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CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/62**

Paper 6 Investigation and Modelling (Extended) **May/June 2026**

1 hour 30 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. Do **not** use correction fluid or tape.
- 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 50.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Any blank pages are indicated.

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Section A

Investigation Nim

You are advised to spend no more than 45 minutes on this section.

This investigation looks at the minimum number of moves it takes to win the game of Nim.
Nim is a game for two players using a pile of sticks.

In this game, you and your friend take turns to remove sticks from the pile.
A player wins when they take the last stick.

1 In each move, a player takes 1 or 2 sticks from the pile.

There are 3 sticks in the pile.
Your friend starts the game.

Your friend takes 1 stick from the pile, leaving 2.
You win by taking the remaining 2 sticks.

The table shows these moves.

move	number of sticks taken	number of sticks left in the pile	result
		3	
1	friend takes 1	2	
2	you take 2	0	you win

There is another way for you to win the game when your friend starts.
This time your friend takes 2 sticks from the pile.

move	number of sticks taken	number of sticks left in the pile	result
		3	
1	friend takes 2	1	
2	you take 1	0	you win

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(a) There are 6 sticks in the pile.
Your friend starts the game.

You should win when there are 3 sticks left after your move.

Complete the tables to show two different ways that you win.

move	number of sticks taken	number of sticks left in the pile	result
		6	
1	friend takes 1	.....	
2	you take	3	
3	friend takes 1	.....	
4	you take	0	you win

move	number of sticks taken	number of sticks left in the pile	result
		6	
1	friend takes 2	.....	
2	you take	3	
3	friend takes 2	.....	
4	you take	0	you win

[2]

(b) Your friend starts the game.
You should win when there are 3, 6 or 9 sticks in the pile.

(i) In a game there are 9 sticks in the pile.
It is your friend's move.

Give a reason why you should win.

..... [1]

(ii) In a game there are 20 sticks in the pile.
It is your move.

Write down the number of sticks you should take to make sure you win.

..... [1]

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(c) There are 18 sticks at the start of the game.
You always take the number of sticks so that you are sure to win.

Complete the table.

move	number of sticks taken	number of sticks left in the pile	result
		18	
1	friend takes 1	17	
2	you take	.....	
3	friend takes 2	.....	
4	you take	12	
5	friend takes 2	.....	
6	you take	9	
7	friend takes 1	.....	
8	you take	.....	
9	friend takes 2	.....	
10	you take	.....	
11	friend takes 1	.....	
12	you take	0	you win

[2]

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2 In different games of Nim, a player can take different numbers of sticks from the pile.
You win a game of Nim after your friend goes first.

(a) Complete the table.

number of sticks that can be taken in each move	sequence of possible number of sticks in the pile at the start				*n*th term of the sequence
1 or 2	3	6	9	12	
1, 2 or 3	4	8	12	.....	
1, 2, 3 or 4	5	.....	.....	.....	
1, 2, 3, 4, or 5	.....	.....	.....	.....	
1, 2, 3, …. or k					

[3]

(b) The number of sticks in the pile at the start is 30.
In each game, the greatest number of sticks you can take in each move is k.

Find all the different possible values of k.

..... [4]

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3 Now **you** always start the game.
In each move, a player takes 1 or 2 sticks from the pile.
You always take the number of sticks so that you are sure to win.

Example

There are 5 sticks in the pile at the start.

move	number of sticks taken	number of sticks left in the pile	result
		5	
1	you take 2	3	
2	friend takes 2	1	
3	you take 1	0	you win

There are now 19 sticks in the pile at the start.

Give a reason why you should take 1 stick in your first move.

..... [1]

4 You always start the game.
In each move, a player now takes 1, 2 or 3 sticks from the pile.
You always take the number of sticks so that you are sure to win.

In your first move you always take 1 stick so that you are sure to win.
The possible number of sticks in the pile at the start form this sequence.

1 5 9 13 17 ...

(a) Find the nth term for this sequence.

..... [2]

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(b) When there is 1 stick in the pile at the start there is 1 move to win.

Complete the total number of moves to win.

number of sticks at the start (p)	1	5	9	13	17
total number of moves to win (m)	1				

You may use the table below to help you.

move	**number of sticks taken**	**number of sticks left in the pile**	**number of sticks left in the pile**
	you take 1		
	friend takes		
	you take		
	friend takes		
	you take		
	friend takes		
	you take		
	friend takes		
	you take		
	friend takes		
	you take		

[3]

(c) Find a formula for the total number of moves, m, in terms of the number of sticks in the pile at the start, p.

..... [2]

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5 In a game, there are 50 sticks in the pile at the start.
You start the game and you win.

In each move a player can take up to k sticks from the pile, $1 < k < 7$.
You always take the number of sticks so that you are sure to win.

Complete the table.
If you are not sure to win, write X in the cell for the number of sticks you take on the first move.

value of k	**number of sticks you take on the first move**	**total number of moves to win**
2		
3		

[4]

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Section B

Modelling Regular investment

You are advised to spend no more than 45 minutes on this section.

In this task you will look at investing money in an account that pays compound interest.

$\$P$ is invested at a rate of $R\%$ per unit of time.
There is a total of $\$A$ in the account at the end of n units of time.
A unit of time may be a year or a month.

$$A = Pr^n \qquad \text{where } r = 1 + \frac{R}{100}.$$

Example

\$200 is invested at a rate of 3% per year for 8 years.

So $A = 200 \times \left(1 + \frac{3}{100}\right)^8$

$A = 200 \times 1.03^8$

$A = 253.35$

6 Rosie invests \$500 in a savings account that pays compound interest at a rate of 4% per year.

(a) Work out how much money is in the account at the end of 5 years.

..... [2]

(b) Rosie wants the value of her investment to grow to \$1000.

Calculate the number of complete years it takes for the value of Rosie's \$500 to first reach \$1000.

..... [3]

7 At the start of each year, Abdul invests \$300 in a savings account that pays compound interest at a rate of 4% per year.

At the end of 2 years:

- there is \$300 which has been in the account for 2 years
- there is \$300 which has been in the account for 1 year
- interest is paid on each of these amounts.

Work out the total amount of money Abdul has in the account at the end of 2 years.

..... [3]

8 Joe invests in a savings account that pays compound interest at a rate of 4% per year.

At the start of each year he invests \$$P$ into the account.
At the end of 5 years, there is a total of \$$T$ in the account.

(a) Complete the missing expressions in these calculations.

$$T = \text{.....} + P\times 1.04^4 + P\times 1.04^3 + P\times 1.04^2 + P\times 1.04$$

$$1.04T = \text{.....} + \text{.....} + P\times 1.04^4 + P\times 1.04^3 + P\times 1.04^2$$

[2]

(b) Use **8(a)** to show that

$$T = \frac{1.04P(1.04^5 - 1)}{1.04 - 1}.$$

The first line of working has been started for you.

$1.04T - T =$

[3]

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(c) Joe wants to have a total of \$700 in the account at the end of 5 years.

Work out how many dollars Joe should invest each year.

..... [3]

9 Each year, Maya invests \$$P$ in a savings account that pays compound interest at a rate of R% per year.

At the end of n years there is a total of \$$T$ in the account.

A model for the total value of Maya's investment is

$$T = \frac{P \times r(r^n - 1)}{r - 1}, \qquad \text{where } r = 1 + \frac{R}{100}.$$

Maya invests \$250 each year for 9 years.
The account pays a rate of 5% compound interest per year.

Find the value of T.

..... [2]

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10 Each month, Esa invests in a savings account that pays compound interest at a rate of R% per month.
Esa invests \$50 each month for 15 months.
\$$T$ is the total amount in the account at the end of 15 months.

(a) Use the model in **Question 9** to show that a model for T is

$$T = \left(\frac{5000}{R} + 50\right)\left(\left(1 + \frac{R}{100}\right)^{15} - 1\right).$$

[3]

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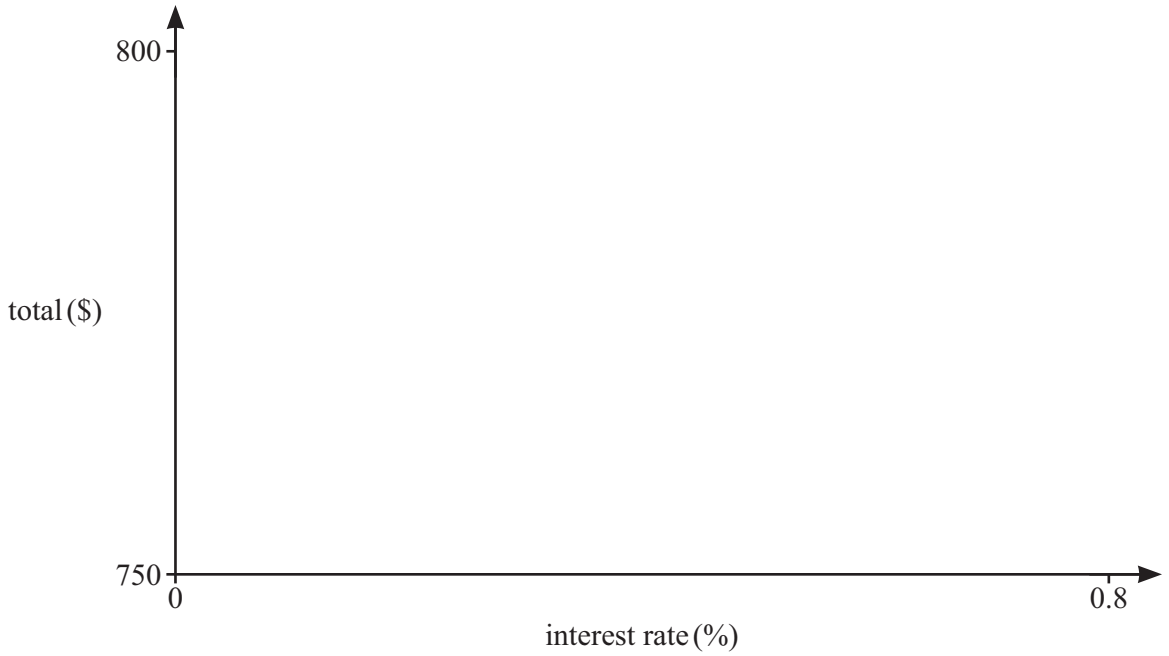
(b) (i) On the diagram, sketch the graph of T for values of R between 0 and 0.8.



[2]

(ii) Find a linear model for T in terms of R.

..... [2]

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