Centre Number						Candidate Number				

Surname	
Other Names	
Candidate Signature	

Algebra and Graphs 4988

Specimen Question Paper

For Examiner's Use	
Examiner's Initials	

Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

For this paper you must have:
- a clean copy of the Data Sheet (enclosed)
- a ruler
- a calculator.

Time allowed
- 1 hour 15 minutes

Instructions
- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided Do not write outside the box around each page.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- You may **not** refer to the copy of the Data Sheet that was available prior to this examination. A clean copy is enclosed for your use.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 50.
- You are expected to use a calculator where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

4988

Section A

Answer **all** questions in the spaces provided.

Use **Cooking time** *from page 2 of the Data Sheet.*

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1   The cooking time, T minutes for a joint of lamb weighing W kg, is given by the formula

$$T = c + dW$$

where c and d are constants.

The cooking time for a 2 kg joint is 135 minutes.

The cooking time for a 3 kg joint is 190 minutes.

1 (a) (i)   Write down two equations in terms of c and d.

....

and...
(2 marks)

1 (a) (ii)   Solve the equations in **(i)** to find the values of c and d.

$c = $ ....

$d = $ ....
(3 marks)

1 (b)   Alternative cooking instructions allow 45 minutes per kilogram plus another 50 minutes.

1 (b) (i)   Write down a formula for the cooking time, S minutes, for a W kg joint according to the alternative instructions.

....

....
(2 marks)

1 (b) (ii)   Find the weight of joint for which the two formulae give the same cooking time.

....

....

....
(3 marks)

10

Section B

Answer **all** questions in the spaces provided.

*Use **Cricket ball** from page 2 of the Data Sheet.*

2   A cricket ball is hit into the air.

Its vertical height, *h* metres, is given by the equation $h = 20t - 5t^2$, where *t* is the time in seconds after the ball is hit.

2 (a)   Complete the table for values of *h*, using the given values of *t*.

t (seconds)	0	1	2	3	4
h (metres)	0			15	

(2 marks)

Space for working

....

....

....
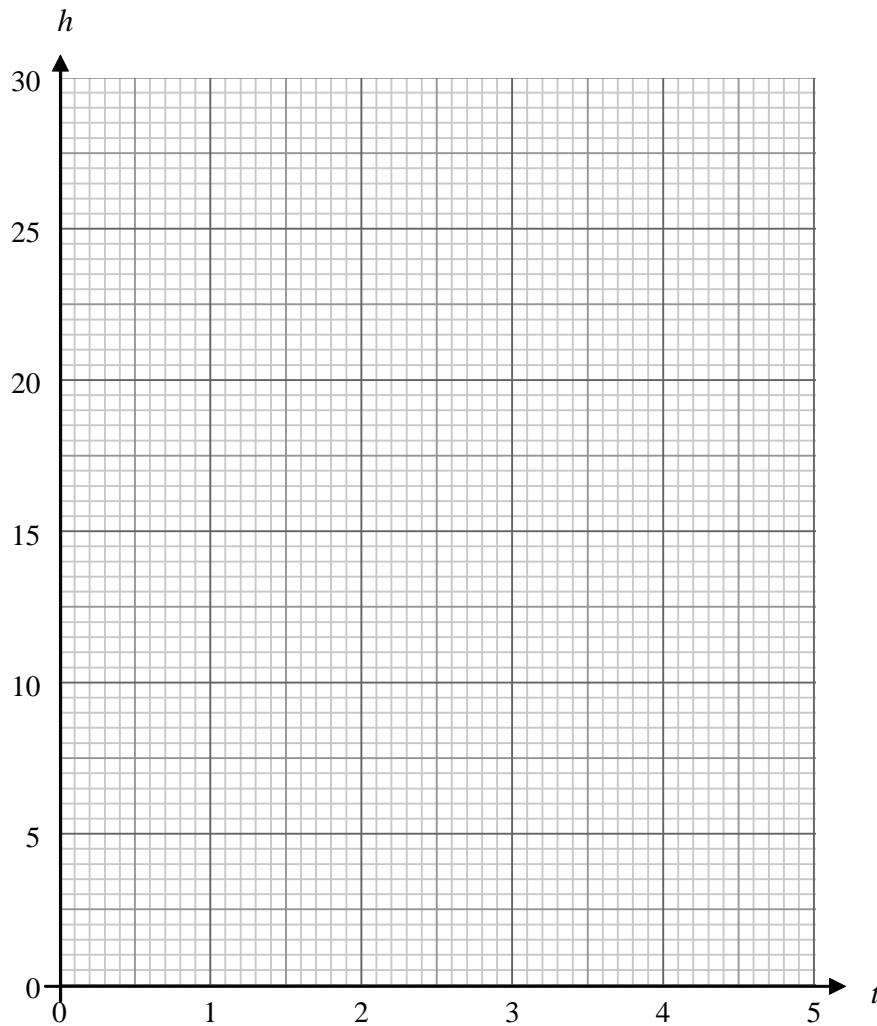
2 (b) On the axes below, draw the graph of $h = 20t - 5t^2$, for $0 \leq t \leq 4$.

(3 marks)

2 (c) State the value of t when the cricket ball is at its highest point.

....
(1 mark)

2 (d) Use the graph to estimate the times when the cricket ball is at a height of 10 metres.

....

$t =$ ....

....

$t =$ ....
(2 marks)

3 (a) When the cricket ball is at a height of 10 metres, explain why the values of t can be found using the equation $t^2 - 4t + 2 = 0$.

....

....

....
(3 marks)

3 (b) Solve the equation $t^2 - 4t + 2 = 0$. Give your answers to two decimal places.

The solutions of $at^2 + bt + c = 0$, where $a \neq 0$, are given by $t = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

....

$t = $...

....

and $t = $...

....
(4 marks)

$\overline{7}$

Section C

Answer **all** questions in the spaces provided.

Use **Training loads** *from 3 of the Data Sheet.*

4   The time, T minutes, for an athlete to run a fixed distance is given by the equation

$T = 55 + \dfrac{5}{x}$, where her training load has been x times the usual amount.

4 (a)   Complete the table for values of T, using the given values

x	1	2	3	4	5
T			56.67	56.25	

(2 marks)

Space for working

....

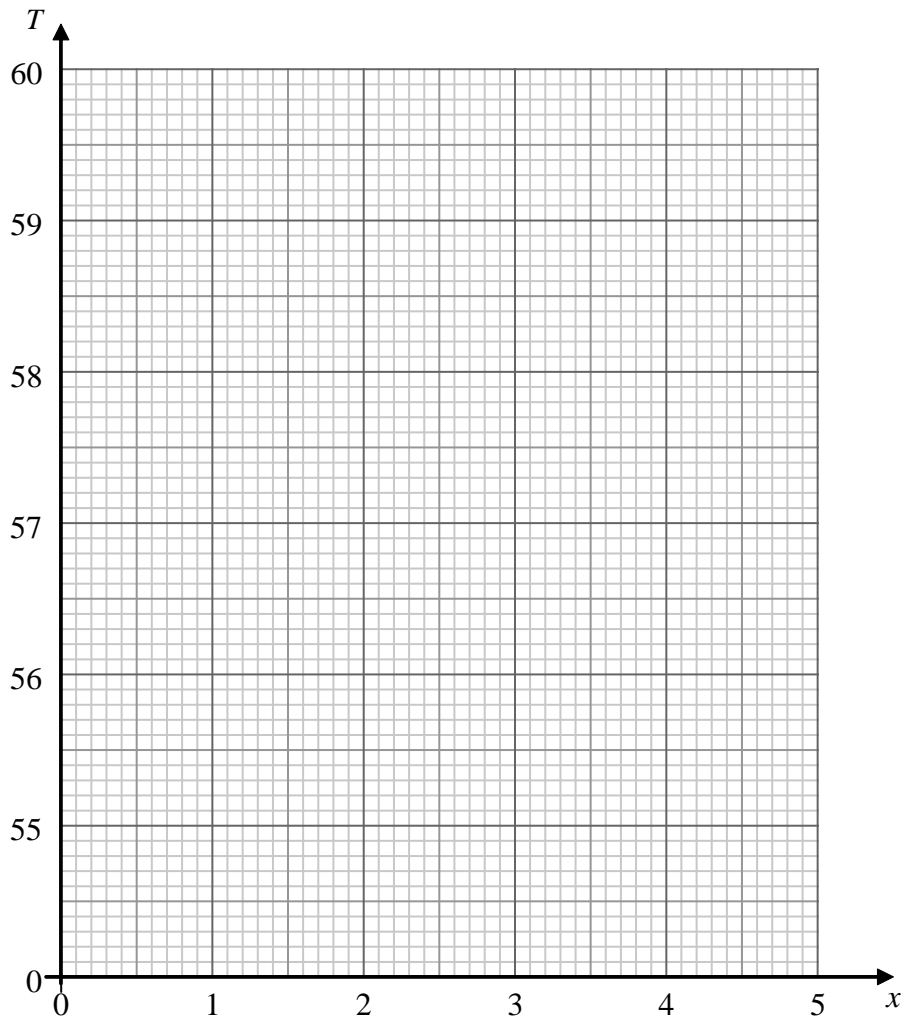..

4 (b) On the axes below, draw the graph of $T = 55 + \dfrac{5}{x}$, for $1 \le x \le 5$.

(3 marks)

4 (c) (i) Use the graph to estimate the value of x giving $T = 57$.

....
(1 mark)

4 (c) (ii) Explain why, according to this model, no amount of extra training will enable the athlete to reduce her time to 55 minutes.

....

....
(2 marks)

4 (d) Use algebra to solve the equation $55 + \dfrac{5}{x} = 59$ exactly.

....

....

$x =$ ....

(3 marks)

11

Section D

Answer **all** questions in the spaces provided.

*Use **Acceleration** from 3 of the Data Sheet.*

5 (a) Describe what the car is doing between times $t = 10$ and $t = 25$.

....

....

(2 marks)

5 (b) What is the gradient of the velocity-time graph between times $t = 0$ and $t = 10$?

....

....

(1 mark)

5 (c) Explain what is represented by the gradient of the velocity-time graph.

....

....

(1 mark)

5 (d) Find the total distance travelled by the car.

....

....

....

(3 marks)

7

Section E

Answer **all** questions in the spaces provided.

6 We share the planet with about 10 million species; about 2 million are known to man.

6 (a) Write 10 million in standard form.

....
(1 mark)

6 (b) Assume that the figure 10 million is correct to the nearest million.

6 (b) (i) What is the largest possible number of species on the planet?

....
(1 mark)

6 (b) (ii) What is the smallest possible number on species on the planet?

....
(1 mark)

7 Japan Tobacco has annual sales of 205 billion in Japan. A recent estimate of the population of Japan is 127 463 611.

Use rough estimates to calculate the average number of Japan Tobacco's cigarettes smoked per person each day in Japan.

....

....

....

....
(4 marks)

$\overline{3}$

$\overline{4}$

END OF QUESTIONS