Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

5828262990

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/62**

Paper 6 (Extended) **October/November 2016**

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

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Answer **both** parts **A** and **B**.

A INVESTIGATION RECTANGLES WITHIN RECTANGLES (20 marks)

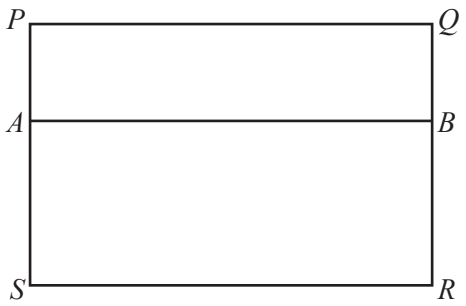
You are advised to spend no more than 45 minutes on this part.

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*.

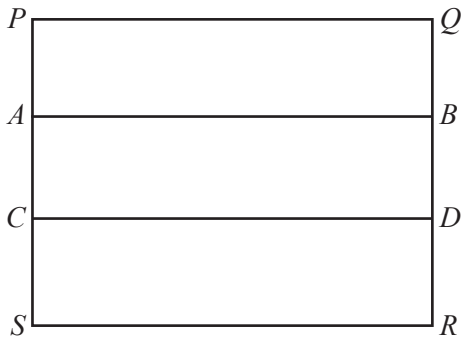
The total number of rectangles is 3.

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.



Three of the 6 rectangles are *PQBA*, *PQRS* and *ABRS*.

Write down the other three rectangles.

.....

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

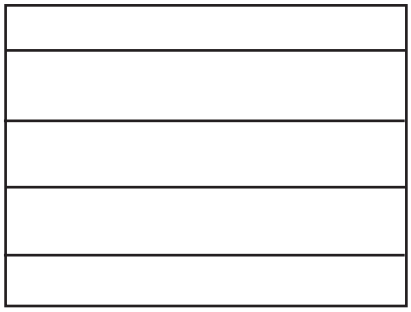
Find the total number of rectangles.



.....

(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					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.

.....

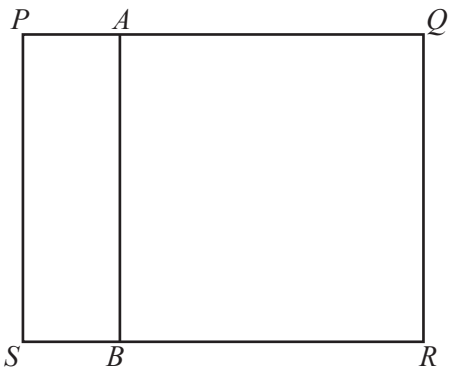
(f) Ten horizontal lines are drawn inside the rectangle.

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 $AQRB$.

Complete the table.

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

3 **(a)** n vertical lines are drawn inside a rectangle.
The total number of rectangles is $an^2 + bn + c$.

Find the values of a, b and c.

a = ...

b = ...

c = ...

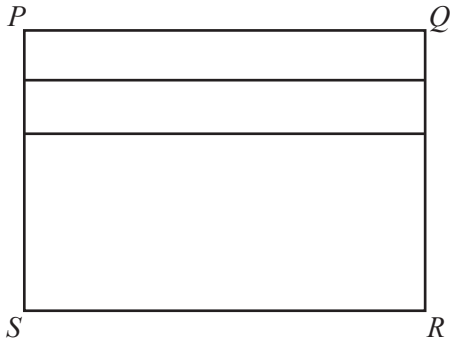
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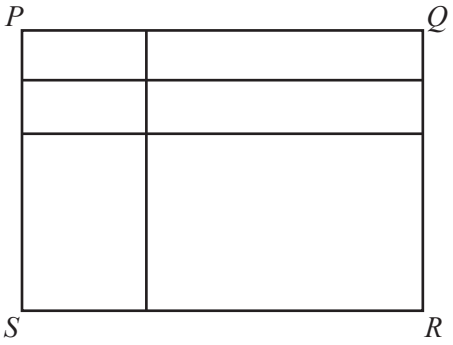
(b) Using your values for a, b and c found in **part (a)**, factorise $an^2 + bn + c$.
Write it in the form $a(n + p)(n + q)$.

.....

4 Two horizontal lines are drawn inside rectangle $PQRS$ to form a total of 6 rectangles.

For **each** of these 6 rectangles, 3 rectangles are formed when one vertical line is also drawn inside rectangle $PQRS$.





So the total number of rectangles is 18.

(a) One horizontal line and one vertical line are drawn inside rectangle $PQRS$.

Find the total number of rectangles.

.....

(b) Three horizontal lines and two vertical lines are drawn inside a rectangle.

Find the total number of rectangles.

.....

(c) n horizontal lines and m vertical lines are drawn inside a rectangle.

Find an expression, in terms of n and m, for the total number of rectangles.
Do not simplify this expression.

.....

5 $ABCD$ is a square.
An equal number of horizontal lines and vertical lines are drawn inside the square.

Show that the number of rectangles inside $ABCD$ could not be 76^2 but it could be 78^2.

B MODELLING BIRTHDAY MONEY (20 marks)

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

1 Rosie's grandmother gave her \$10 on her 1st birthday.
On each birthday after that her grandmother gave her \$5 more than she gave Rosie on her last birthday.

(a) How much did Rosie receive from her grandmother on her 5th birthday?

.....

(b) Find a model, in terms of n, for the amount in dollars, A, that Rosie received from her grandmother on her nth birthday.

.....

(c) Use your model to show that Rosie received \$105 from her grandmother on her 20th birthday.

2 **(a)** Find the total amount that Rosie had received from her grandmother, up to and including her 5th birthday.

.....

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(b) A model for the total amount of money, \$$T$, that Rosie received up to and including her nth birthday, is

$$T = kn(n + 3).$$

(i) Use your answer to **part (a)** to find the value of k.

.....

(ii) Show that Rosie received a total of \$1150 from her grandmother, up to and including her 20th birthday.

(c) Work out Rosie's age when she first received a total of more than \$4 000.

.....

3 Zahari's grandfather gave him \$10 on his 1st birthday.
On each birthday after that his grandfather gave him 10% more than he gave him on his last birthday.

How much did Zahari receive from his grandfather on his 5th birthday?

.....

4 The model $A = 10 \times 1.1^{n-1}$ can be used to calculate the amount in dollars, A, that Zahari received from his grandfather on his nth birthday.

(a) Explain why the numbers 10 and 1.1 are used in the model.

.....

.....

.....

(b) Use the model to calculate how much Zahari received from his grandfather on his 20th birthday. Give your answer in dollars correct to the nearest cent.

.....

5 **(a)**



(i) On the axes, sketch the graph of the model for A that you found in **question 1(b)**.

(ii) On the same axes, sketch the model $A = 10 \times 1.1^{n-1}$.

(b) After their 1st birthdays, on which birthday did Zahari first get more money than Rosie?

.....

(c) Apart from their 1st birthdays, which of these two situations, A or B, gives Zahari more money than Rosie on an earlier birthday?

His grandfather gave him

A $5 on his 1st birthday, with an increase of 15% on each birthday
B $7.50 on his 1st birthday, with an increase of 12% on each birthday.

Give reasons for your choice.

.....

.....

6 Zahari's grandmother gave him $\$d$ on his 1st birthday.
On each birthday after that his grandmother gave him 10% more than she gave him on his last birthday.

(a) Change the model $A = 10 \times 1.1^{n-1}$ to show this situation.

.....

(b) Find the value of d that will give Zahari \$148 on his 22nd birthday.

.....

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