UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/05**

Paper 5 (Core) **May/June 2011**

1 hour

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, highlighters, glue or correction fluid.
You may use a pencil for any diagrams or graphs.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.

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 24.

This document consists of **5** printed pages and **3** blank pages.

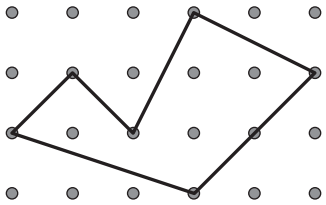
Answer **all** the questions.

INVESTIGATION **PICK'S EQUATION**

In 1899 the Austrian mathematician Georg Pick found a method to work out the area 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.

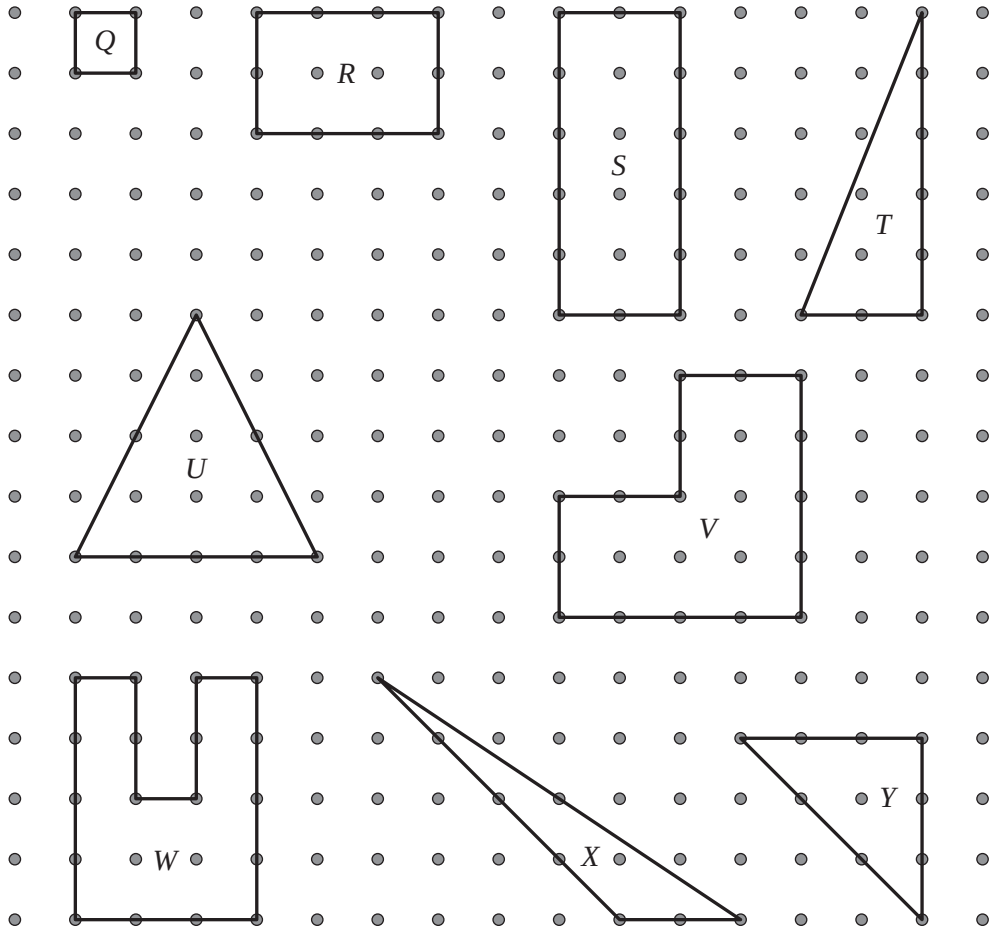
In the polygon shown, $p = 7$ and $i = 4$.



1 The diagram below shows 9 polygons, labelled Q to Y.

For the rectangle R, $p = 10$ and $i = 2$.
Its area is A = length × width = 3 × 2 = 6 squares.

For the triangle X, $p = 8$ and $i = 1$.
Its area is $A = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 2 \times 4 = 4$ squares.



Complete the table below.

Polygon	Dots on perimeter p	Dots inside i	Area A	$p + 2i - 2$
Q		0		2
R	10	2	6	12
S	14			20
T		2	5	
U	8			16
V	16		12	
W	18	2		
X	8	1	4	8
Y			$4\frac{1}{2}$	9

2 Use the table to write down an equation connecting $p + 2i - 2$ with A.
This is **Pick's Equation**.

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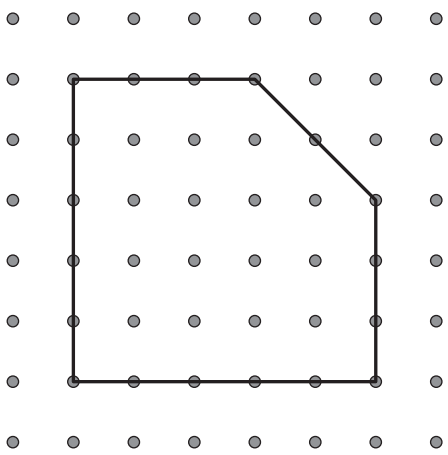
3 Show that Pick's Equation gives the correct value for the area of this polygon.



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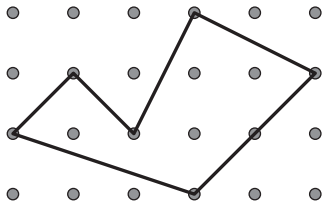
4 Use Pick's Equation to find the area of this polygon.



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Area = ... squares

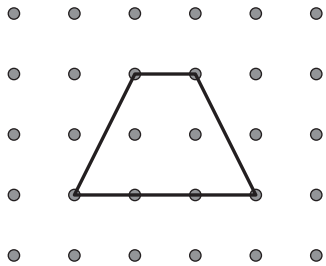
5 A polygon has an area A equal to 4 squares.

(a) Using Pick's Equation, a possible pair of values for p and i is $p = 6$ and $i = 2$.

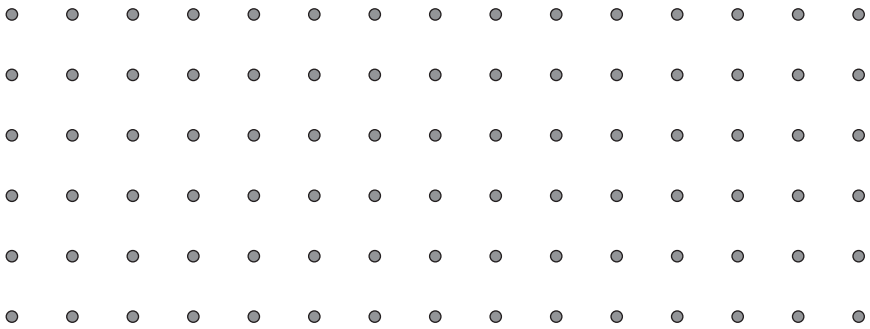
Find another possible pair of values for p and i.

$p =$ ..... and $i =$ .....

(b) The diagram below shows a quadrilateral with $A = 4$, $p = 6$ and $i = 2$.



Draw, on the square grid below, a quadrilateral with $A = 4$ and the pair of values for p and i that you found in **part (a)**.



6 For any polygon, explain why the value of p is greater than 2.

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7 Use Pick's Equation to show all the possible pairs of values for p and i when a polygon has an area $A = 6$.

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