Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0726134080

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/51**

Paper 5 (Core) **October/November 2018**

1 hour

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 **all** the questions.
You must show all 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 to 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 24.

This document consists of **8** printed pages.

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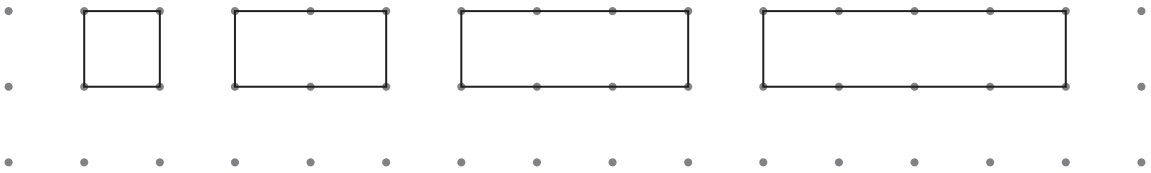
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Answer **all** the questions.

INVESTIGATION **DOTS IN RECTANGLES**

This investigation looks at the number of dots inside rectangles drawn on square dotty paper.

1 Rectangles with a height of 1 unit have no dots inside.



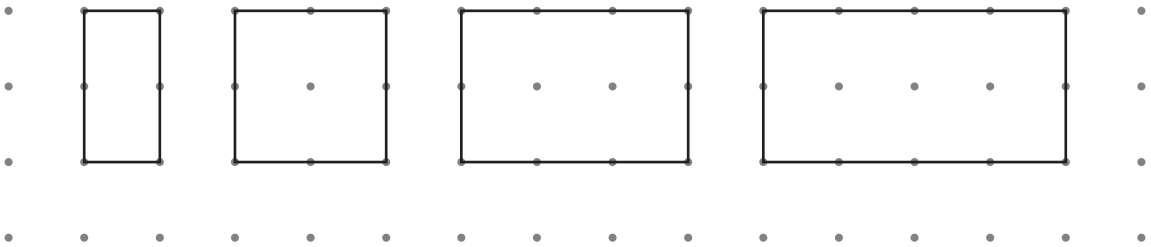
height 1
width 1

height 1
width 2

height 1
width 3

height 1
width 4

(a) (i) These rectangles all have a height of 2 units.



height 2
width 1

height 2
width 2

height 2
width 3

height 2
width 4

Complete the table.

Height of rectangle (h)	Width of rectangle (w)	Number of dots inside rectangle (d)
2	1	
2	2	
2	3	
2	4	

(ii) Find an expression, in terms of w, for the number of dots, d, inside rectangles of height 2.

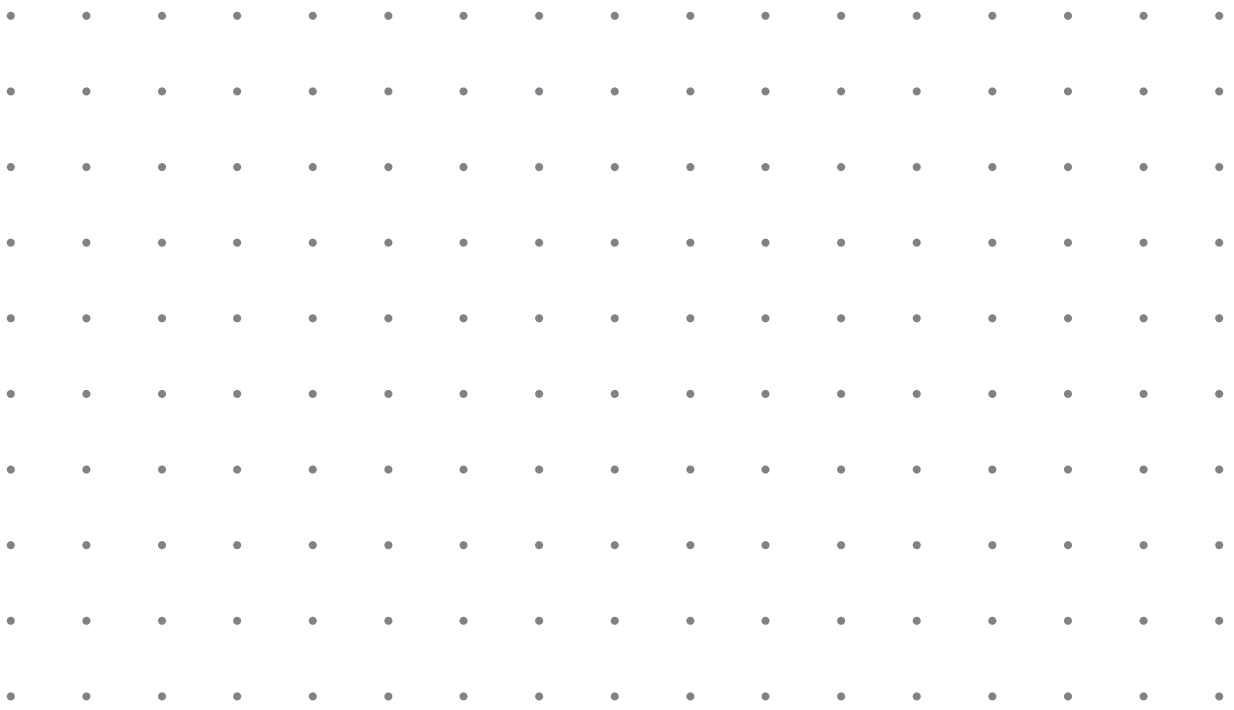
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(b) Complete the tables below.
You may use the square dotty paper on this page to help you.

Height of rectangle (h)	Width of rectangle (w)	Number of dots inside rectangle (d)
3	1	
3	2	
3	3	
3	4	
3	w	$2(w - 1)$

Height of rectangle (h)	Width of rectangle (w)	Number of dots inside rectangle (d)
4	1	
4	2	
4	3	
4	4	
4	w	



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(c) **(i)** Find a formula, in terms of h and w, for the number of dots, d, inside a rectangle of height h and width w.

$d =$ .....

(ii) Use your formula in **part (i)** to show that there are 30 dots inside a rectangle of height 6 and width 7.

(iii) There are 33 dots inside a rectangle.
Find the height and the width of this rectangle.

.....

2 **(a)** Squares are formed when $h = w$.
Change your formula in **question 1(c)(i)** to find the number of dots, d, inside a square of side s.

.....

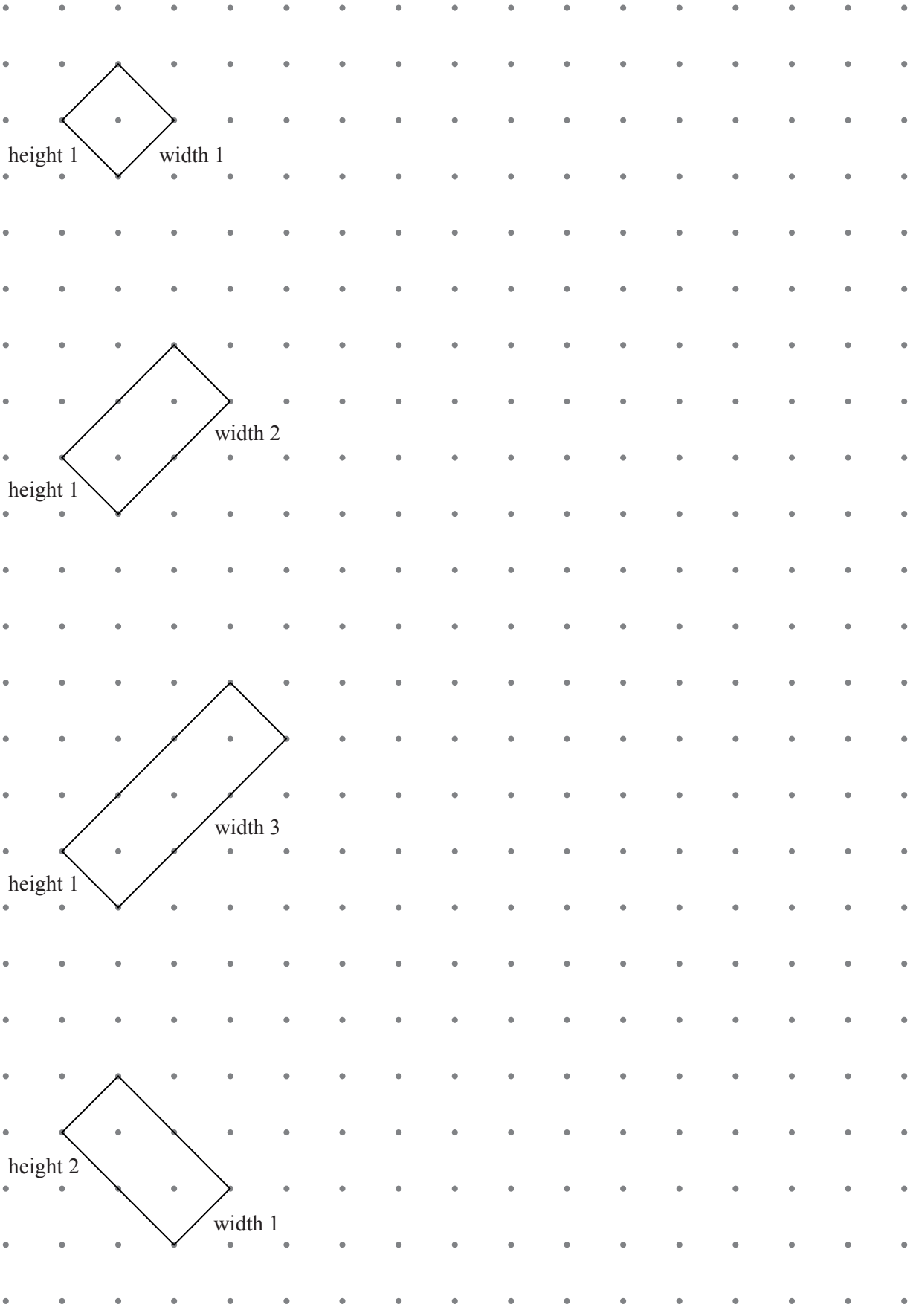
(b) Find the number of dots inside a square of side 10.

.....

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3 The rectangles below are drawn at an angle of 45° to the horizontal.
They are called *diagonal* rectangles.

The diagonal lines between the dots give the height and the width of the *diagonal* rectangles.



(a) Complete the tables below.

Height of *diagonal* rectangle (h)	Width of *diagonal* rectangle (w)	Number of dots inside *diagonal* rectangle (d)
1	1	1
1	2	2
1	3	3
1	4	

Height of *diagonal* rectangle (h)	Width of *diagonal* rectangle (w)	Number of dots inside *diagonal* rectangle (d)
2	1	2
2	2	
2	3	
2	4	
2	w	$3w - 1$

Height of *diagonal* rectangle (h)	Width of *diagonal* rectangle (w)	Number of dots inside *diagonal* rectangle (d)
3	1	
3	2	
3	3	
3	4	

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(b) Use your results from **part (a)** and any patterns you notice to complete the following table with expressions, in terms of the width w, for the number of dots inside *diagonal* rectangles.

Height of *diagonal* rectangle (h)	Number of dots inside *diagonal* rectangle (d)
1	
2	$3w - 1$
3	
4	
5	$9w - 4$

(c) **(i)** Find a formula, in terms of h and w, for the number of dots, d, inside a *diagonal* rectangle.

.....

(ii) Use your formula in **part (i)** to find the number of dots inside the *diagonal* rectangle of height 10 and width 3.

.....

Question 4 is printed on the next page.

4 **(a)** *Diagonal* squares are formed when $h = w$.
Change your formula in **question 3(c)(i)** to find the number of dots, d, inside a *diagonal* square of side s.

.....

(b) There are 181 dots in a *diagonal* square.
Find the length of one side.

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