Surname	
Other Names	
Candidate's Signature	

GCSE 9 - 1 Questions

Velocity Time Graphs

Calculator Allowed

INSTRUCTIONS TO CANDIDATES

Write your name in the space provided.

Write your answers in the spaces provided in this question paper.

Answer ALL questions.

Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.

You should have a ruler, compass and protractor where required.

Total Marks :

1) The following graphs show 3 different journeys, where v is velocity in metres per second, and t is time in seconds.
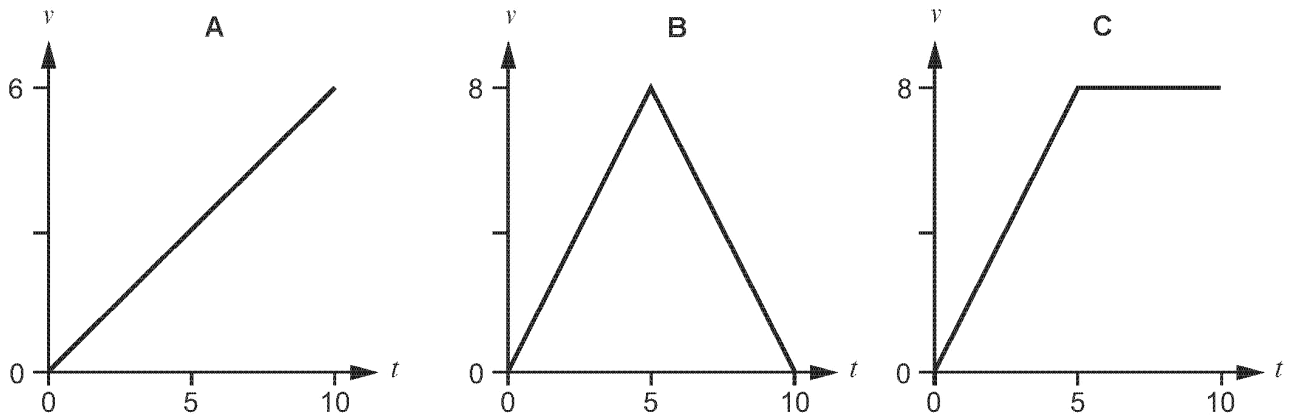
One of these graphs shows a journey when the distance travelled in 10 seconds was 60 metres. Identify this graph and explain how you obtained your answer, showing your calculations.   [3]

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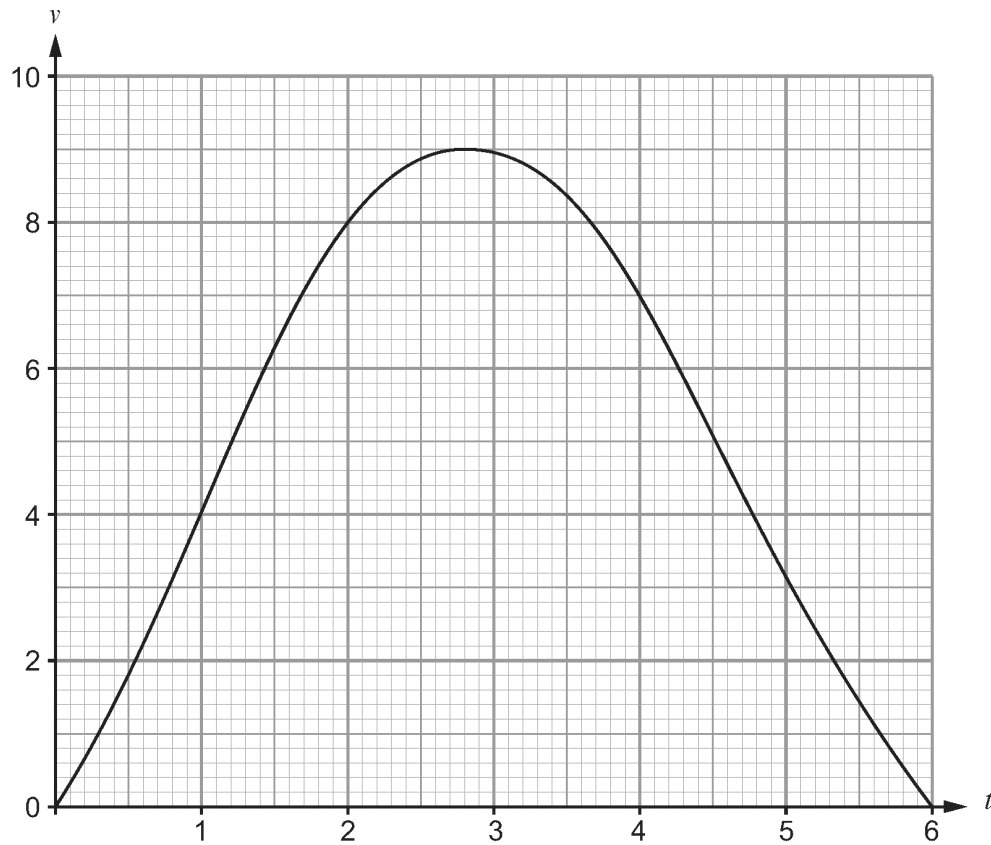
2) The graph below shows the velocity, v, in m/s, of a particle at time t seconds after the start of the experiment.

(a)   Find an approximation for the distance travelled by the particle during the 6 seconds of the experiment using the ordinates $t = 0$, $t = 2$, $t = 4$, $t = 6$.   [4]

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(b) Is your approximation an over estimate or under estimate of the actual distance travelled? Tick (✓) a box.
Give a reason for your answer. [1]
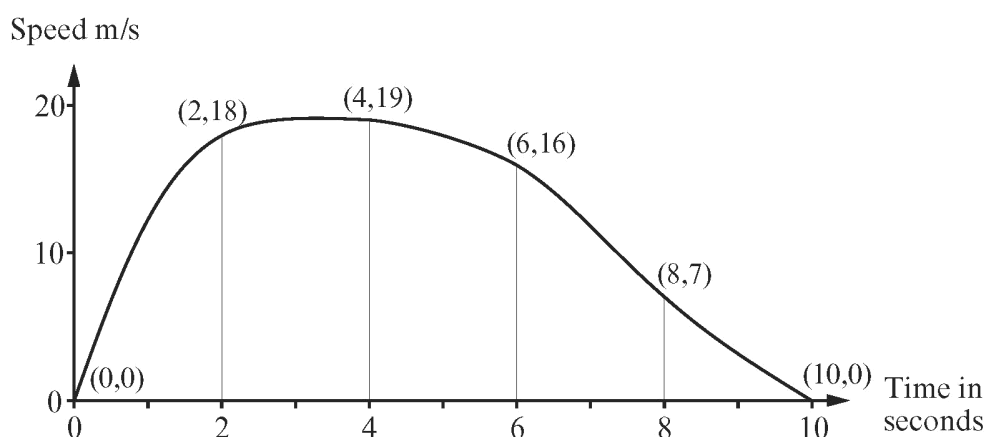
Over estimate ☐   Under estimate ☐

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3) Dani is researching speed, distance and time.
She carries out an experiment using a computer to generate a graph to show the speed of a particle over a 10 second time interval.
The computer display is shown below.

Speed m/s

20 ─

(2,18)   (4,19)
           (6,16)

10 ─

            (8,7)

(0,0)   (10,0)   Time in
0   seconds
0   2   4   6   8   10

By calculating the area, enclosed between the curve and the time axis, Dani can estimate the distance the particle travelled.
Find an estimate for the distance travelled by the particle.
You must state the unit of your answer.

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[5]

4) The graph below shows the speed of a cyclist, between two sets of traffic lights.

Speed (metres per second)

Time (t seconds)
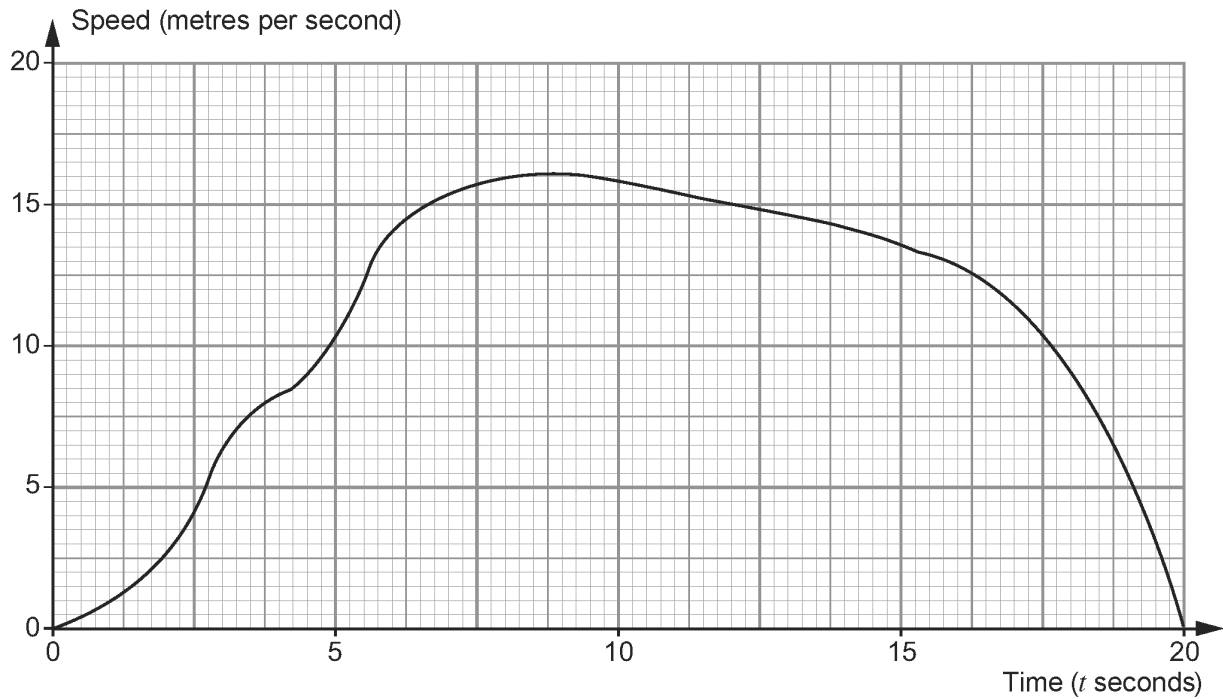
(a) Calculate the acceleration of the cyclist at $t = 7.5$ seconds.
Give the units of your answer. [4]

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(b) Calculate an estimate for the distance between the two sets of traffic lights. [4]

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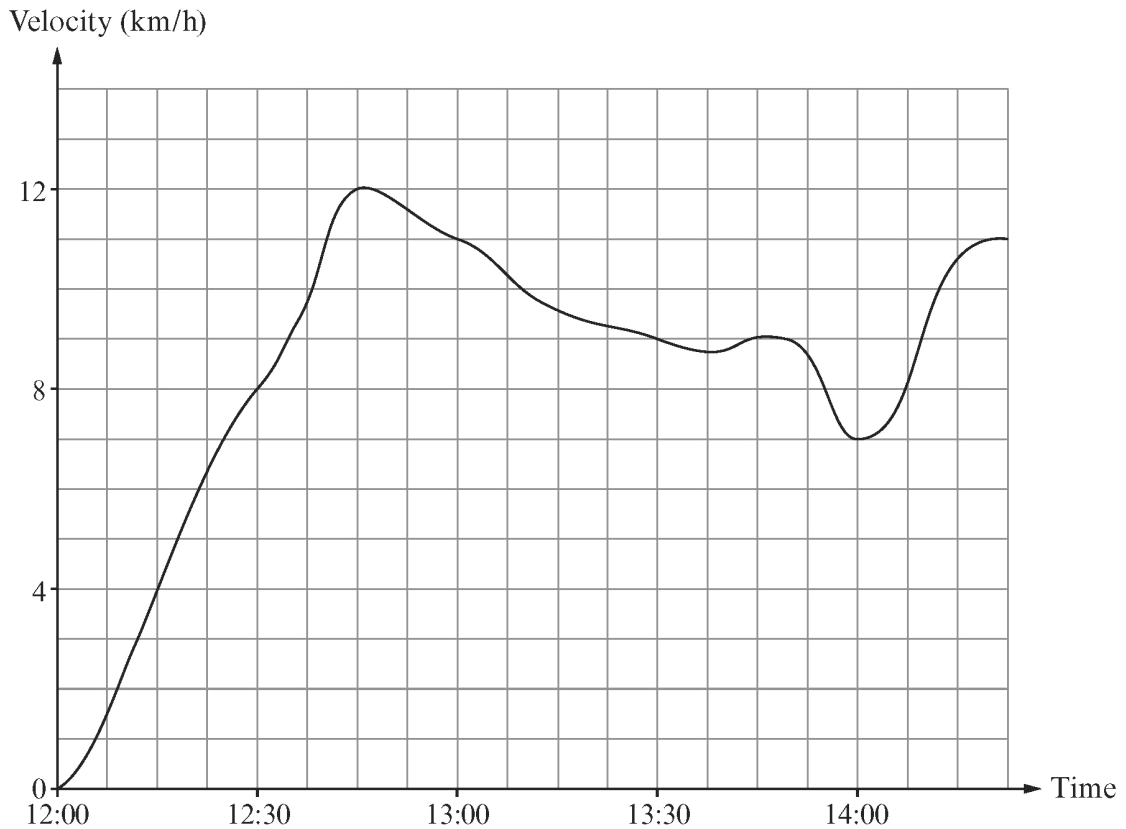
5) Sue rode her bike along a cycle path.
She started her ride at 12:00.
The graph shows information about her cycle ride.

Velocity (km/h)

By considering every $\frac{1}{2}$ hour of Sue's cycle ride, use the trapezium rule to calculate an estimate for the total distance travelled in the first 2 hours.
Give the units of your answer.

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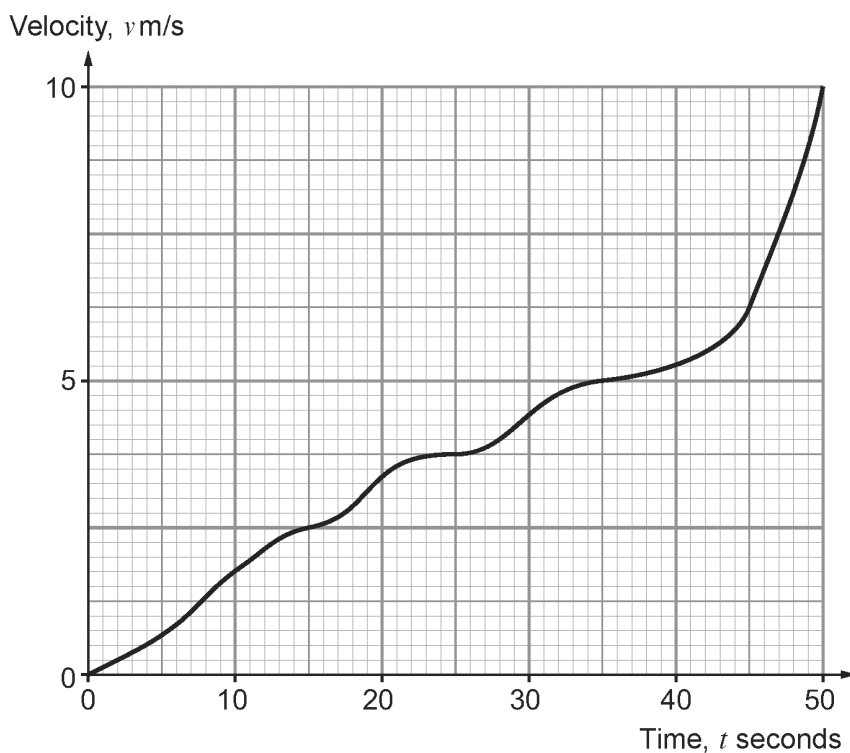...

[5]

6) A velocity-time graph, representing a 50 second journey of a car accelerating from 0 m/s, is shown below.

Velocity, v m/s

Time, t seconds

(a) Calculate the velocity of the car in km/h at time t = 50 seconds. [3]

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Velocity: .... km/h

(b) Calculate an estimate for the acceleration at time t = 30 seconds.
You must give the units for your answer. [4]

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Acceleration: ....

(c)   Calculate an estimate for the distance travelled by the car in the first 30 seconds.   [3]

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Distance travelled ....

(d)   Over the same period, the velocity of another car is given by the equation $v = 0\cdot004t^2$.
Other than at $t = 0$ seconds and $t = 50$ seconds, find the value of t for which the velocities
of the two cars are the same.
Give your answer correct to the nearest second.   [4]

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Time t: .... seconds

7) *(a)* In an experiment, it was found that the velocity, v m/s, of a particle at time t seconds was given by the equation $v = 5t - t^2$.

Draw the graph of $v = 5t - t^2$ for values of t from 0 to 5.

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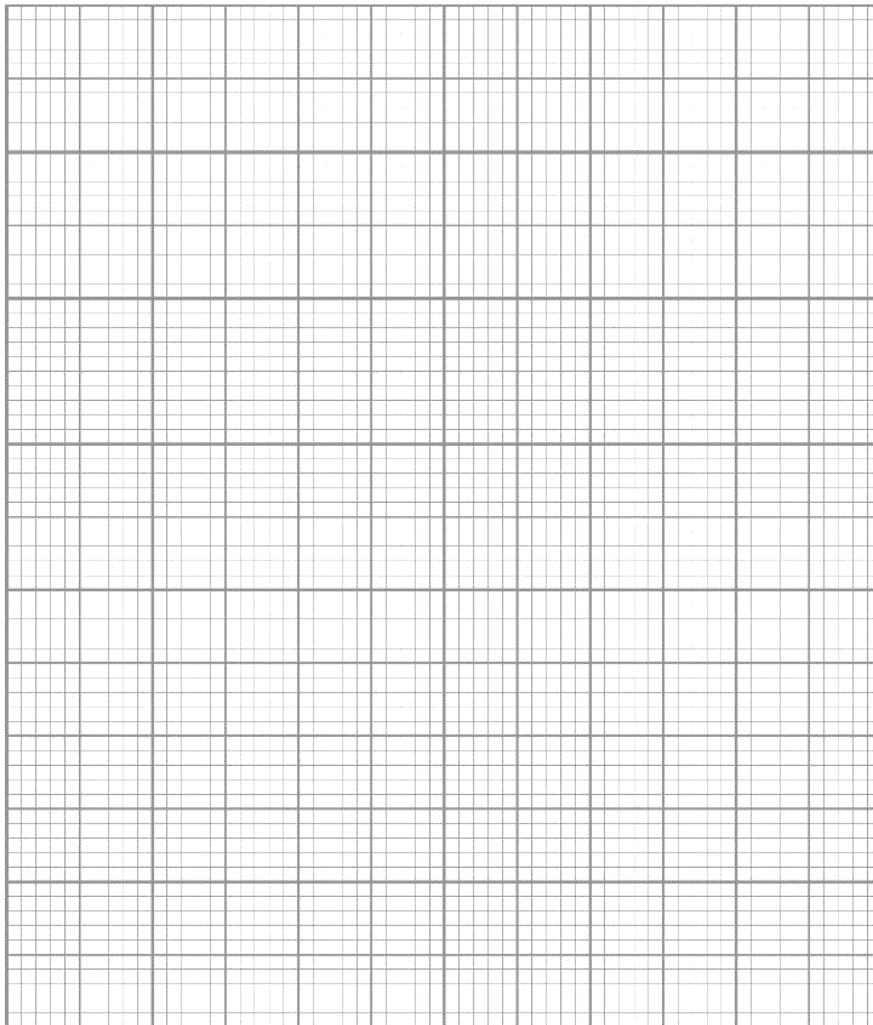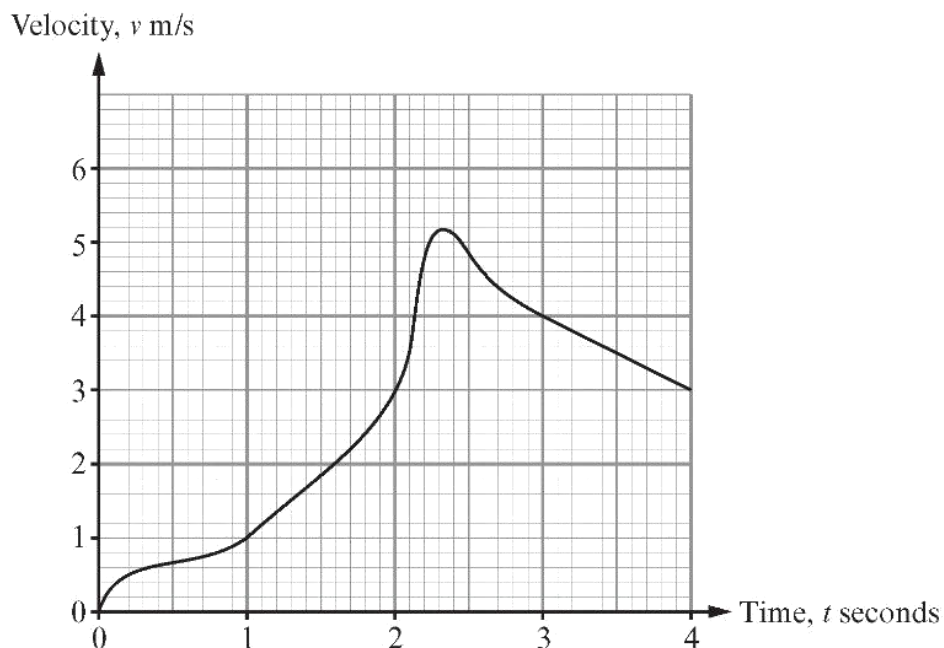
[4]

(b) A velocity-time graph for a different experiment is shown below.

Velocity, v m/s

(i) Based on this experiment, complete the following sentence. [1]

"The acceleration of this particle is zero when t = ..."

(ii) Find an approximation for the acceleration of the particle in this experiment when $t = 1$. Give the units of your answer. [4]

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(iii) Find an approximation for the distance travelled by the particle between $t = 0$ and $t = 4$. [3]

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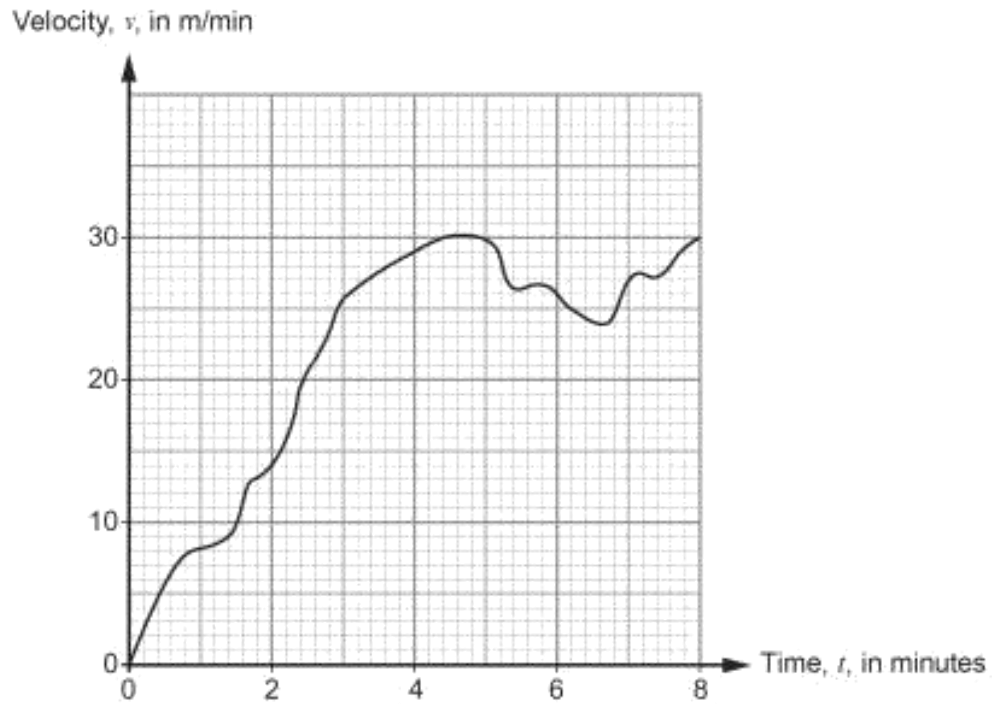
8) Polly carried out an experiment.
She used equipment to record the velocity of an object, v, in m/min for the first 8 minutes of the experiment.

The velocity-time graph is shown below.

Velocity, v, in m/min

(a)   Write down the gradient of the curve when $t = 4\cdot6$. [1]

(b)   Find an estimate for the acceleration of the object at $t = 3\cdot5$. [3]

(c) (i) Use the trapezium rule, with the ordinates $t = 0$, $t = 2$, $t = 4$, $t = 6$ and $t = 8$, to estimate the area of the region bounded by the curve, the positive time axis and the line $t = 8$. [4]

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(ii) Calculate an estimate for the distance the object travelled in the first 8 minutes of Polly's experiment, giving your answer in kilometres. [1]

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9) Siân went for a ride on her bike.

She started her ride at 14:00.
The graph below shows information about her bike ride.
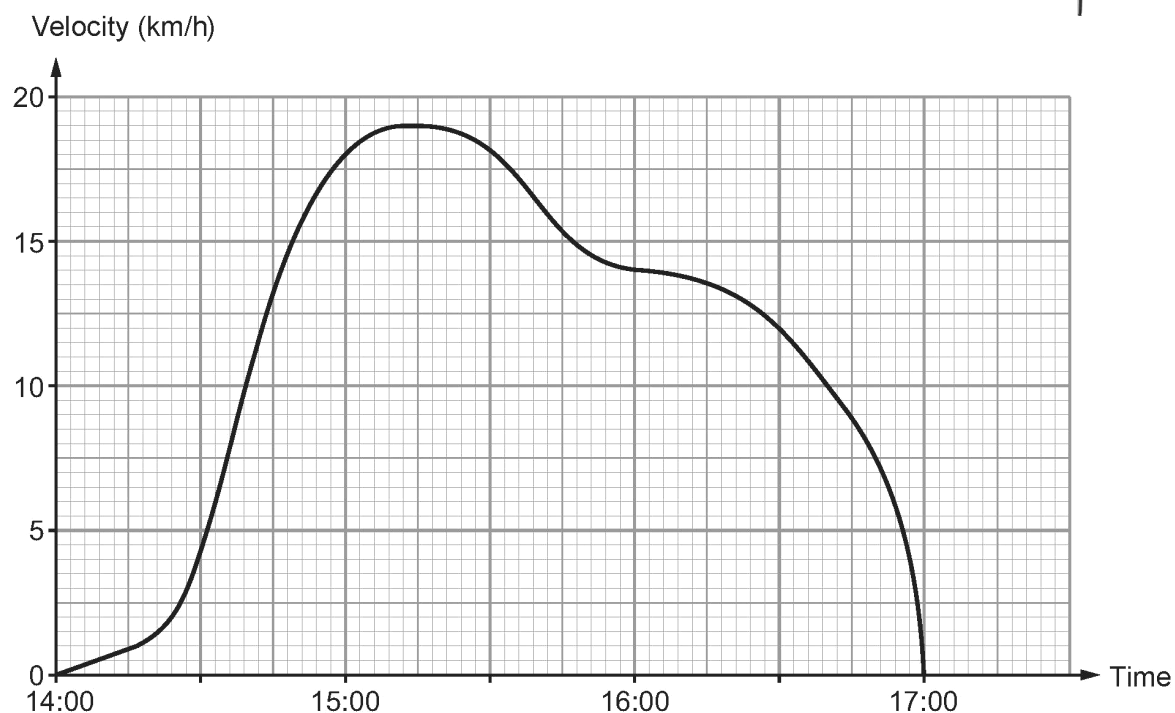
Velocity (km/h)

(a)   During which quarter-hour period was Siân's acceleration the greatest?   [1]

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(b)   At about what time did Siân stop accelerating?   [1]

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(c)   Siân usually finds cycling at a velocity of 18 km/h very comfortable.
Express 18 km/h in metres per second.   [2]

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(d) Using her velocities at 14:00, 15:00 and 16:00, calculate an estimate for the total distance Siân travelled **between 14:00 and 16:00**. [3]

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Distance travelled .... km

(e) *In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

Siân estimated the distance she travelled between 16:00 and 17:00 as **5 miles**.
Is Siân's estimate reasonable?
You must justify your answer and show your working. [3 + 2 OCW]

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10) A velocity-time graph, representing a 50 second journey of a motorcycle accelerating from 0 m/s, is shown below.
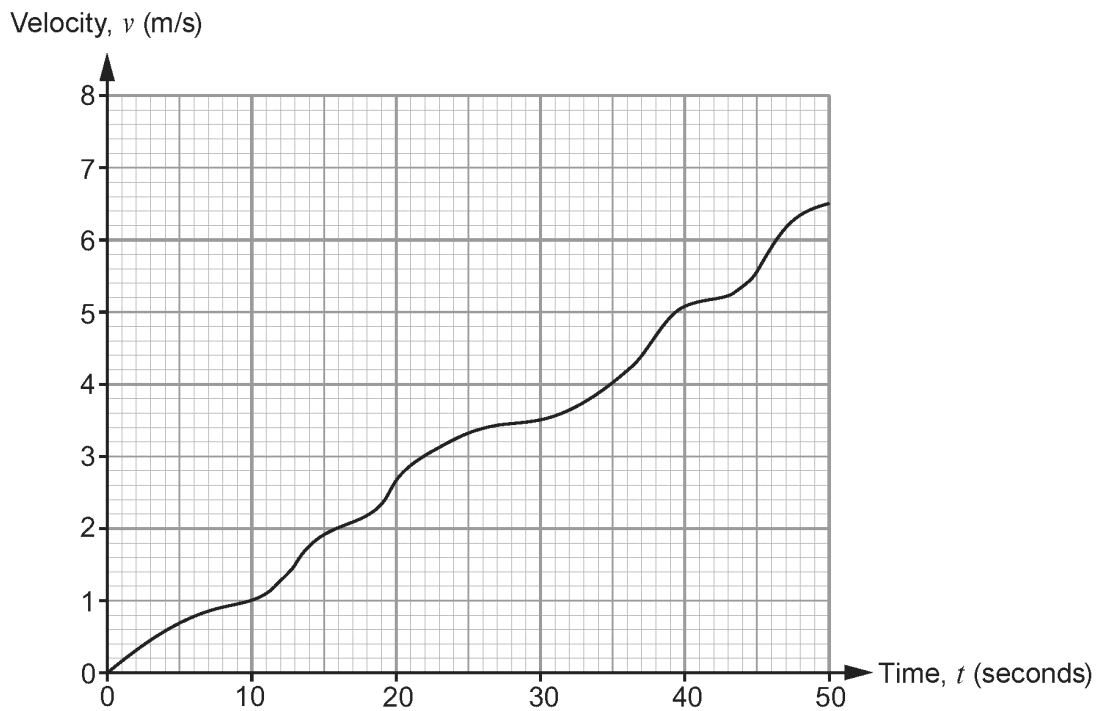
(a) Calculate an estimate for the distance travelled by the motorcycle in the first 40 seconds. [3]

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Estimated distance travelled .... metres

(b) Calculate an estimate for the acceleration at time t = 30 seconds. [3]

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Estimated acceleration .... m/s^2

(c) Calculate the velocity of the motorcycle in **km/h** at time t = 35 seconds. [3]

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Velocity .... **km/h**

(d) Over the same period, the velocity, in m/s, of another motorcycle is given by the equation $v = \dfrac{3t^2}{1000}$.

Other than at t = 0 seconds, find the value of t for which the velocities of the two motorcycles are the same.
Give your answer correct to the nearest second. [4]

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Time .... seconds

11) In an experiment, it was found that the velocity, v in m/s, of a particle at time t seconds after the start of the experiment, was given by the equation $v = 7t - t^2$.

   (a)   Draw the curved graph of $v = 7t - t^2$ for values of t from 0 to 7.   [5]

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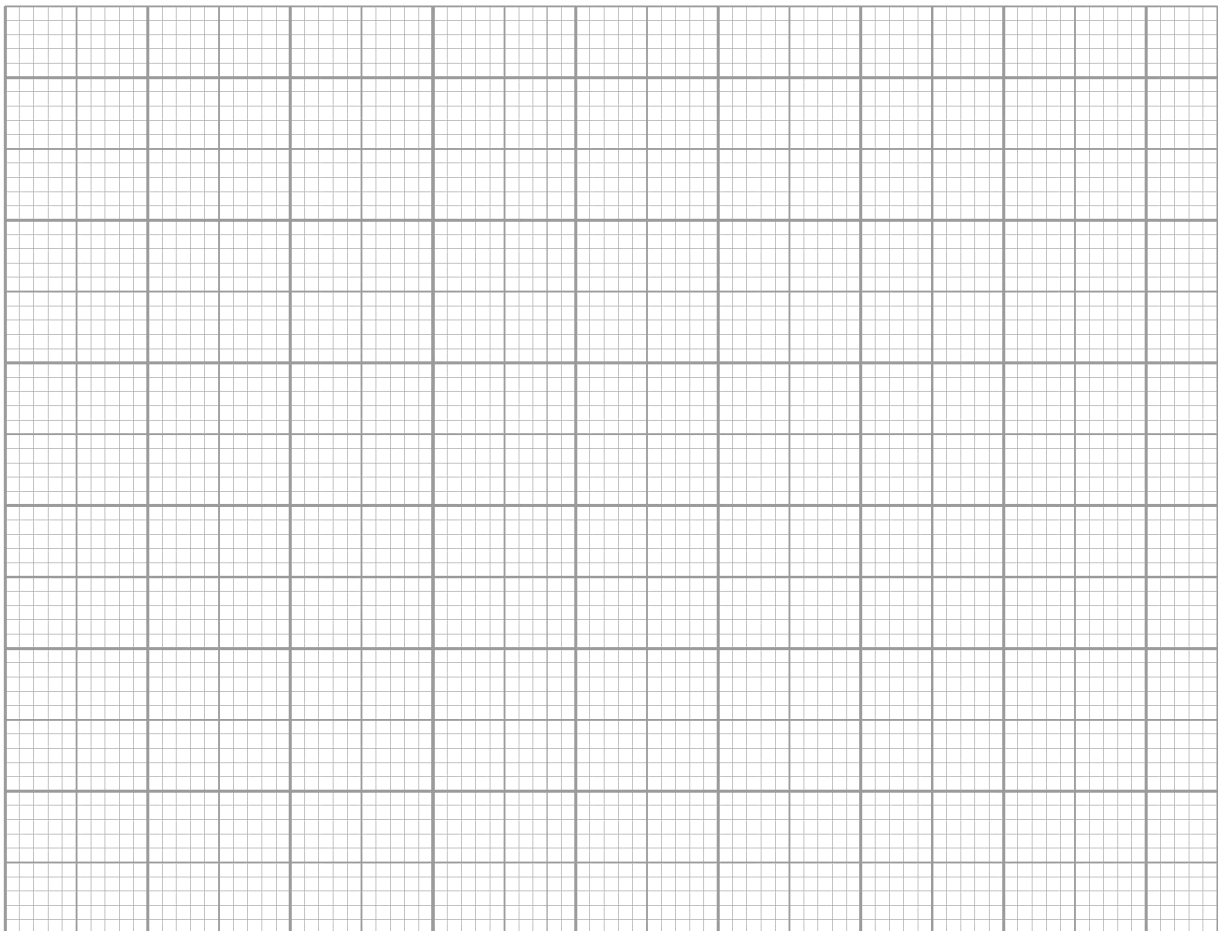
(b)   The acceleration of the particle is the rate of change of the velocity.

   (i)   Find the value of t when the acceleration of the particle is zero.   [1]

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   (ii)   Find an approximation for the acceleration when $t = 5 \cdot 2$.
   State the units of your answer.   [4]

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(c)   Use the graph to find an approximation for the distance travelled by the particle between the times $t = 1$ and $t = 5$.   [4]

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