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CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/52**

Paper 5 Investigation (Core) **May/June 2023**

1 hour 10 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a graphic display calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly, including sketches, to gain full marks for correct methods.
- In this paper you will be awarded marks for providing full reasons, examples and steps in your working to communicate your mathematics clearly and precisely.

INFORMATION

- The total mark for this paper is 36.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

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Answer **all** the questions.

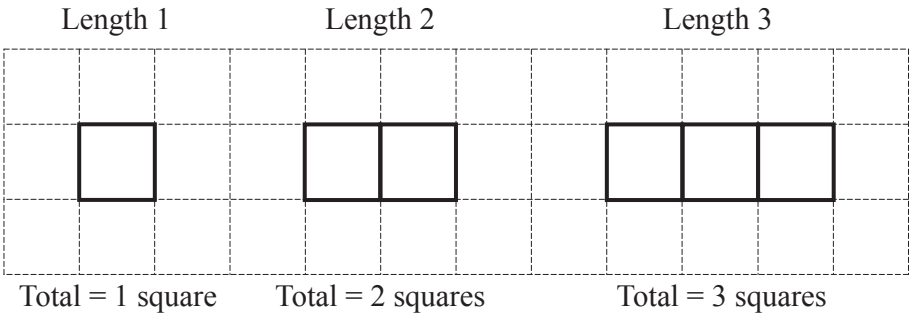
INVESTIGATION SQUARES IN RECTANGLES

This investigation looks at finding the total number of squares inside a rectangle drawn on a grid.

In this investigation:

- the sides of the rectangles are on the grid lines
- the length of a rectangle is never less than its width.

1 Rectangles of width 1



Complete the statements.

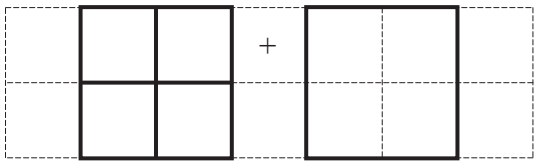
The number of squares in a rectangle of width 1 and length 4 is .....

The number of squares in a rectangle of width 1 and length L is ..... [2]

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2 Rectangles of width 2

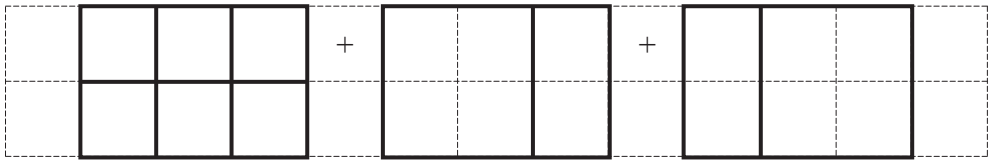
Length 2



4 squares of side 1 + 1 square of side 2

Total = 5 squares

Length 3

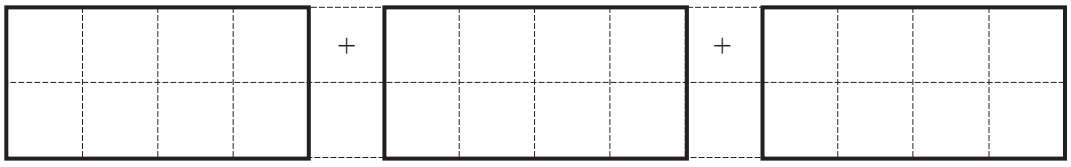


6 squares of side 1 + 1 square of side 2 + 1 square of side 2

Total = 8 squares

(a) Draw lines on these rectangles and write the number of squares under each one to show there is a total of 11 squares.

Length 4

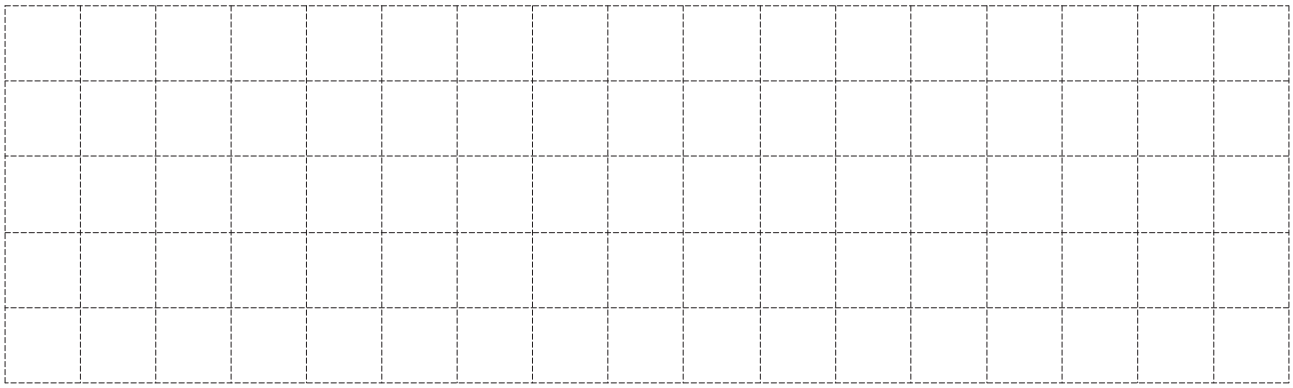


..... squares of side 1 + ... squares of side 2 + ... square of side 2

Total = 11 squares [3]

(b) (i) Complete the table.
You may use the grid below the table to help you.

Rectangles of width 2	
Length of rectangle	Total number of squares
2	5
3	8
4	11
5	



[2]

(ii) Find the total number of squares inside a rectangle of width 2 and length 8.

..... [2]

(c) Can a rectangle of width 2 have a total of exactly 30 squares inside?
Show how you decide.

..... [1]

(d) **(i)** Find an expression, in terms of L, for the total number of squares in a rectangle of width 2 and length L.

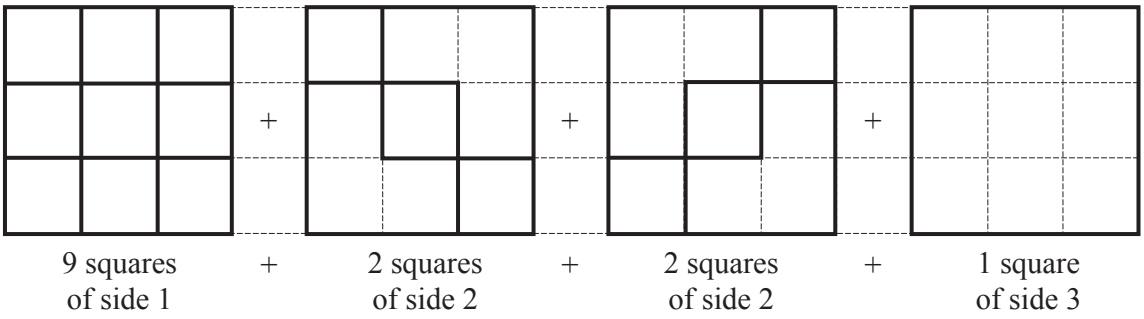
..... [2]

(ii) Calculate the total number of squares in a rectangle of width 2 and length 170.

..... [2]

3 Rectangles of width 3

Length 3

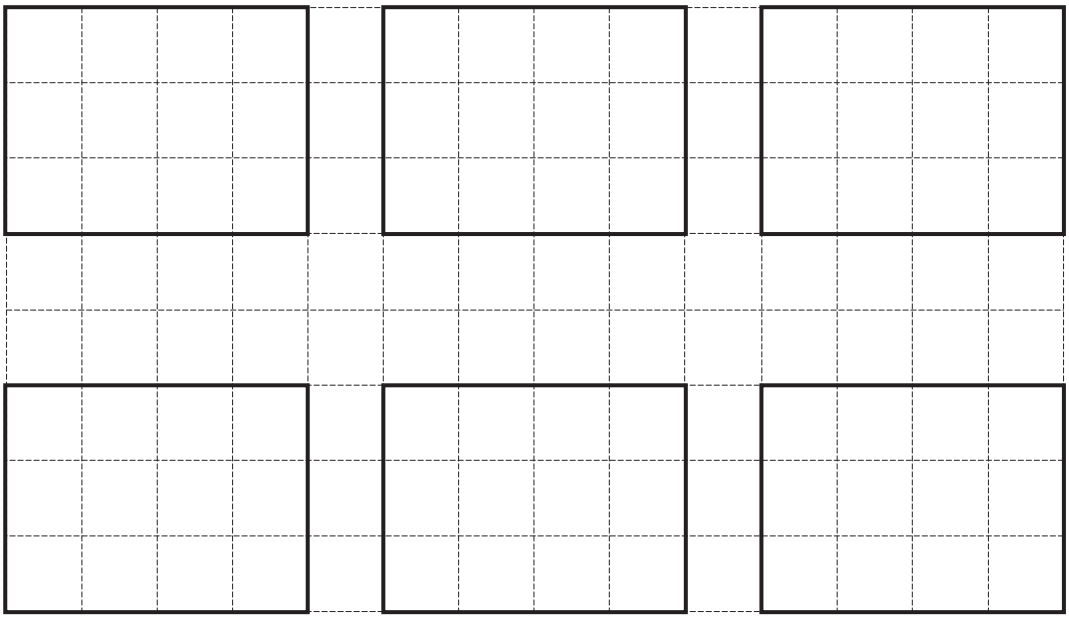


Total = 14 squares

(a) Draw lines on these rectangles and write the number of squares under each one to find the total number of squares in a rectangle of width 3 and length 4.

You may not need to use all the rectangles.

Length 4



..... [4]

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(b) (i) Complete the table.
You may use the grid to help you.

Rectangles of width 3	
Length of rectangle	Total number of squares
3	14
4	
5	26
6	32
7	

[2]

(ii) Find an expression, in terms of L, for the number of squares in a rectangle of width 3 and length L.

..... [2]

4 This is another method to count squares in rectangles.

Step A	Multiply the width by the length of the rectangle	1st product
Step B	Subtract 1 from the width and 1 from the length and multiply	2nd product
Step C	Repeat step B until the width is 1	
Step D	Add together all the products	

Example

Rectangle of width 3 and length 5

Step A	3×5	1st product $= 15$
Step B	$(3-1) \times (5-1) = 2 \times 4$	2nd product $= 8$
Step C	$(2-1) \times (4-1) = 1 \times 3$	3rd product $= 3$
	Width is now 1 so move to step D	
Step D	$15 + 8 + 3 = 26$	

(a) Use this method to show that the total number of squares in a rectangle of width 4 and length 4 is 30.

[2]

(b) (i) Complete the table.

Rectangles of width 4	
Length of rectangle	Total number of squares
4	30
5	
6	
7	
8	70

[3]

(ii) Find an expression, in terms of L, for the number of squares in a rectangle of width 4 and length L.

..... [2]

5 **(a)** Complete the table.

Use your answers to **Question 1**, **Question 2(d)(i)**, **Question 3(b)(ii)** and **Question 4(b)(ii)** to help you.

Width of rectangle	Expression for total number of squares in terms of L
1	
2	
3	
4	
5	
6	$21L - 35$

[3]

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(b) Find all the rectangles that have a total of 50 squares.
Give the length and width of each rectangle.

[4]

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