Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/61**

Paper 6 (Extended) **May/June 2017**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Graphics Calculator

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
Do not use staples, paper clips, glue or correction fluid.
You may use an HB pencil for any diagrams or graphs.
DO **NOT** WRITE IN ANY BARCODES.

Answer both parts **A** and **B**.
You must show all the relevant working to gain full marks for correct methods, including sketches.
In this paper you will also be assessed on your ability to provide full reasons and communicate your mathematics clearly and precisely.
At the end of the examination, fasten all your work securely together.
The total number of marks for this paper is 40.

This document consists of **12** printed pages.

CAMBRIDGE International Examinations

[Turn over

Answer **all** the questions.

A INVESTIGATION VIRUS (20 marks)

You are advised to spend no more than 45 minutes on this part.

This investigation looks at the way a virus spreads in plants in a field.

1 In a field there are a large number of plants in a straight line.
The diagram shows the plants near the middle of the field.

• • • • • • • •

On Day 1, one of the plants is infected with a virus (V).

• • • V • • • •

On Day 2, that plant is dead (D) and the virus infects the plants next to it.

• • V D V • • •

This continues from day to day so this is the pattern on Day 3.

• V D D D V • •

The diagram shows that the virus infects two more plants on day 3.
So the total number of plants that are infected or dead is five.

(a) Complete this table.

Day (n)	Total number of plants that are infected or dead (t)
1	1
2	3
3	5
4	
5	

(b) Find a formula for t in terms of n.

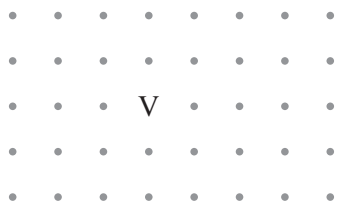
.....

(c) On which day are there a total of 97 plants that are infected or dead?

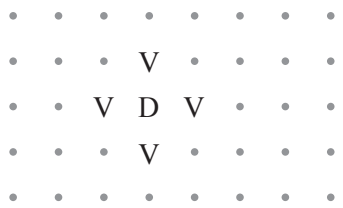
.....

2 In another field there are a large number of plants in equally spaced rows and columns.
The diagram shows the plants near the middle of the field.

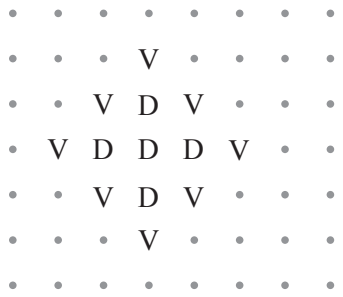
On Day 1, one of the plants is infected with a virus (V).
The virus infects all the plants next to it.



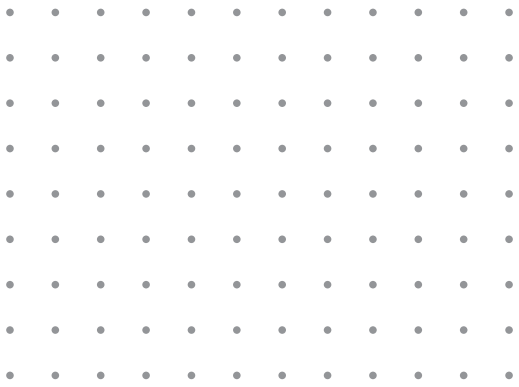
On Day 2 that plant is dead (D) and the plants next to it are infected.



On Day 3 there are 5 dead plants and 8 infected plants.



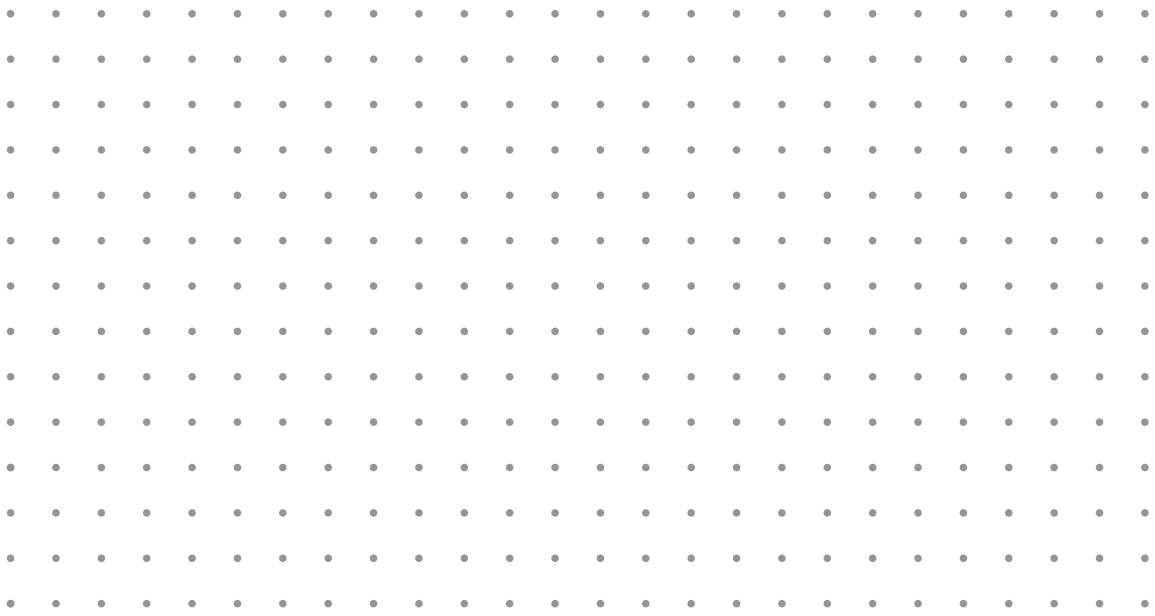
(a) Draw the pattern for Day 4.



(b) Complete this table to show the number of infected plants each day.

Day (n)	Number of infected plants (p)
1	1
2	4
3	8
4	
5	

You may use this grid to help you.



(c) Work out a formula for the number of infected plants (p) in terms of the day (n) for $n \geqslant 2$.

.....

(d) Complete this table to show the total number of infected or dead plants each day.

Day (n)	Total number of infected or dead plants (t)
1	1
2	5
3	13
4	
5	

(e) Find a formula for t in terms of n.

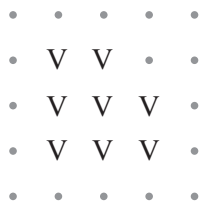
.....

(f) Show that your formula works when $n = 6$.

(g) On which day are exactly 221 plants infected or dead?

.....

3 In another field on Day 1 eight plants, in the arrangement below, are infected.



On Day 2 these plants are dead and the plants next to them are infected.

(a) Show that the number of plants that are infected on Day n, where $n \geqslant 2$, is $4n + 3$.

(b) Find an expression for the total number of plants that are infected or dead on Day n, where $n \geqslant 2$.

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B MODELLING SCOUT'S PACE (20 marks)

You are advised to spend no more than 45 minutes on this part.

This task investigates a way of travelling long distances on foot using a mixture of walking and jogging.

1 Explain why multiplying by $\frac{1000}{60}$ changes km/h into metres per minute.

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2 **(a)** A scout walks at 5 km/h.

Show that 5 km/h is approximately 83.3 metres per minute.

(b) When walking at 5 km/h, the scout takes 120 paces in one minute.

How many metres does the scout walk in 30 paces?

.....

(c) When jogging at 10 km/h, the scout takes 150 paces in one minute.

How many metres does the scout jog in 30 paces?

.....

3 *Scout's Pace* means to walk for 30 paces then to jog for 30 paces and to keep repeating this.

(a) Show that the scout takes 27 seconds to walk 30 paces then to jog 30 paces.

(b) Find the average speed, in m/s, of the scout when using *Scout's Pace*.

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(c) Change your answer in **part (b)** into km/h.

.....

4 To find a model for average speed using *Scout's Pace* assume that, at different speeds, the scout always takes

- 120 paces per minute when walking

and

- 150 paces per minute when jogging.

The scout walks at x km/h and jogs at y km/h.

(a) Show that an expression for the distance travelled by the scout when walking 30 paces is $\frac{25x}{6}$ metres.

(b) The distance travelled by the scout when jogging 30 paces is $\frac{10y}{3}$ metres.

Show that a model for the average speed, S km/h, using *Scout's Pace* is

$$S = \frac{5x + 4y}{9}.$$

(c) Find the average speed using *Scout's Pace* when the jogging speed, y km/h, is twice the walking speed, x km/h.
Give your answer, in terms of x, in its simplest form.

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(d) Find y in terms of x when the average speed is $1.5x$ km/h.

.....

(e) The average speed is 7 km/h.
The jogging speed is 10 km/h.

Find the walking speed.

.....

Question 5 is printed on the next page.

5 The scout now walks at 150 paces per minute and jogs at 180 paces per minute.

Change the model in **question 4(b)** for the average speed using *Scout's Pace*.
Give your answer in its simplest form.

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