



Cambridge IGCSE[™]

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

CAMBRIDGE INTERNATIONAL MATHEMATICS

0607/52

Paper 5 Investigation (Core)

May/June 2025

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

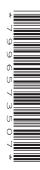
INSTRUCTIONS

- 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. Any blank pages are indicated.



INVESTIGATION

THE CORE AND SHELL OF SEQUENCES

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In this investigation you will look at the values of the shell and the core in sequences of positive integers. Each sequence has an odd number of terms.

The *core integer* is the integer in the middle of the sequence.

The *shell integers* are the integer at the beginning and the integer at the end of the sequence.

For the sequence 6 9 12 15 18 21 24 the core integer is 15 and the shell integers are 6 and 24.

shell integers

1 (a) Write down the core integer and the shell integers for the sequence

5 6 7 8 9 10 11 12 13.

Core integer

Shell integers and

[1]

(b) You calculate the *value of the core*, C, by multiplying the core integer by itself. In the example $C = 15 \times 15 = 225$.

Calculate C for the sequence in **part** (a).

.....[1]

(c) You calculate the *value of the shell*, S, by multiplying the two shell integers together. In the example $S = 6 \times 24 = 144$.

Calculate S for the sequence in **part** (a).

.....[1]

2 Exponential sequences

In an *exponential sequence* the term-to-term rule is multiply by the same number.

Examples

Sequence: 1 2 4 8 16 Term-to-term rule: \times 2

Sequence: 1 5 25 125 625 Term-to-term rule: \times 5

		$C = \dots $	••••
		$S = \dots S$	••••
(b)	(i)	Complete the 4th and 5th terms in this exponential sequence.	
		3 6 12	
	(ii)	Calculate C and S.	
		$C = \dots \dots$	
		$S = \dots $	
(c)	Wri	te down what you notice about C and S for the sequences in part (a) and part (b).	
(c)	Wri	te down what you notice about C and S for the sequences in part (a) and part (b).	
	Wri		
		The 1st term of an exponential sequence is <i>a</i> .	
		The 1st term of an exponential sequence is a . To get the next term you multiply by m .	••••
		The 1st term of an exponential sequence is <i>a</i> . To get the next term you multiply by <i>m</i> . Write expressions for the 3rd and 5th terms of this sequence.	

(e) An exponential sequence has 5 terms. The 1st term is 2 and the middle term is 722.

Use part (c) to find the 5th term.

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3 Fibonacci sequence 1 1 2 3

1 1 2 3 5 8 13 ...

In the Fibonacci sequence you find the next term by adding the previous two terms. For example 5th term + 6th term = 7th term so 5+8=13.

- (a) Calculate C and S for these sequences of 3 consecutive terms in the Fibonacci sequence.
 - (i) The 2nd, 3rd and 4th terms.

$$C = \dots$$

$$S = \dots$$

(ii) The 4th, 5th and 6th terms. 3 5 8

$$C = \dots$$

$$S = \dots$$
 [1]

(iii) The 6th, 7th and 8th terms.

$$C = \dots$$

$$S = \dots$$
 [2]

(b) In the Fibonacci sequence there are 3 consecutive terms where the value of their shell is S = 17480760.

Use what you notice in your answers to **part (a)** to calculate the middle term.





4 Linear sequences with three terms

In a linear sequence the term-to-term rule is add the same number. This number is the *common difference*, *d*.

(a) F is the difference between the value of the core and the value of the shell. So F = C - S.

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Complete the table.

Lin	ear sequ	ience	Common difference d	F
17	18	19	1	1
24	27	30		
14	20			36
20		40		

(b) Use part (a) to find a formula for F in terms of d.

(c) A linear sequence of 3 terms has F = 49. The 1st term is 11.

Complete the sequence.

11, [2]



5 Sequences of consecutive integers

(a) Complete the table.

Consecutive integers									Number of integers <i>n</i>	F
17	18	19							3	1
20	21	22	23	24					5	
13	14	15	16	17	18	19				9
1	2	3	4	5	6	7	8	9		

6

[3]

(b) A formula for F is $F = k(n-1)^2$ where k is a fraction.

Find the value of k.

.....[2]



(c) Find the value of F for a sequence of 99 consecutive integers.

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(d) In a sequence of consecutive integers, the difference in the value of the core and the value of the shell is 529.

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Find the number of integers in the sequence.

 [3]
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