Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5524846572

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/53**

Paper 5 (Core) **October/November 2018**

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, glue or correction fluid.
You may use an HB 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 to 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.

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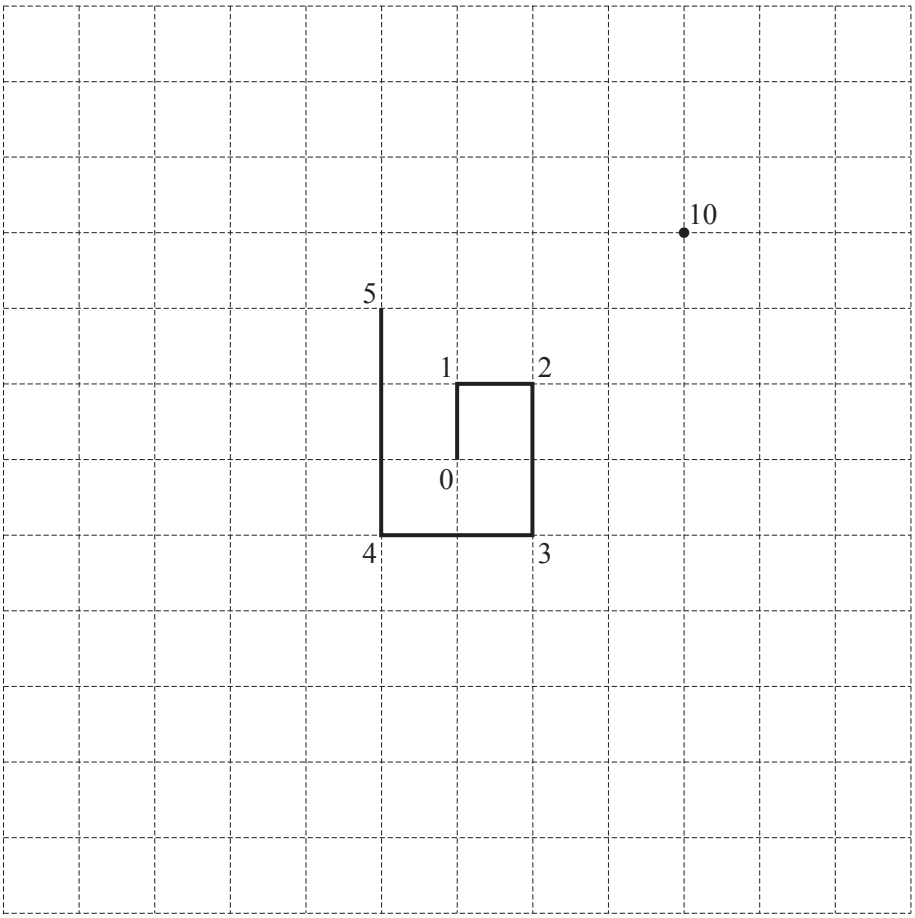
Answer **all** the questions.

INVESTIGATION **RIGHT SPIRALS**

This investigation is about the lengths of spirals drawn on a square grid.

A robot starts from 0 and moves 1 unit to Corner 1.
It then turns right and moves 1 unit to Corner 2.
It then turns right and moves 2 units to Corner 3.
It then turns right and moves 2 units to Corner 4.
It then turns right and moves 3 units to Corner 5.

This forms a spiral, shown on the grid below.



The robot continues to turn and move in the same way.

1 **(a)** Continue the spiral to Corner 10.

(b) The length of the spiral from 0 to Corner 4 is 6 units.

Find the length of the spiral from 0 to Corner 10.

.....

(c) Use your spiral to complete this table.

Corner number	Lengths added	Length from 0
1	1	1
2	1 + 1	2
3	1 + 1 + 2	4
4		6
5		
6	1 + 1 + 2 + 2 + 3 + 3	12
7	1 + 1 + 2 + 2 + 3 + 3 + 4	16
8	1 + 1 + 2 + 2 + 3 + 3 + 4 + 4	
9		
10	1 + 1 + 2 + 2 + 3 + 3 + 4 + 4 + 5 + 5	

2 This table shows the first five terms of a sequence.

n	1	2	3	4	5	6	7
Term of the sequence	1	3	6	10	15		

(a) For this sequence, fill in the next two terms.

(b) Write down the mathematical name for this sequence of numbers.

.....

(c) The nth term for this sequence is $\frac{n(n+1)}{2}$.

Show that this is correct when $n = 5$.

3 This table shows the length, L, of the spiral from 0 to an **even numbered** corner, k.

(a) Use your table from **question 1(c)** to help you complete this table.

k	Length (L)
2	2
4	6
6	12
8	
10	
12	
14	56
16	

(b) Complete this table using your answers to **question 2(a)** and **question 3(a)**.

n	Term of the sequence	k	Length (L)
1	1	2	2
2	3	4	6
3	6	6	12
4	10	8	
5	15	10	
6		12	

(i) Complete this formula for n in terms of k.

$n =$ .....

(ii) Write down the connection between the length, L, and the term of the sequence.

.....

(iii) Use **part (i)**, **part(ii)** and **question 2(c)** to show that the formula for the length, L, of the spiral from 0 to an **even numbered** corner, k, is

$$L = \frac{k}{2}\left(\frac{k}{2} + 1\right).$$

(iv) Show that the formula from **part(iii)** is correct for Corner 6.

(v) Show that the formula from **part (iii)** is not correct when k is an **odd number**.

[Turn over

4 **(a)** Write down the length of the spiral

(i) from Corner 5 to Corner 6 ,

.....

(ii) from Corner 6 to Corner 7.

.....

(b) When k is an **even** number, find an expression, in terms of k, for the length of the spiral

(i) from Corner $(k - 1)$ to Corner k,

.....

(ii) from Corner k to Corner $(k + 1)$.

.....

5 **(a)** Using **question 3(b)(iii)** and **question 4 (b)(i)**, show that the length of the spiral from 0 to Corner 7 is 16 units.

(b) Find the length of the spiral from 0 to Corner 91.

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