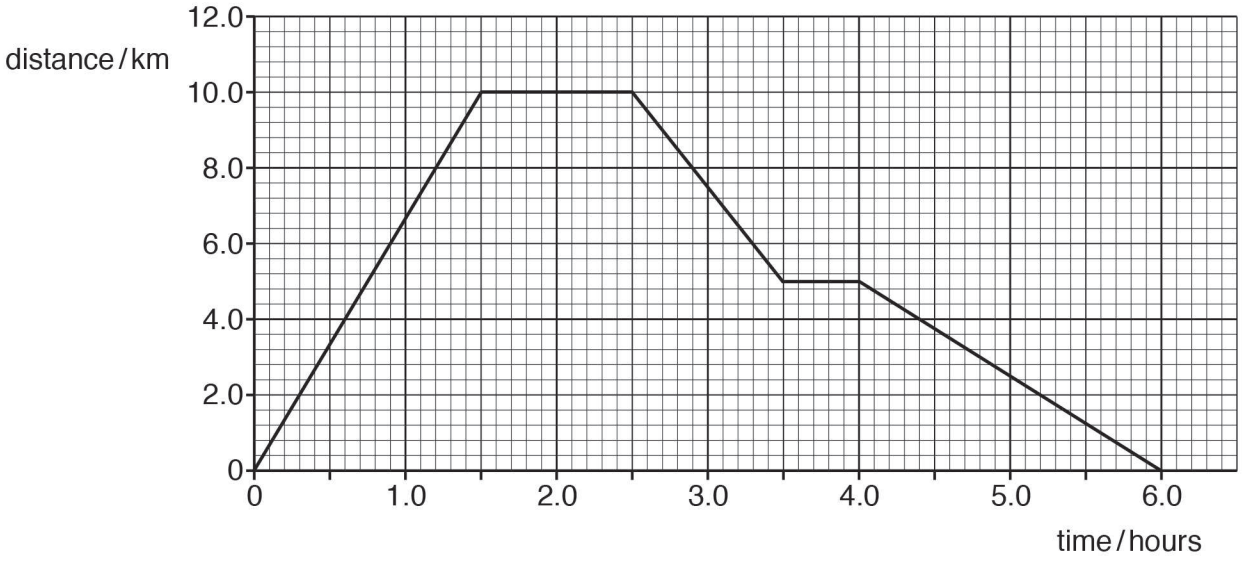
An athlete runs 12 km in 1.5 hours.

Calculate the athlete's average speed in km / h.

average speed = ... km / h [3]

[Total: 3]

12 The graph is a distance-time graph for a man walking from home to a café. At the café the man stops for a drink.



On the return journey from the café, the man stopped to rest.

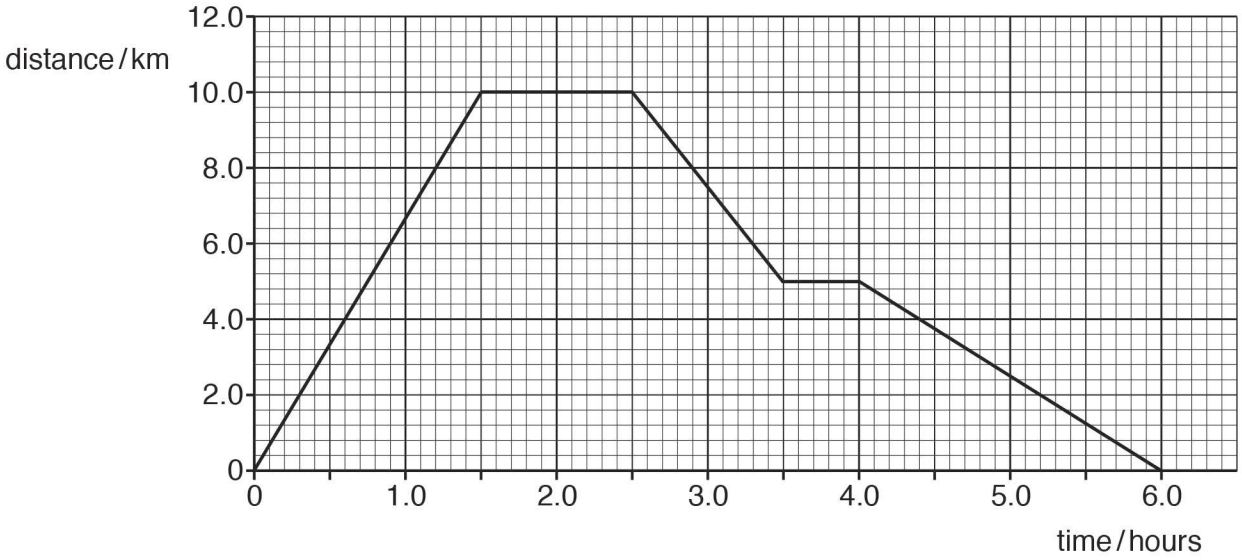
The man left home at 13:00.

Determine the time when the man began his rest.

time when rest began = ... [1]

[Total: 1]

13 The graph is a distance-time graph for a man walking from home to a café. At the café the man stops for a drink. On the return journey from the café, the man stops to rest.

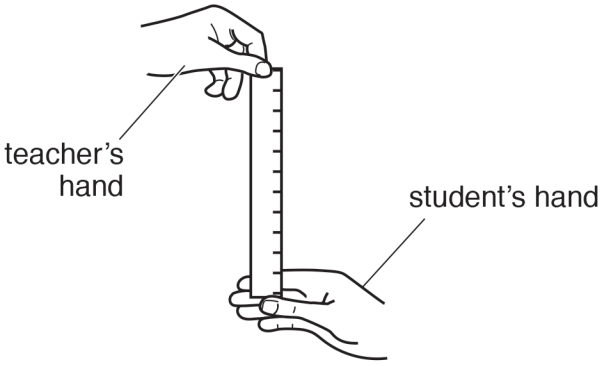


For how long did the man rest on the return journey? State the time in minutes.

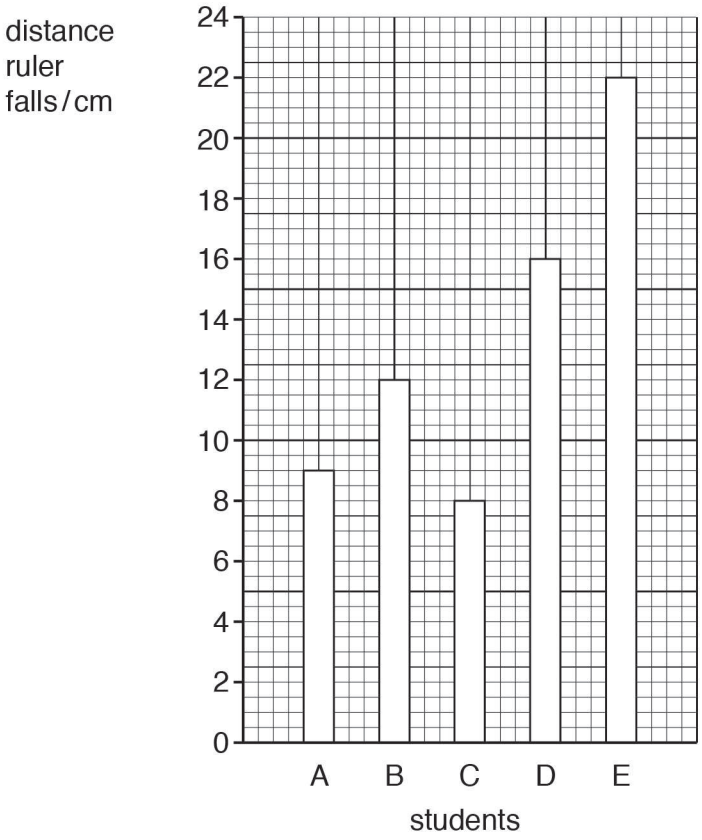
time = ... minutes [1]

[Total: 1]

14 A teacher investigates the reaction time of five students. A 0.50 m ruler is held above the hand of a student before being allowed to fall. The arrangement is shown in the diagram.



As soon as the ruler falls the student closes their hand, catching the ruler. The further the ruler falls, the greater the reaction time of the student. The results obtained are shown in the bar chart.



(a) Using the results shown in the bar chart, calculate the average distance that the ruler drops.

average distance = ... cm [2]

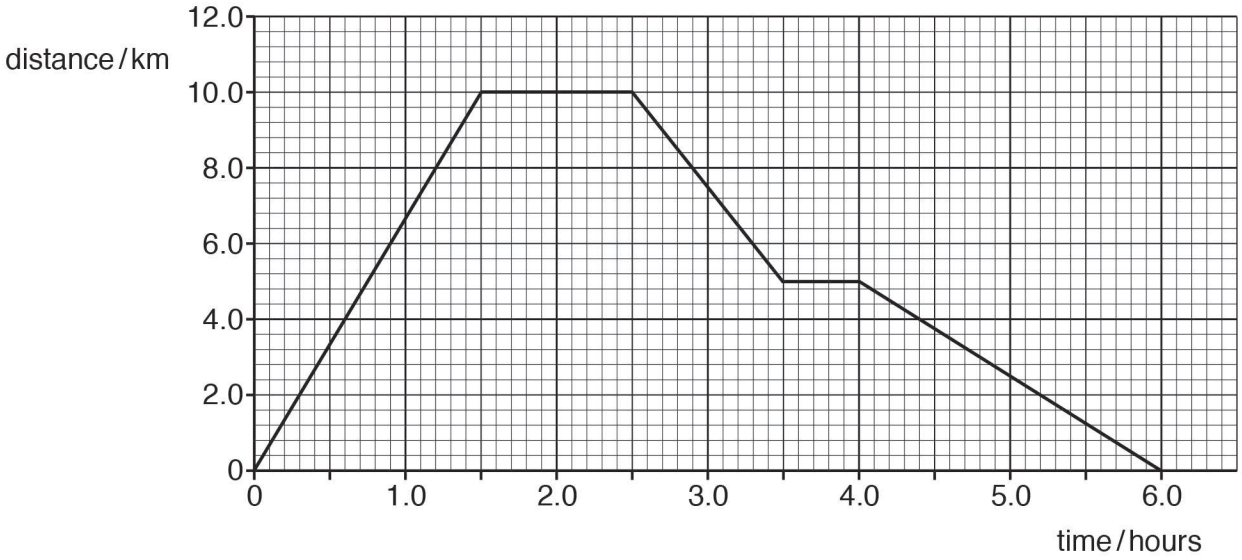
(b) List the students in order of their reaction times, with the shortest reaction time at the top of the table. One has been done for you.

order	student
1st	
2nd	
3rd	B
4th	
5th	

[2]

[Total: 4]

15 The diagram is a distance-time graph for a man walking from home to a café. At the café the man stops for a drink. On the return journey from the café, the man stops to rest.



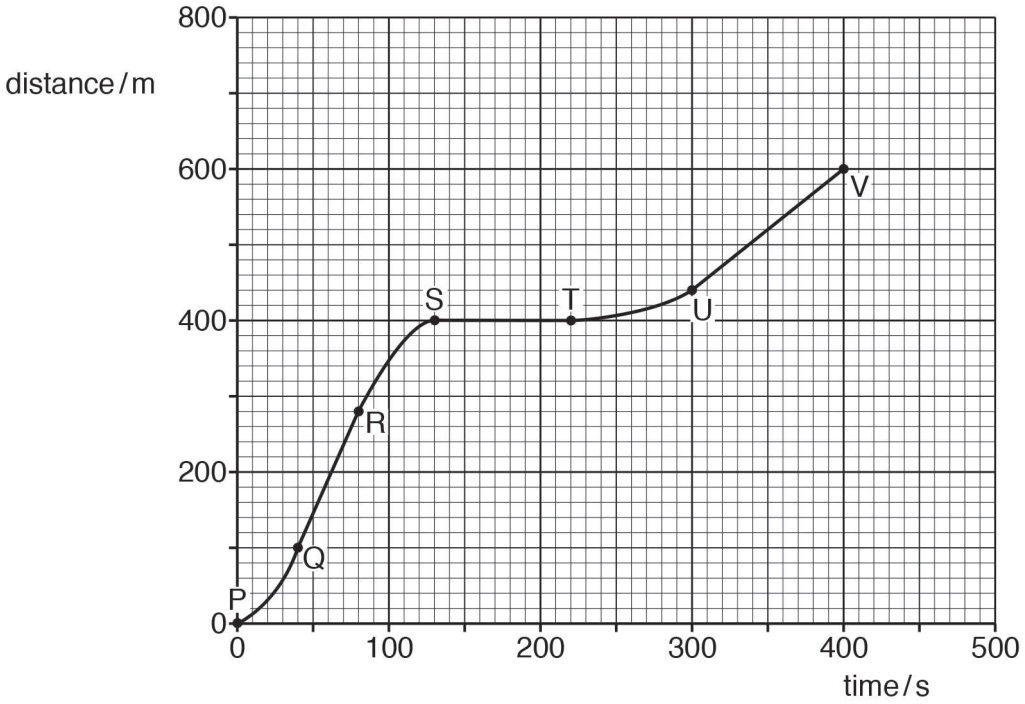
Describe, in words, how the graph shows that the man travelled at a slower speed on the return journey after resting.

.....

..... [1]

[Total: 1]

16 The graph is a distance-time graph for a cyclist travelling between points P and V on a straight road.



After point V, the straight road continues down a steep hill. The cyclist travels down the steep hill. He does not apply the brakes and all resistive forces can be ignored.

On the graph, sketch a possible motion for the cyclist after V. [1]

[Total: 1]

17 A school bus is taking some students to school.

On part of the journey, the average speed of the bus is 7.5 m / s.

Calculate the distance the bus travels in 150 s.

distance = ... m [3]

[Total: 3]

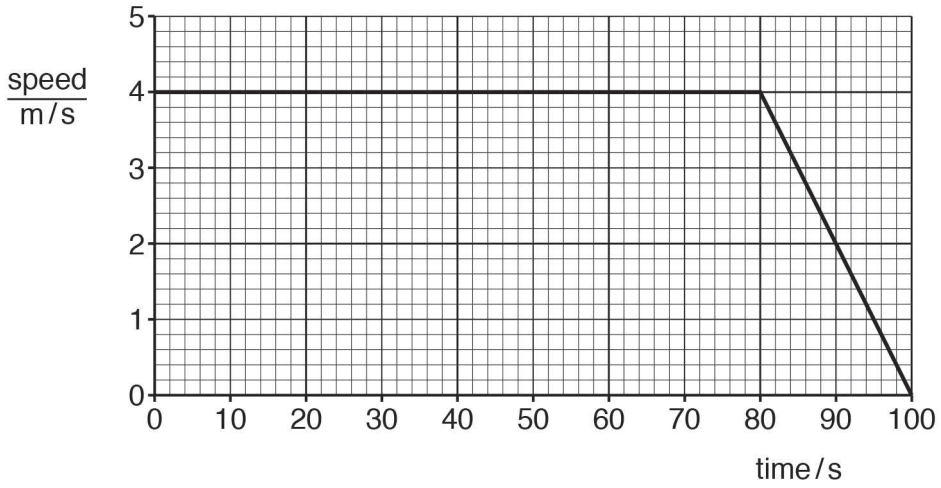
18 A student measures the average time taken for a drop of water to fall 12 m to the ground. The time taken is 1.6 s.

Calculate the average speed of this drop of water.

average speed = ... m / s [3]

[Total: 3]

19 The diagram shows a speed-time graph for a student who is running.



Describe the movement of the student, as shown in the speed-time graph.

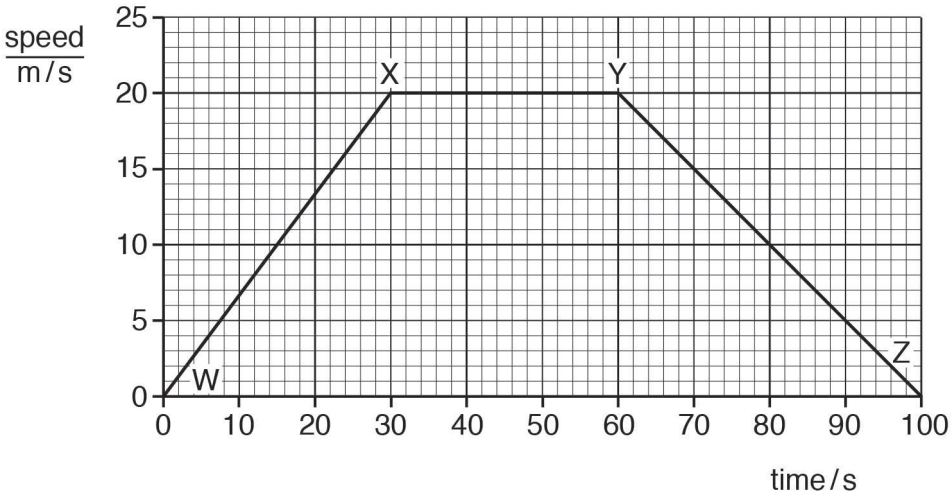
.....

.....

..... [2]

[Total: 2]

20 The graph is a speed-time graph for a car.



On the graph, the labels W, X, Y and Z show the points when the car's motion changed.

(a) Calculate the distance that the car travels between 60 s and 100 s.

distance travelled = ...m [3]

(b) The graph shows that the car's acceleration is greater than its deceleration.

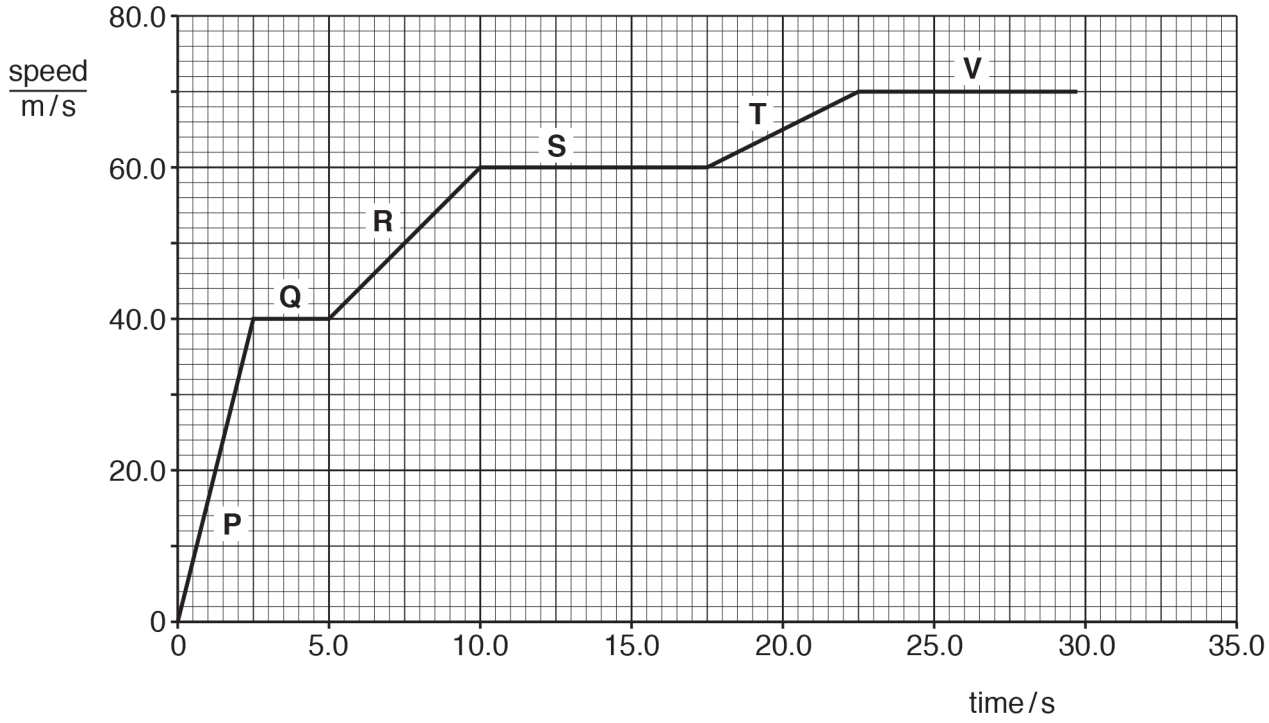
Explain how the graph shows this.

.....

..... [1]

[Total: 4]

21 The graph is a speed-time graph for a car during part of a race.



(a) State the section of the graph that shows the greatest acceleration. Explain your answer.

greatest acceleration .....

explanation.....

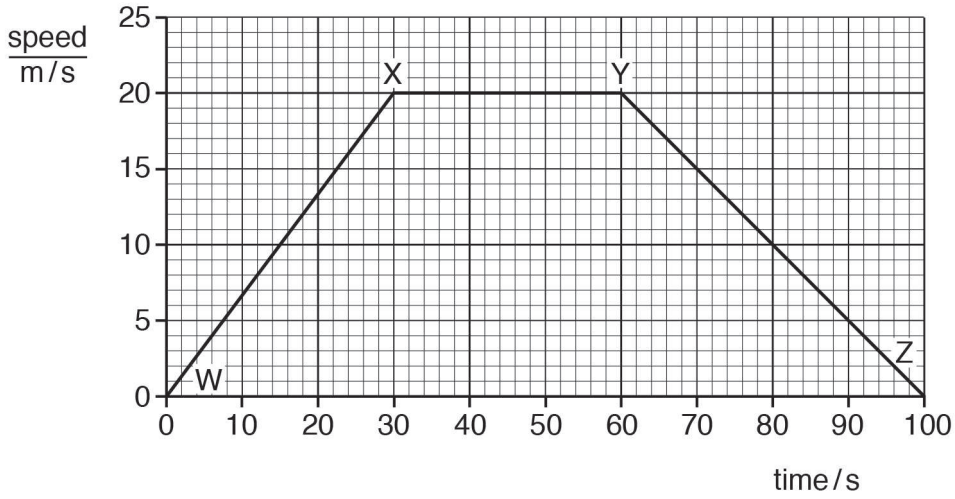
..... [2]

(b) Calculate the distance travelled by the car during the first 2.5 seconds.

distance = ... m [3]

[Total: 5]

22 The graph is a speed-time graph for a car.



On the graph, the labels W, X, Y and Z show the points when the car's motion changed.

On the diagram below, draw a line from each section of the graph to the correct description of the motion.

section of graph	**description of the motion**
from W to X	accelerating
from X to Y	decelerating
from Y to Z	stationary
	constant speed

[3]

[Total: 3]

23 A car is racing around a track. The length of the track is 4.0 km. The car goes around the track 20 times. The car takes 26 minutes and 40 seconds to complete the 20 laps.

Calculate the average speed of the car in m / s.

average speed = ... m / s [4]

[Total: 4]

24 A model railway has two stations, Station A and Station B. The distance between the two stations is 120 m. A model train takes 54 s to travel between Station A and Station B.

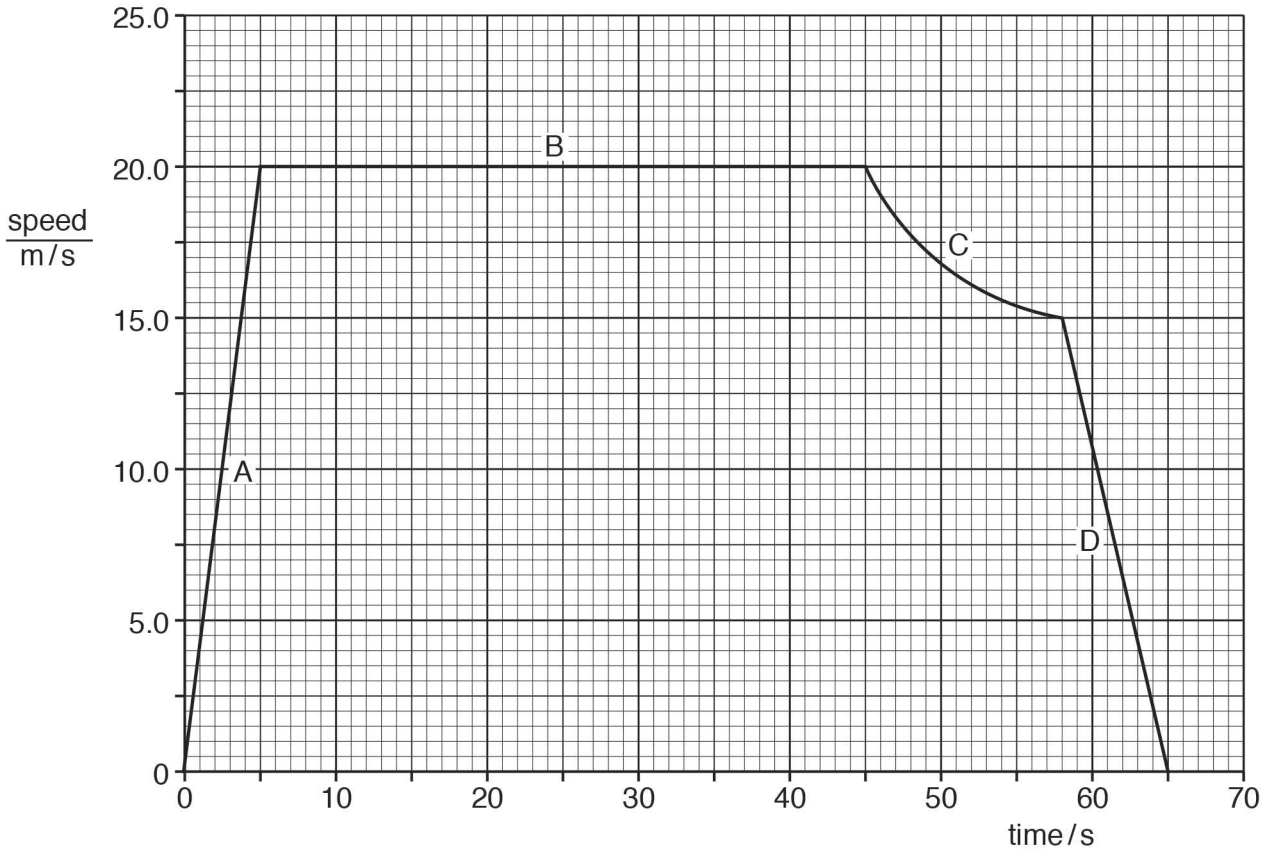
Calculate the average speed of this model train.

average speed = ... m / s [3]

[Total: 3]

25 Some cyclists are racing around a track.

The graph is a speed-time graph for one cyclist.



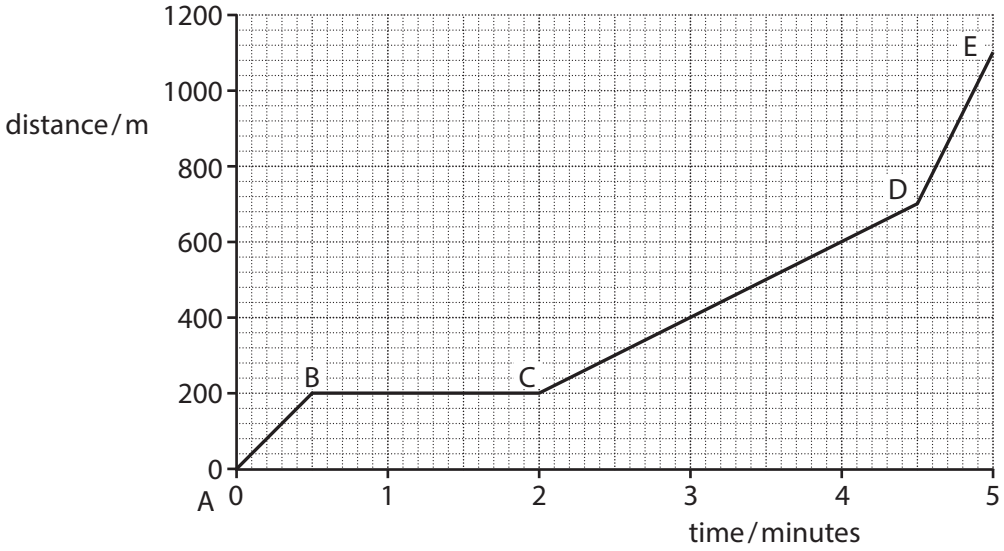
Tick the box that represents the cyclist travelling at constant speed.

- ☐ A
- ☐ B
- ☐ C
- ☐ D

[1]

[Total: 1]

26 A girl cycles to meet a friend. The distance-time graph for her journey from start to finish is shown in the figure.

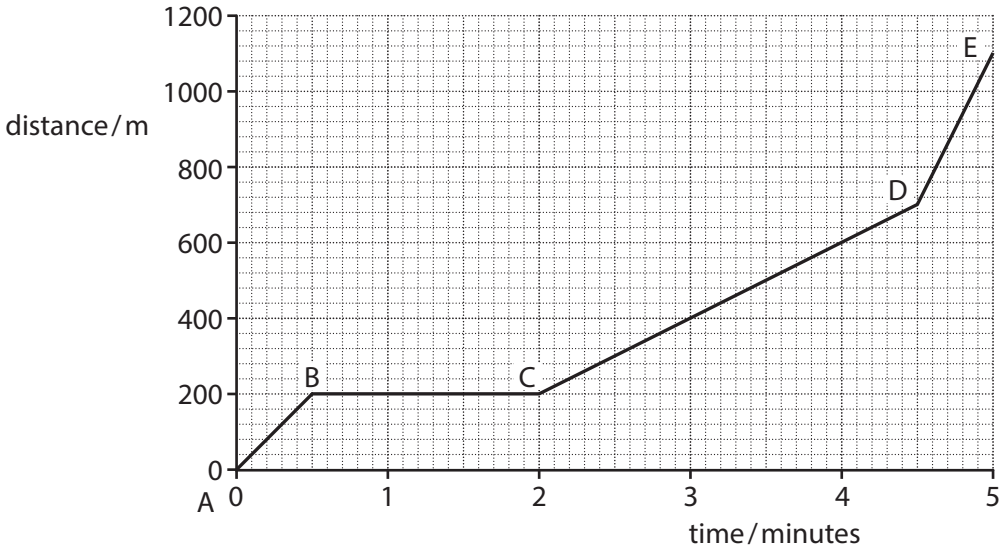


Which section of the graph shows the part of the girl's journey that involves cycling up a hill 500 m long?

between ..... and ..... [1]

[Total: 1]

27 A girl cycles to meet a friend. The distance-time graph for her journey from start to finish is shown in the figure.



Describe the motion of the girl between points B and C.

..... [1]

[Total: 1]

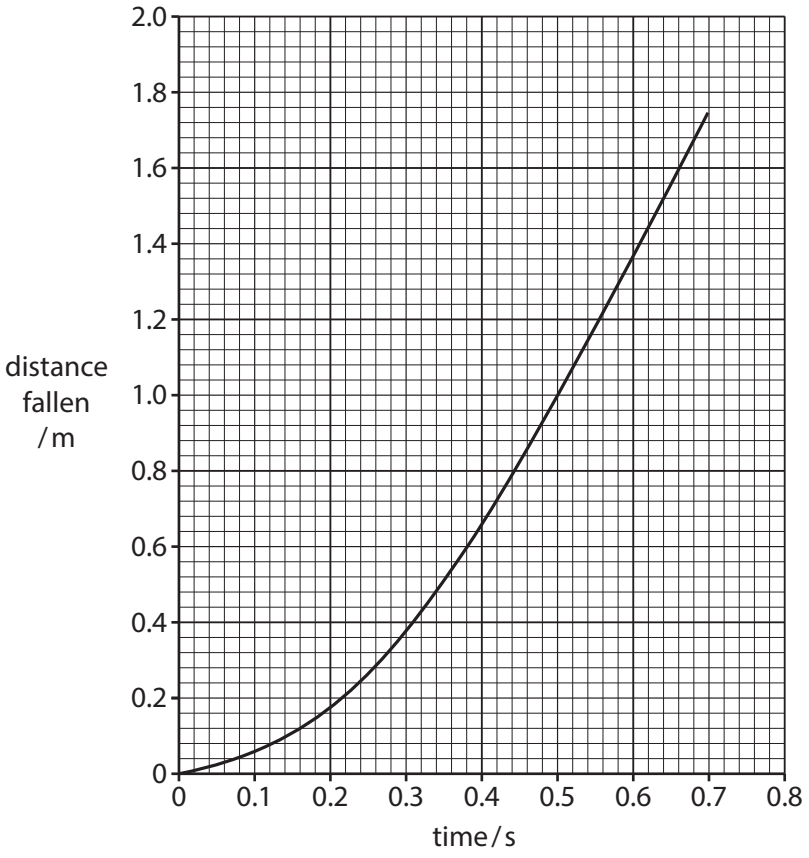
28 A car is travelling at a constant speed of 80 km / h.

Calculate the distance travelled by the car in half an hour.

distance = ... km [1]

[Total: 1]

29 The figure shows a distance-time graph for a falling object.



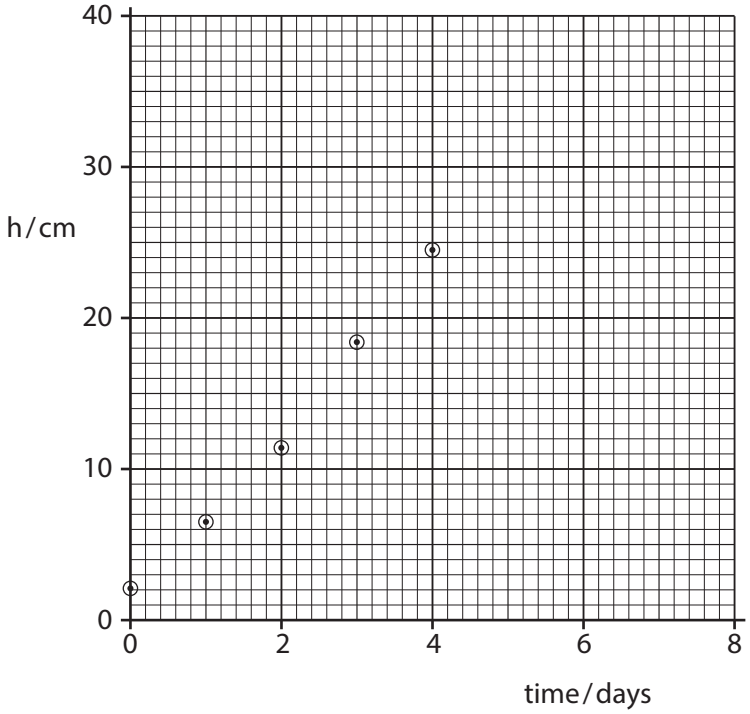
Use this graph to find the time it takes the object to fall from 0.60 m to 1.60 m.

time = ... s [2]

[Total: 2]

30

(a) Complete the graph by plotting the last three values of height *h* against time. Do **not** draw a line through the points.



[2]

(b) Describe how the graph shows that the speed of growth of the plant is not constant.

.....

..... [1]

[Total: 3]