



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

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**CAMBRIDGE INTERNATIONAL MATHEMATICS**

**0607/05**

Paper 5 (Core)

**May/June 2009**

**1 hour**

Additional Materials:      Answer Booklet/Paper  
   Graphics Calculator

\* 9 2 6 7 0 8 8 1 5 7 \*

**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.

Answer **all** the questions.

You must show all relevant working to gain full marks for correct methods, including sketches, even if your answer is incorrect.

**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 the marks for this paper is 24.

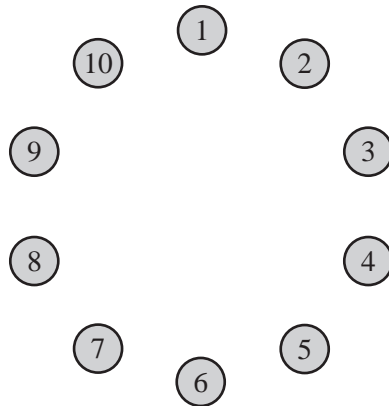
This document consists of **3** printed pages and **1** blank page.



Answer **all** questions.

## INVESTIGATION

## REMOVING DISCS



The diagram shows ten discs, numbered 1 to 10, arranged in a circle.

You remove the disc numbered 1, and, going clockwise, leave the next one, remove the one after that, leave the next one, and so on until only one disc remains.

The discs which you remove are, in order, numbered 1, 3, 5, 7, 9, 2, 6, 10, 8.

The remaining disc is numbered 4.

- 1 **Copy and complete** the table showing the number on the remaining disc when you have 2 discs, 3 discs, 4 discs, ..., 20 discs in the circle. You may find it useful to draw some more diagrams to help you.

| Number of discs in the circle | Number on the remaining disc |
|-------------------------------|------------------------------|
| 2                             | 2                            |
| 3                             | 2                            |
| 4                             | 4                            |
| 5                             |                              |
| 6                             |                              |
| 7                             |                              |
| 8                             | 8                            |
| 9                             |                              |
| 10                            | 4                            |
| 11                            | 6                            |
| 12                            | 8                            |
| 13                            | 10                           |
| 14                            |                              |
| 15                            | 14                           |
| 16                            | 16                           |
| 17                            |                              |
| 18                            |                              |
| 19                            | 6                            |
| 20                            | 8                            |

- 2 When you have 2, 4, 8, 16 or 32 discs in the circle, the number on the remaining disc is always the same as the total number of discs in the circle. Assume this pattern continues.

Write down the next two numbers when this happens.

- 3 Use question 2, and any patterns you see in your table, to find the number on the remaining disc when the circle contains

(a) 33 discs,

(b) 31 discs,

(c) 68 discs,

(d) 127 discs,

(e) 200 discs.

- 4 How many discs are there when

(a) the remaining disc is numbered 14 and there are between 20 and 30 discs in the circle,

(b) the remaining disc is numbered 24 and there are between 30 and 50 discs in the circle?

- 5 Consider the original ten discs again.

Remove the disc numbered 10, and going **anticlockwise**, leave the next one, remove the one after that, leave the next one, and so on until only one disc remains.

You should finish with the disc numbered 7.

(a) Write down the numbers on the discs in the order in which you remove them.

(b) When you started with the disc numbered 1 and worked clockwise, the order was

**1 3 5 7 9 2 6 10 8**

Compare this order with the order you have written down in **part (a)**.

Explain how the two orders are related.

- (c) When there are 700 discs and you work clockwise, first removing the disc numbered 1, the remaining disc is the disc numbered 376.

Find the number on the remaining disc when you work anticlockwise, first removing the disc numbered 700.

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