Mock Grade 7

Maths Booklet 6

Paper 3H
Calculator

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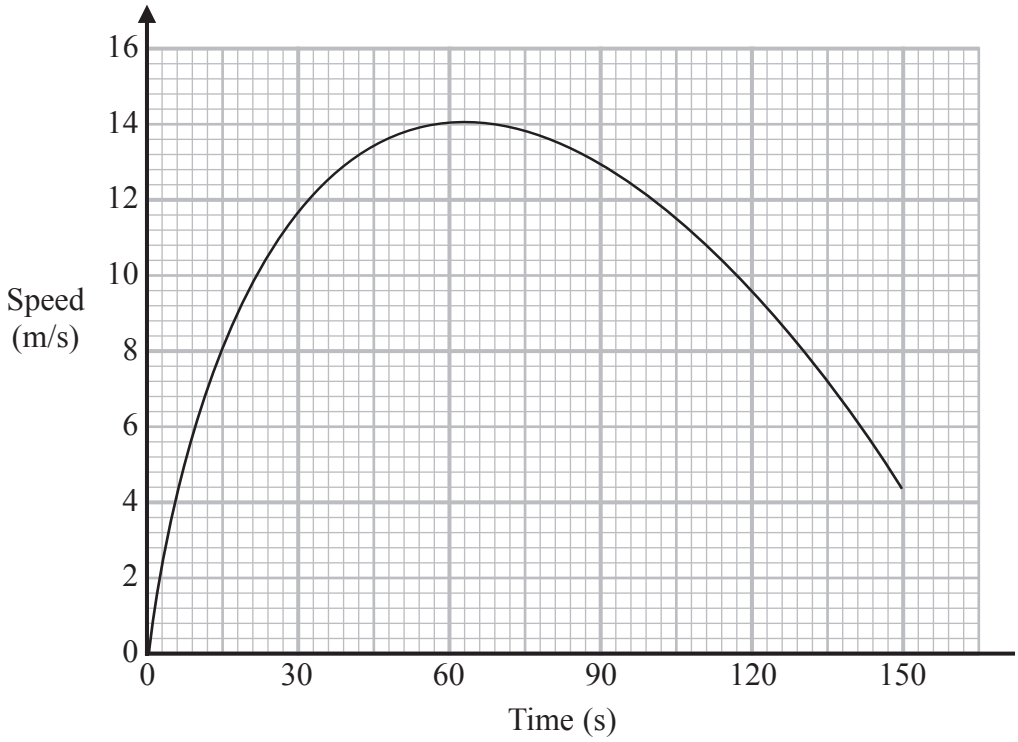
1 Here is a speed-time graph for a car.



(a) Work out an estimate for the distance the car travelled in the first 60 seconds.

..... m

(b) Is your answer to part (a) an underestimate or an overestimate of the actual distance the car travelled in the first 30 seconds?
Give a reason for your answer.

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.....

(c) Work out an estimate for the acceleration of the car at time 90 seconds.

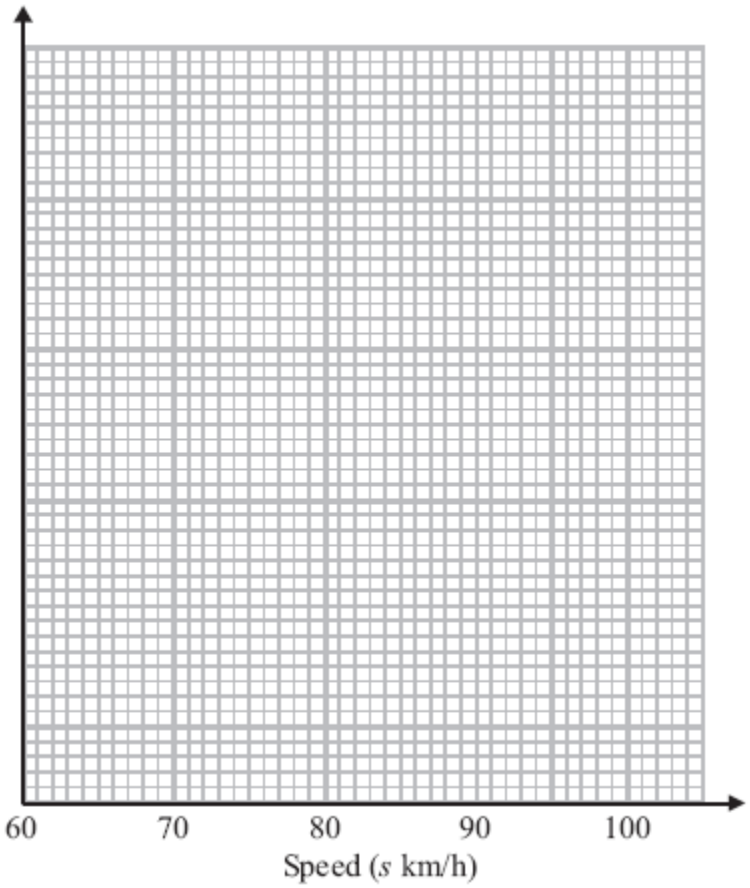
(2)

(Total for Question 1 is 5 marks)

2 The table gives some information about the speeds, in km/h, of 100 cars.

Speed(s km/h)	Frequency
$60 < s \leq 65$	15
$65 < s \leq 70$	25
$70 < s \leq 80$	36
$80 < s \leq 100$	24

(a) On the grid, draw a histogram for the information in the table.



(3)

(b) Work out an estimate for the number of cars with a speed of more than 85 km/h.

.....

(2)

(Total for Question 14 is 5 marks)

3 Here is a list of five numbers.

98^{53} 98^{64} 98^{73} 98^{88} 98^{91}

Find the highest common factor of these five numbers.

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(Total for Question 3 is 1 mark)

4 Write $x^2 + 10x - 9$ in the form $(x + a)^2 + b$ where a and b are integers.

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(Total for Question 4 is 2 marks)

5 Cone **A** and cone **B** are mathematically similar.
The ratio of the volume of cone **A** to the volume of cone **B** is 64 : 125

The surface area of cone **A** is 464 cm^2

Show that the surface area of cone **B** is 725 cm^2

(Total for Question 5 is 3 marks)

6 (a) Show that the equation $x^3 + 4x = 1$ has a solution between $x = 0$ and $x = 1$.

(2)

(b) how that the equation $x^3 + 4x = 1$ can be rearranged to give: $x = \frac{1}{4} - \frac{x^3}{4}$

(2)

(c) Starting with $x_0 = 0$, use the iteration formula $x_{n+1} = \frac{1}{4} - \frac{x_n^3}{4}$ twice to find an estimate for the solution to $x^3 + 4x = 1$

…….....

(3)

(d) By substituting your answer to part (c) into $x^3 + 4x - 1$,
comment on the accuracy of your estimate for the solution to $x^3 + 4x - 1 = 0$

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(2)

(Total for Question 6 is 9 marks)

7 The petrol consumption of a car, in litres per 100 kilometres, is given by the formula

$$\text{Petrol consumption} = \frac{100 \times \text{Number of litres of petrol used}}{\text{Number of kilometres travelled}}$$

Nathan's car travelled 162 kilometres, correct to 3 significant figures.
The car used 13.1 litres of petrol, correct to 3 significant figures.

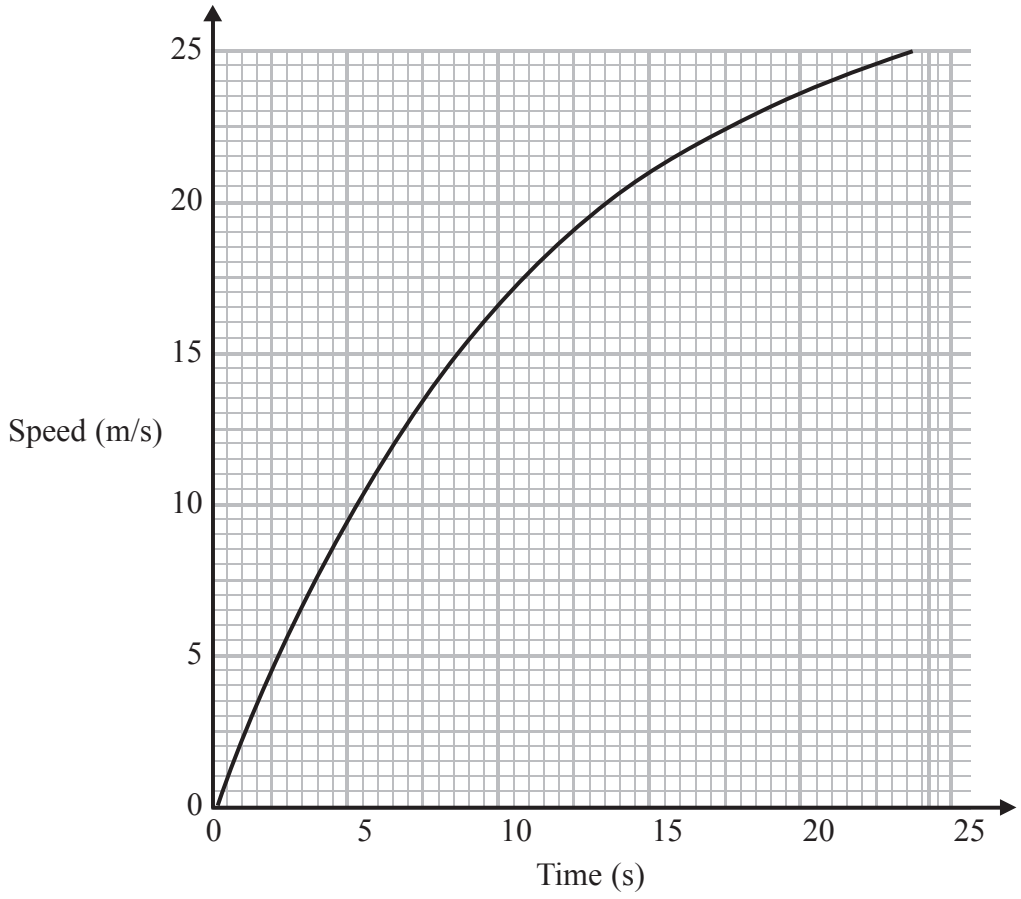
Nathan says,

"My car used less than 8 litres of petrol per 100 kilometres."

Could Nathan be wrong?
You must show how you get your answer.

(Total for Question 7 is 3 marks)

8 Here is a speed-time graph for a train.



(a) Work out an estimate for the distance the train travelled in the first 20 seconds.
Use 4 strips of equal width.

..... m

(3)

(b) Is your answer to (a) an underestimate or an overestimate of the actual distance the train travelled?
Give a reason for your answer.

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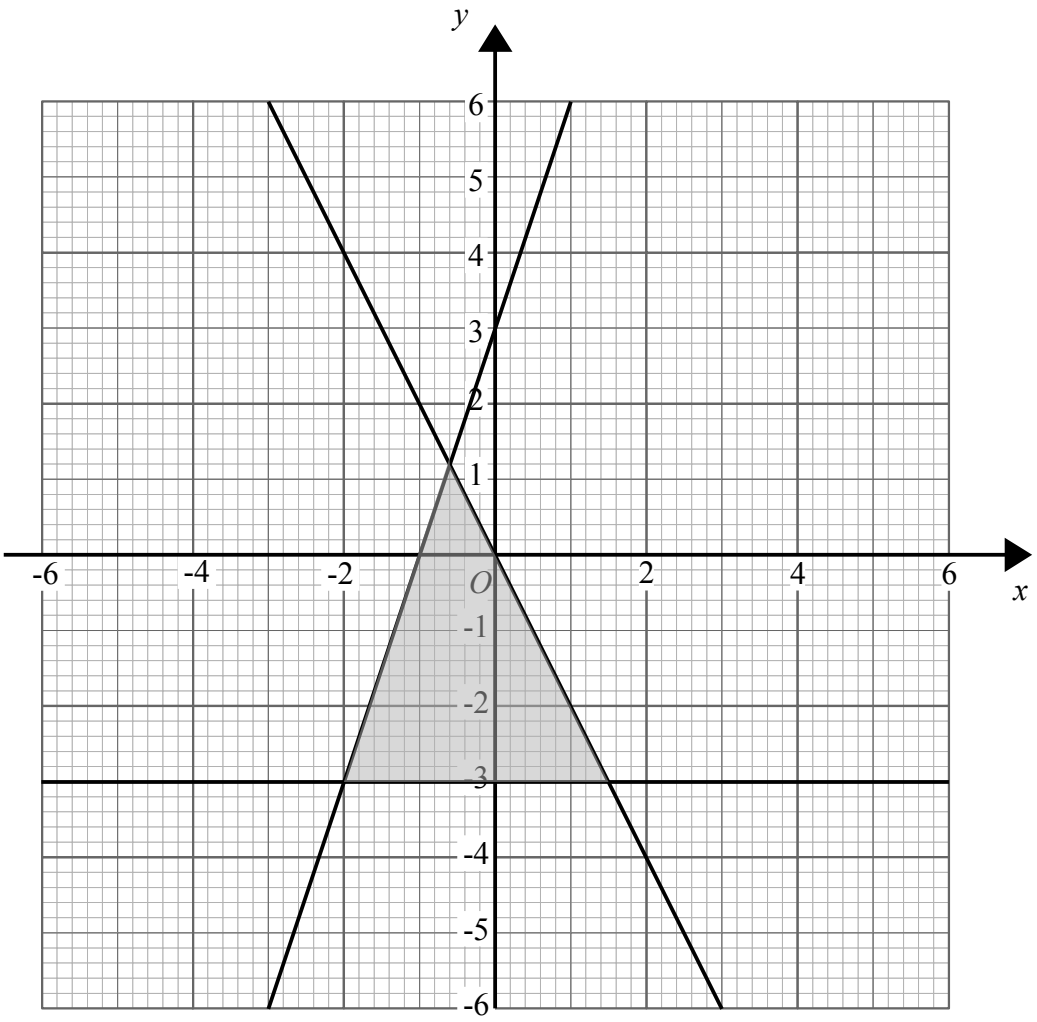
(1)

(Total for Question 8 is 4 marks)

9



Write down the three inequalities that define the shaded region

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(Total for Question 9 is 4 marks)

9 Using $x_{n+1} = 1 + \frac{1}{x_n^2}$

With $x_0 = 2$

(a) Find the values of x_1, x_2 and x_3.

$x_1 =$
……
$x_2 =$
……
$x_3 =$
……

(3)

(b) Explain the relationship between the values of x_1, x_2 and x_3 and the equation $x^3 - x^2 - 1 = 0$

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(2)

(Total for question 9 is 5 marks)