Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

5257101967

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/53**

Paper 5 (Core) **October/November 2016**

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 **7** printed pages and **1** blank page.

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Answer **all** the questions.

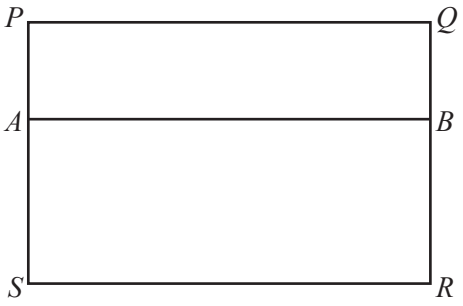
INVESTIGATION RECTANGLES WITHIN RECTANGLES

This investigation looks for a method to find the number of rectangles when you draw horizontal and vertical lines inside a rectangle.

One horizontal line, *AB*, is drawn inside a rectangle *PQRS*.

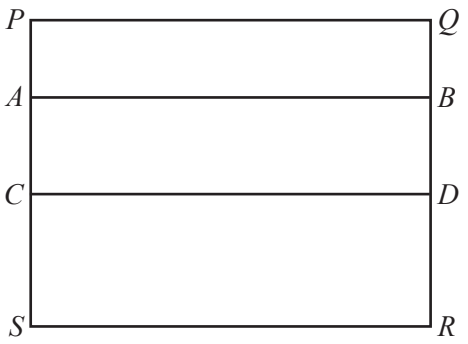
The total number of rectangles is 3.

They are *PQBA*, *PQRS* and *ABRS*.



1 (a) Another line *CD* is drawn inside the rectangle *PQRS*.

The total number of rectangles is now 6.



Four of the 6 rectangles are *PQBA*, *PQDC*, *PQRS* and *ABDC*.

Complete the table to show the other two rectangles.

PQBA	*PQDC*	*PQRS*
ABDC		

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(b) Three horizontal lines, *AB*, *CD* and *EF* are drawn inside the rectangle *PQRS*.



Complete the table to show all ten rectangles.

PQBA			*PQRS*
ABDC		*ABRS*	
	CDRS		

(c) Four horizontal lines are drawn inside the rectangle.

Find the total number of rectangles.



(d) Complete the table.

Number of horizontal lines inside the rectangle	0	1	2	3	4	5	6	7
Total number of rectangles		3	6	10				36

(e) The numbers in the bottom row of the table in **part (d)** form a sequence.

Write down the mathematical name of these numbers.

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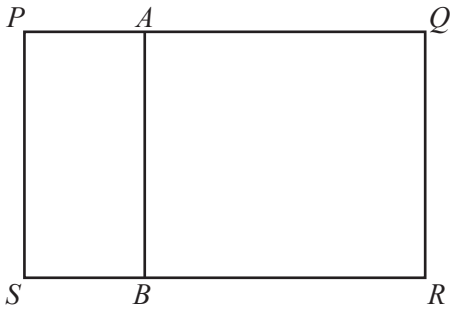
(f) Ten horizontal lines are drawn inside the rectangle.

Find the total number of rectangles.

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2 One vertical line, *AB*, is drawn inside rectangle *PQRS*.



The total number of rectangles is 3.

They are *PABS*, *PQRS* and *AQRB*.

(a) Two vertical lines are drawn inside a rectangle.

Find the total number of rectangles.

.....

(b) Complete the table.

Number of vertical lines inside a rectangle	0	1	2	3	4	5	6	7
Total number of rectangles		3						

(c) What is the connection between the table in **question 1(d)** and the table in **question 2(b)**?

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3 12 vertical lines are drawn inside a rectangle.

Show that the total number of rectangles is given by the calculation $\frac{12^2 + 3 \times 12 + 2}{2}$.

4 **(a)** When n vertical lines are drawn inside a rectangle the total number of rectangles, T, is

$$T = \frac{1}{2}n^2 + an + b, \qquad \text{where } a \text{ and } b \text{ are constants.}$$

Find the value of a and the value of b.
Use your answers to write down the formula for T.

$a =$ .....

$b =$ .....

$T =$ .....

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(b) Use your formula in **part (a)** to show that when 7 vertical lines are drawn inside a rectangle, the number of rectangles is 36.

(c) Calculate how many vertical lines are drawn when there are 231 rectangles.

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5 When 30 horizontal lines are drawn inside a rectangle, find the total number of rectangles.

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