Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Speed-time graphs

Time allowed: 1 hour

Subject code **0580**

Mathematics

Questions from Paper 2 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.
You may use a calculator.

Total marks

/ 46

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.
- Unless a question says otherwise, give answers that are not exact to 3 significant figures, and angles in degrees to 1 decimal place.

Information

- This paper has 10 questions worth 46 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

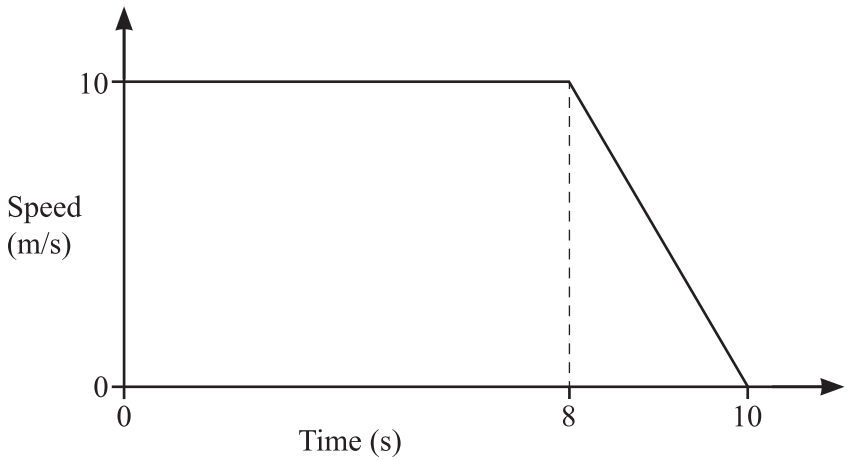
Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1



NOT TO SCALE

The diagram shows the speed–time graph for part of a car journey.

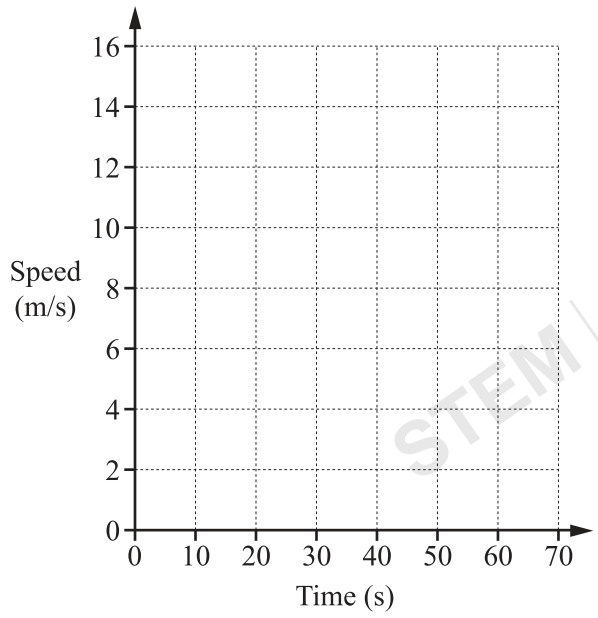
Calculate the total distance travelled during the 10 seconds.

..... m [2]

Speed-time graphs Click for more variations

2 Petra begins a journey in her car.
She accelerates from rest at a constant rate of 0.4 m/s^2 for 30 seconds.
She then travels at a constant speed for 40 seconds.

On the grid, draw the speed-time graph for the first 70 seconds of Petra's journey.



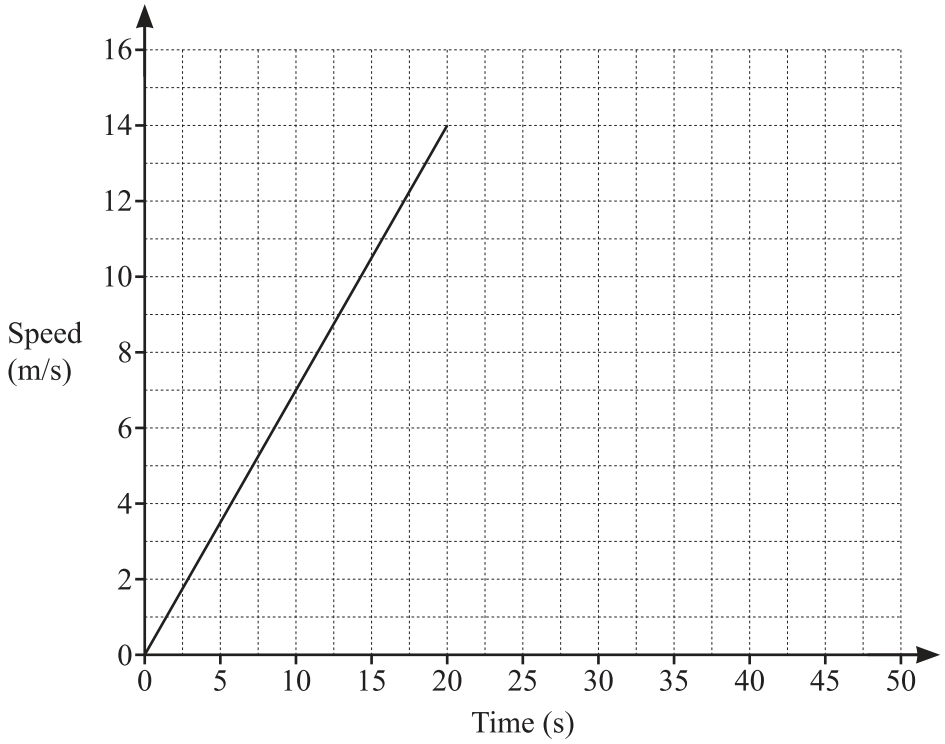
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[2]

Speed-time graphs Click for more variations

3 A car starts its journey by accelerating from rest at a constant rate of $0.7\ m/s^2$ for 20 seconds, before reaching a constant speed of 14 m/s.
It then travels at 14 m/s for a distance of 210 m.
The car then decelerates at a constant rate of $1.4\ m/s^2$, before coming to a stop.

On the grid, complete the speed–time graph for the car's journey.

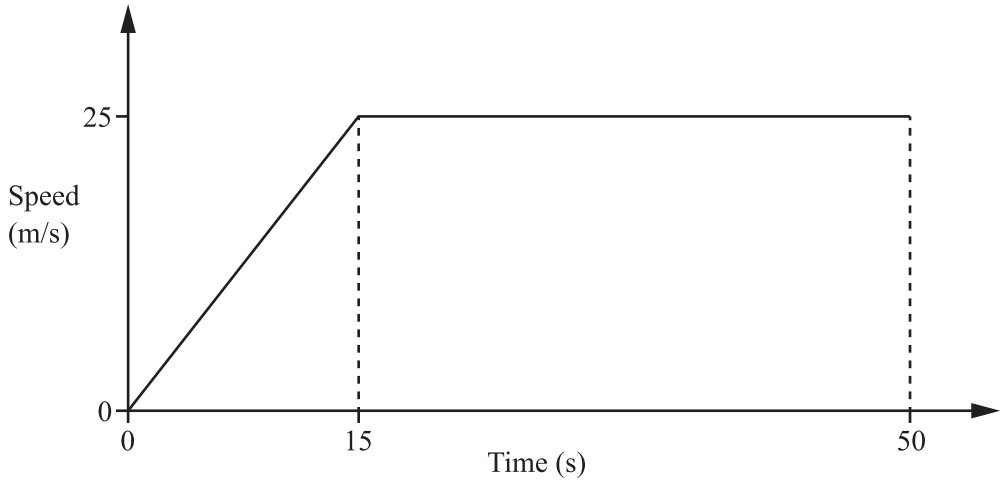


[3]

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4



The speed–time graph shows the first 50 seconds of a journey.

Calculate

(a) the acceleration during the first 15 seconds,

..... m/s^2 [1]

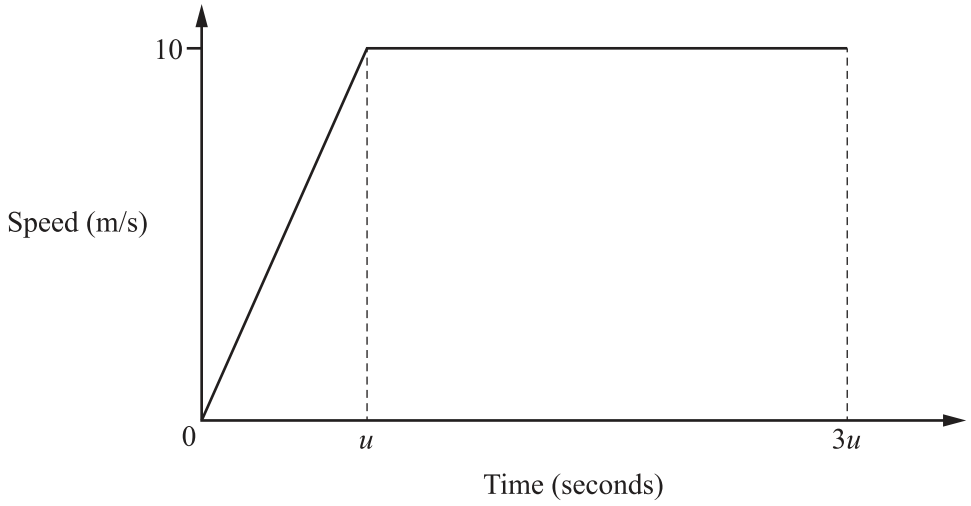
(b) the distance travelled in the 50 seconds.

..... m [3]

(a) Speed-time graphs (b) Speed-time graphs Click for more variations

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5



NOT TO SCALE

A car starts from rest and accelerates for u seconds until it reaches a speed of 10 m/s.
The car then travels at 10 m/s for $2u$ seconds.
The diagram shows the speed-time graph for this journey.

The distance travelled by the car in the first $3u$ seconds is 125 m.

(a) Find the value of u.

Answer(a) u = ... [3]

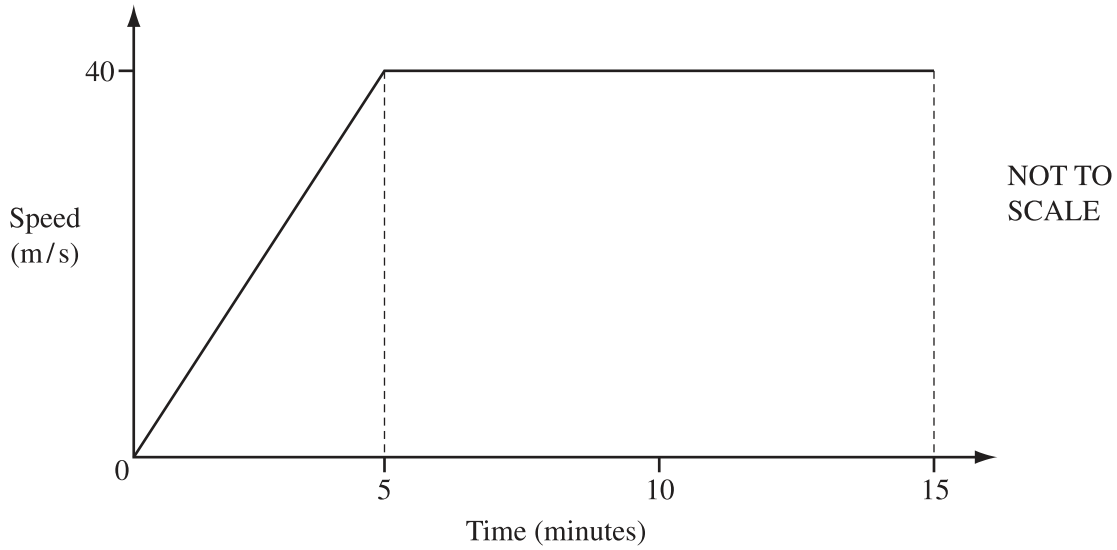
(b) Find the acceleration in the first u seconds.

Answer(b) ..... m/s^2 [1]

(a) Speed-time graphs (b) Speed-time graphs Click for more variations

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6



The diagram shows the speed-time graph for the first 15 **minutes** of a train journey.
The train accelerates for 5 minutes and then continues at a constant speed of 40 metres/**second**.

(a) Calculate the acceleration of the train during the first 5 minutes.
Give your answer in m/s^2.

Answer(a) ..... m/s^2 [2]

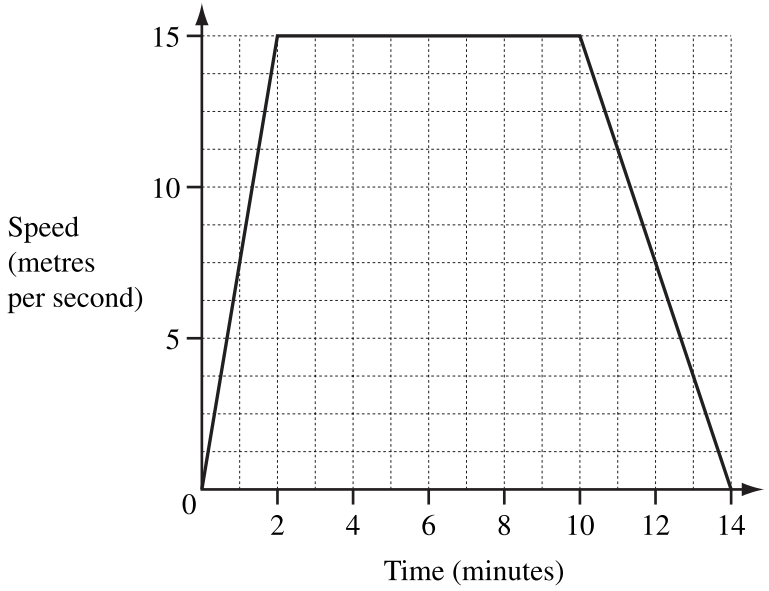
(b) Calculate the average speed for the first 15 minutes of the train journey.
Give your answer in m/s.

Answer(b) ..... m/s [3]

(a) Speed-time graphs (b) Speed-time graphs Click for more variations

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7



The diagram shows the speed-time graph of a train journey between two stations.
The train accelerates for two minutes, travels at a constant maximum speed, then slows to a stop.

(a) Write down the number of **seconds** that the train travels at its constant maximum speed.

Answer(a) ..... s [1]

(b) Calculate the distance between the two stations **in metres**.

Answer(b) ..... m [3]

(c) Find the acceleration of the train in the **first two minutes**.
Give your answer in m/s^2.

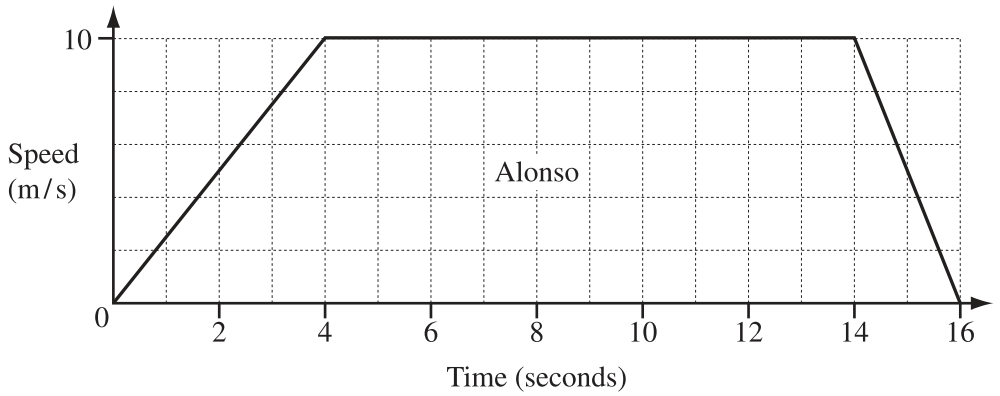
Answer(c) ..... m/s^2 [2]

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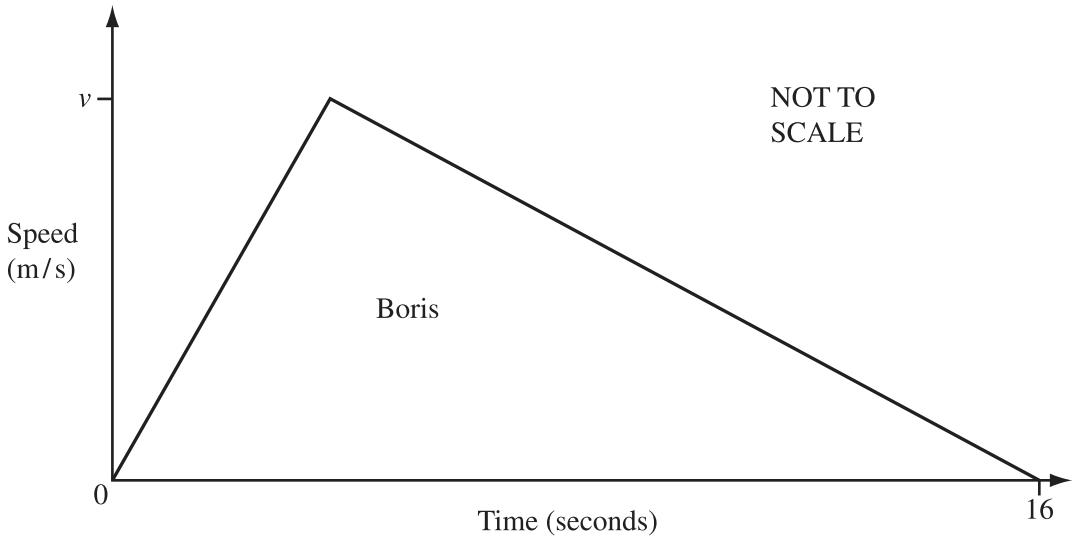
(a) Speed-time graphs (b) Speed-time graphs (c) Speed-time graphs Click for more variations

8 The graphs show the speeds of two cyclists, Alonso and Boris.

Alonso accelerated to 10 m/s, travelled at a steady speed and then slowed to a stop.



Boris accelerated to his maximum speed, v m/s, and then slowed to a stop.



Both cyclists travelled the same distance in the 16 seconds.

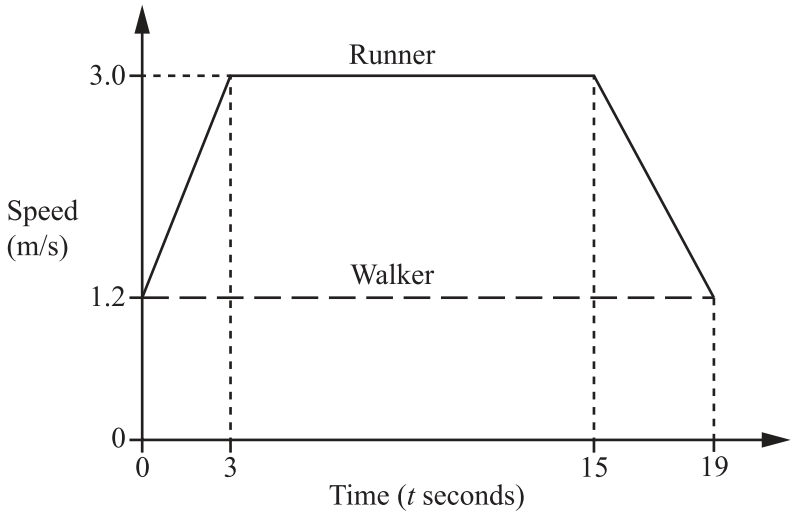
Calculate the maximum speed for Boris.
Show all your working.

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Answer ..... m/s [5]

Speed-time graphs Click for more variations

9 The diagram shows the speed–time graph for part of a journey for two people, a runner and a walker.



NOT TO SCALE

(a) Calculate the acceleration of the runner for the first 3 seconds.

..... m/s^2 [1]

(b) Calculate the total distance travelled by the runner in the 19 seconds.

..... m [3]

(c) The runner and the walker are travelling in the same direction along the same path.
When $t = 0$, the runner is 10 metres behind the walker.

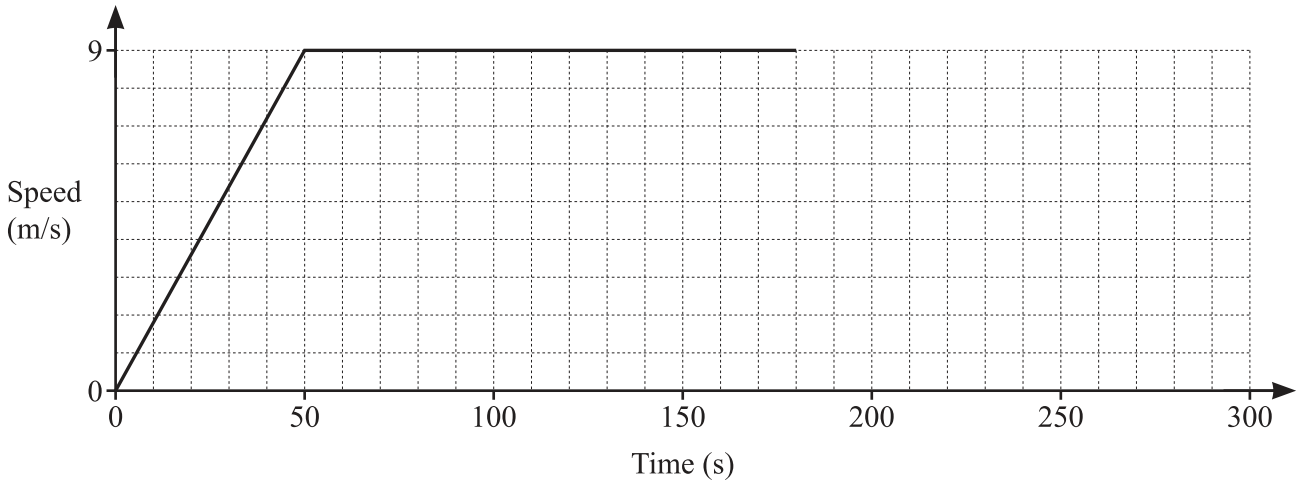
Find how far the runner is ahead of the walker when $t = 19$.

..... m [3]

(a) Speed-time graphs (b) Speed-time graphs (c) Speed-time graphs Click for more variations

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10 The diagram shows the speed–time graph for the first 180 seconds of a train journey.



(a) Find the acceleration, in m/s^2, of the train during the first 50 seconds.

..... m/s^2 [1]

(b) After 180 seconds, the train decelerates at a constant rate of 1944 $\mathbf{km/h^2}$.

Show that the train decelerates for 60 seconds until it stops.

[2]

(c) Complete the speed–time graph. [1]

(d) Calculate the average speed of the train for the whole journey.

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..... m/s [4]

(a) Speed-time graphs (b) Speed-time graphs (c) Speed-time graphs (d) Speed-time graphs

Click for more variations