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**CAMBRIDGE INTERNATIONAL MATHEMATICS****0607/52**

Paper 5 Investigation (Core)

**October/November 2025****1 hour 15 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 40.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **8** pages.

# INVESTIGATION SQUARE PATTERNS

In this investigation you will look at the number of lines used to draw square patterns.

| is a vertical line and — is a horizontal line.

1 This is Pattern 1.



There are 2 vertical lines.

There are 2 horizontal lines.

There are 4 lines in total.

This is Pattern 2.



There are 3 vertical lines.

There are 4 horizontal lines.

There are 7 lines in total.

(a) This is Pattern 3.



Complete these statements for Pattern 3.

There are ..... vertical lines.

There are ..... horizontal lines.

There are ..... lines in total.

[1]





(b) (i) Draw Pattern 4.

[1]

(ii) Complete these statements for Pattern 4.

There are ..... vertical lines.

There are ..... horizontal lines.

There are ..... lines in total.

[1]

(c) Complete the table.

Use your answers to **part (a)**, **part (b)(ii)** and any patterns you notice.

	Pattern number ( $n$ )	Number of vertical lines	Number of horizontal lines	Total number of lines
	1	2	2	4
	2	3	4	7
part (a)	3			
part (b)(ii)	4			
	5			

[2]

(d) (i) Write down an expression, in terms of  $n$ , for the number of vertical lines in Pattern  $n$ .

..... [1]

(ii) A pattern has 48 vertical lines.

Find the pattern number.

..... [1]





(e) (i) Work out how many horizontal lines are in Pattern 8.

..... [2]

(ii) Find an expression, in terms of  $n$ , for the number of horizontal lines in Pattern  $n$ .

..... [1]

(iii) A pattern has 60 horizontal lines.

Find the pattern number.

..... [2]



- (f) (i) Write down the term-to-term rule to continue the sequence of the total number of lines.

..... [1]

- (ii) Use your answers from **part (d)(i)** and **part (e)(ii)** to find an expression, in terms of  $n$ , for the total number of lines in Pattern  $n$ .  
Give your answer in its simplest form.

..... [2]

- (g) The total number of lines in a pattern is 754.

Work out the number of **horizontal** lines in this pattern.

..... [4]



- 2 The square patterns in **Question 1** make towers of squares.

This is Tower 1.

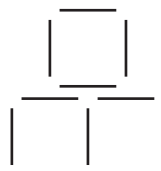


There are 2 vertical lines.

There are 2 horizontal lines.

There are 4 lines in total.

This is Tower 2.

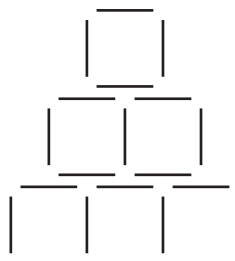


There are 5 vertical lines.

There are 6 horizontal lines.

There are 11 lines in total.

- (a) This is Tower 3.



Complete these statements for Tower 3.

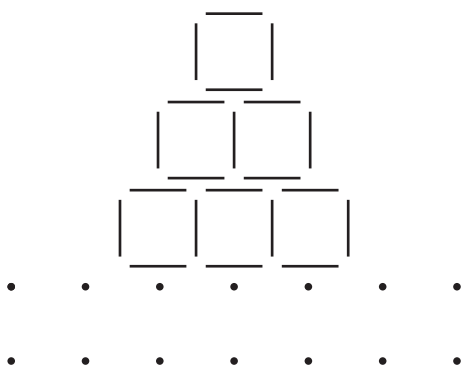
There are ..... vertical lines.

There are ..... horizontal lines.

There are ..... lines in total.

[2]

- (b) Complete Tower 4.



[1]



(c) Complete the table.

Use your answers to **part (a)**, **part (b)** and any patterns you notice.

	Tower number ( $t$ )	Number of vertical lines	Number of horizontal lines	Total number of lines
	1	2	2	4
	2	5	6	11
part (a)	3			
part (b)	4			
	5			

[4]

(d) Find an expression, in terms of  $t$ , for the number of **horizontal** lines in Tower  $t$ .

..... [3]

(e) Explain how to use the total number of lines in Tower 5 to find the total number of lines in Tower 6.

..... [2]

(f) This is an expression for the total number of lines in Tower  $t$ .

$$0.5t(3t+5)$$

Show that this expression gives the correct total number of lines when  $t = 6$ .

[3]

Questions 2(g) and 2(h) are printed on the next page.





- (g) Find an expression for the number of vertical lines in Tower  $t$ .  
Use your answer from **part (d)** and the expression from **part (f)**.  
Give your answer in its simplest form.

..... [3]

- (h) Ali makes a tower with 77 vertical lines.

Find the total number of lines in the bottom row of squares in this tower.

..... [3]

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