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CAMBRIDGE INTERNATIONAL MATHEMATICS

0607/05

Paper 5 Investigation (Core)

For examination from 2025

SPECIMEN PAPER

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.

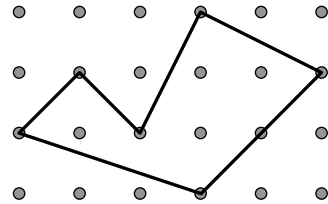
INVESTIGATION PICK'S FORMULA

This investigation is about working out the area of a polygon.

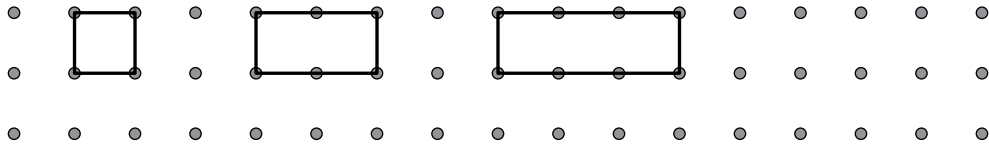
In 1899 the Austrian mathematician Georg Pick found a method to work out the area, A , of any polygon that has its vertices (corners) on a square grid.

His method used the number of dots, p , on the perimeter of the polygon and the number of dots, i , inside the polygon.

In the polygon shown, $p = 7$ and $i = 4$.



1 The diagram shows the first three rectangles of a sequence with $i = 0$.



The second rectangle has $p = 6$. Its area, A , is 2 squares.

(a) Complete the table for the first six rectangles in the sequence.

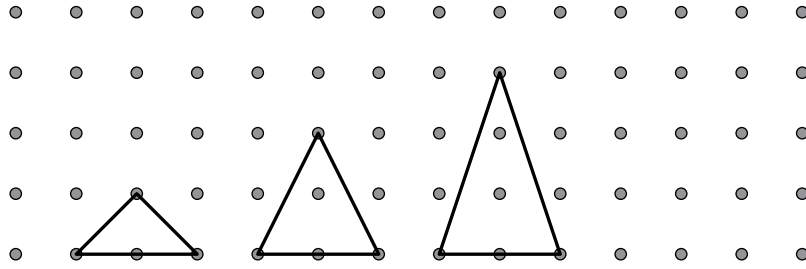
		Rectangle					
		first	second	third	fourth	fifth	sixth
p			6				14
$\frac{1}{2}p$			3				7
A			2				6

[4]

(b) Write down a formula for A in terms of p .

..... [1]

2 The diagram shows the first three triangles of a sequence with $p = 4$.



The third triangle has $i = 2$.

Its area $A = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 2 \times 3 = 3$ squares.

(a) Find the area of the first two triangles in the sequence.

First triangle

Second triangle

[3]

(b) Complete the table for the first six triangles in the sequence.

		Triangle					
		first	second	third	fourth	fifth	sixth
i				2			
A				3			

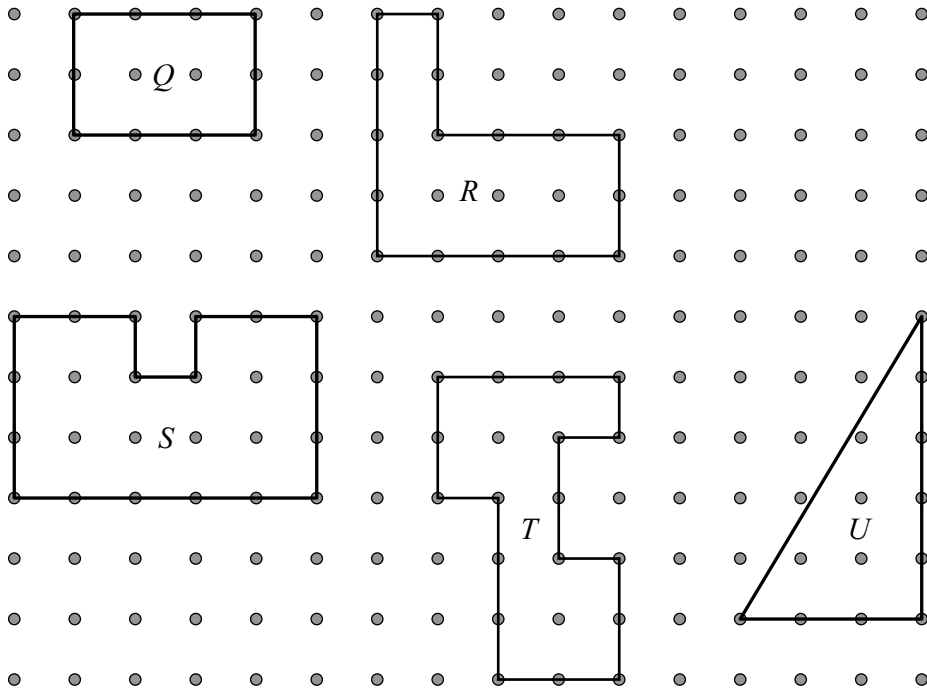
[2]

(c) Write down a formula for A in terms of i .

..... [1]

- 3 Your answers to **Question 1(b)** and **Question 2(c)** show that the area, A , of a polygon relates to $\frac{1}{2}p$ and also to i .

The diagram shows polygons Q , R , S , T and U .



- (a) Complete the table.

	Polygon				
	Q	R	S	T	U
$\frac{1}{2}p$		8	9		4.5
i		3	6	2	
$\frac{1}{2}p + i$	7			11	8.5
A	6				7.5

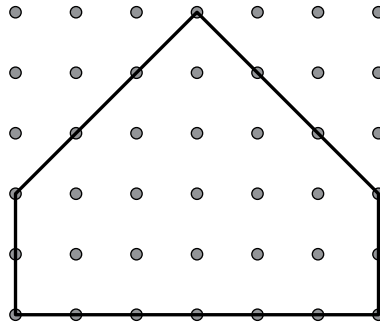
[5]

- (b) Write a formula for A in terms of p and i .

..... [2]

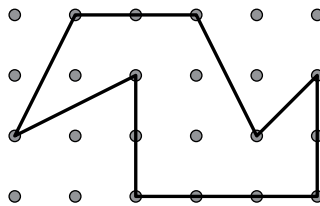
4 The answer to **Question 3(b)** is *Pick's formula*.

Show that Pick's formula gives the correct value for the area of this polygon.



[5]

5 Use Pick's formula to find the area of this polygon.



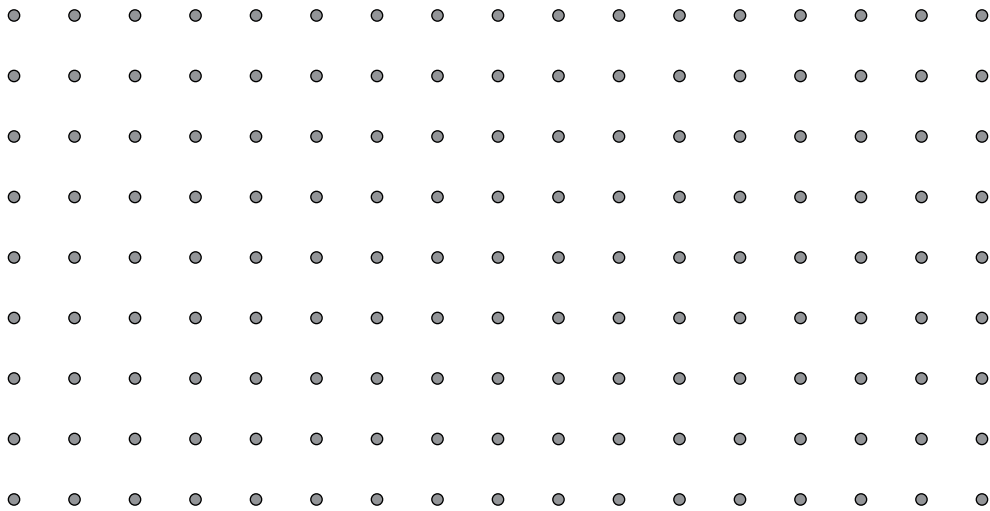
..... [3]

- 6 The area of triangle G is 3 squares.
There are 6 dots on the perimeter of the triangle.

(a) Use Pick's formula to find the number of dots inside triangle G .

..... [2]

(b) Use your answer to **part (a)** to draw triangle G .



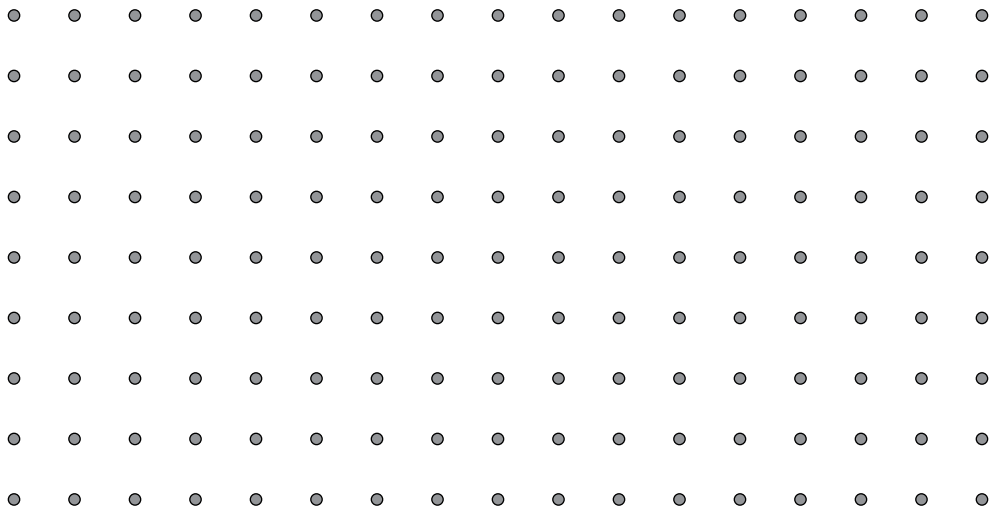
[2]

- 7 The area of quadrilateral H is 4 squares.
There are 2 dots inside the quadrilateral.

(a) Use Pick's formula to find the number of dots on the perimeter of quadrilateral H .

..... [3]

(b) Use your answer to **part (a)** to draw quadrilateral H .



[2]

Question 8 is printed on the next page.

8 (a) For any polygon, give the reason why the value of p is greater than 2.

..... [1]

(b) What is true about the value of p when A is a positive integer?

..... [1]

(c) The area, A , of a polygon is 2 squares.

Use Pick's formula to find all the possible pairs of values for p and i .

..... [3]

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