



# Cambridge IGCSE™

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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.

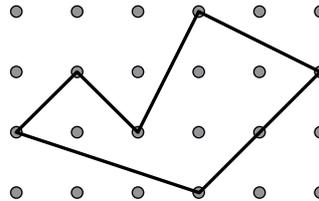
### INVESTIGATION PICK'S FORMULA

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

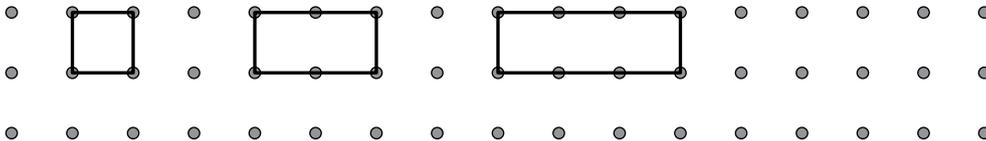
In 1899 the Austrian mathematician Georg Pick found a method to work out the area,  $A$ , of any polygon that has its vertices (corners) on a square grid.

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.

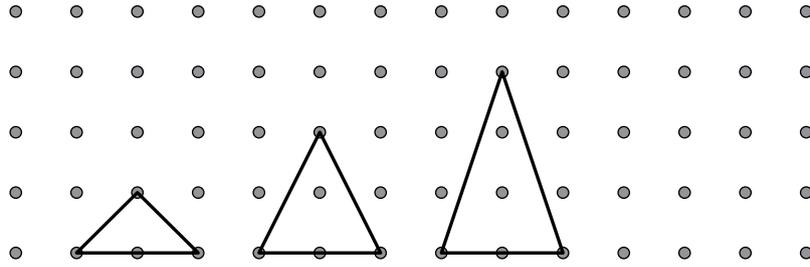
		Rectangle					
		first	second	third	fourth	fifth	sixth
$p$			6				14
$\frac{1}{2}p$			3				7
$A$			2				6

[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			

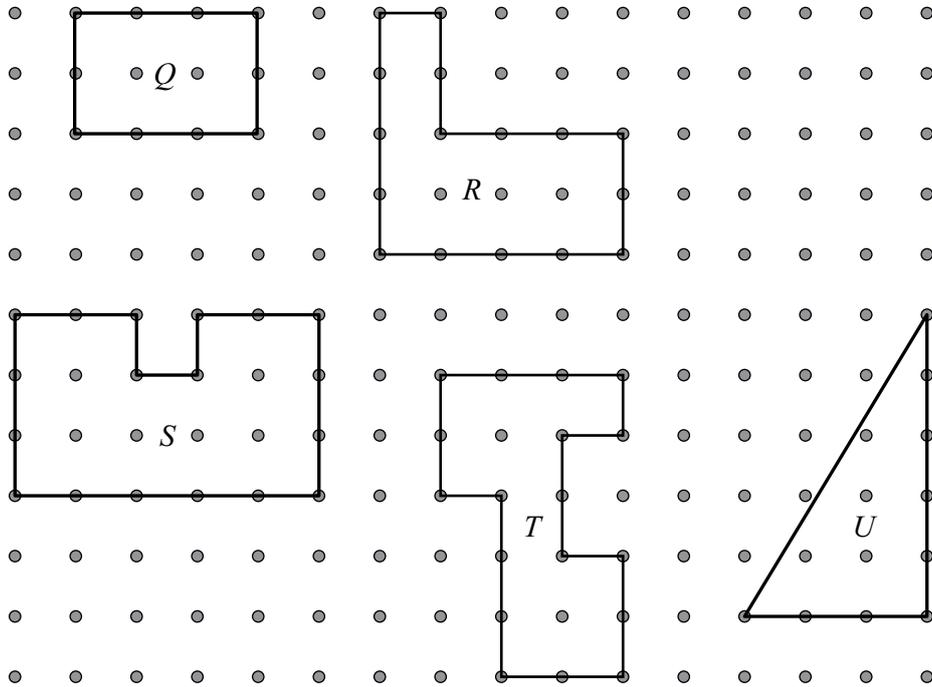
[2]

(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

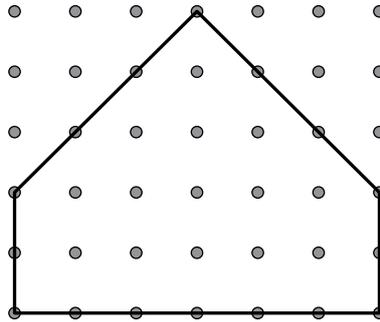
[5]

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

..... [2]

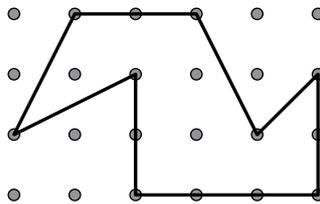
4 The answer to **Question 3(b)** is *Pick's formula*.

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.



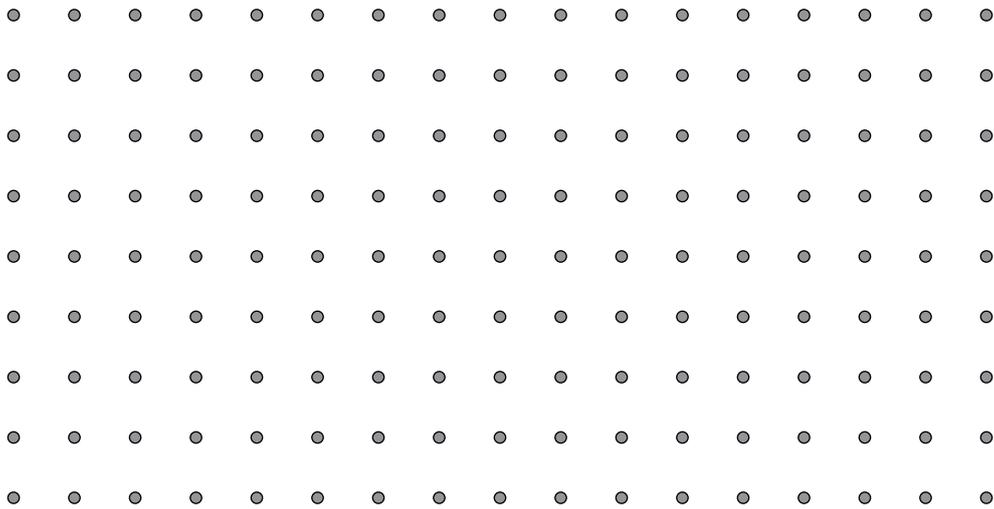
..... [3]

- 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  $G$ .



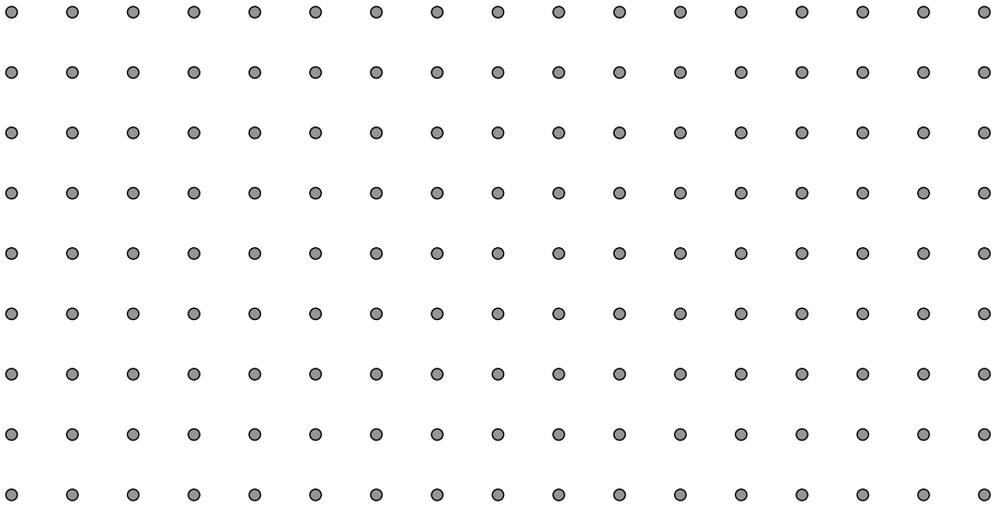
[2]

- 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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