Cambridge Assessment International Education

Cambridge IGCSE™

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7307684196

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/63**

Paper 6 Investigation and Modelling (Extended) **May/June 2024**

1 hour 40 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer both part **A** (Questions 1 to 6) and part **B** (Questions 7 to 10).
- 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 60.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages.

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Answer **both** parts **A** and **B**.

A INVESTIGATION (QUESTIONS 1 to 6)

CHANGING THE ORDER OF OPERATIONS (30 marks)

You are advised to spend no more than 50 minutes on this part.

This investigation is about the results of two calculations when you change the order of operations.

Each calculation uses three integers, x, y and z.

Calculation 1	Calculation 2
Add y and z. Multiply the answer by x.	Multiply y and z. Add the answer to x.

Example

$x = 3$ $y = 5$ $z = 7$

Calculation 1	Calculation 2
$y + z = 5 + 7 = 12$	$y \times z = 5 \times 7 = 35$
$12 \times x = 12 \times 3 = 36$	$35 + x = 35 + 3 = 38$
Result = 36	Result = 38

1 Complete the table.

x	y	z	Result of calculation 1	Result of calculation 2
4	7	5	48	39
4	7	6		46
4	7	7	56	
4	7	8		
5	9	7	80	68
5	9	8	85	
5	9	9		86
5	9	10		

[4]

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2 Show that when $x = 3$, $y = 4$ and $z = 9$ the two calculations give the same result.

[2]

3 $y = 5$ and $z = 6$.

Find the value of x when the two calculations give the same result.

..... [3]

4 **(a)** Complete the table.

x	y	z	Result of calculation 1	Result of calculation 2
6	11	12	138	138
7	13	14	189	
8	15	16		248
9	17	18		

[2]

(b) Use the table in **part (a)** to write y and z in terms of x.

$y =$ .....

$z =$ ..... [2]

(c) The results of calculation 1 and calculation 2 are always the same.

Use your expressions for y and z in **part (b)** to show that this statement is true.

[3]

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5 In this question x, y and z are consecutive, for example 15, 16 and 17.

(a) Write y and z in terms of x.

$y =$ .....

$z =$ ..... [1]

(b) The results of calculation 1 and calculation 2 are the same.

Show that $x^2 - x - 2 = 0$.

[4]

(c) The results of calculation 1 and calculation 2 are the same.
x, y and z are consecutive.

Find two sets of values for x, y and z.

..... [3]

6 When the result of calculation 1 is the same as the result of calculation 2,

$$x(y+z) = x+yz.$$

(a) $x(x-1) = (y-x)(z-x)$

Expand the brackets and rearrange to show that this becomes $x(y+z) = x+yz$.

[2]

(b) The results of calculation 1 and calculation 2 are the same.
$x = 6$ and $z > y$.

Find all the possible values for x, y and z.

..... [4]

B MODELLING (QUESTIONS 7 to 10)

FARMERS' FIELDS (30 marks)

You are advised to spend no more than 50 minutes on this part.

This task looks at the area of a field inside a fence.

7 A farmer uses 600 metres of fencing to make a rectangular field.

The length of the field is x metres.

(a) The area of the field is A square metres.

Show that a model for A, in terms of x, is $A = x(300 - x)$.

[2]

(b) Find the range of possible lengths of the field.

..... [1]

(c) Sketch the graph of the model $A = x(300 - x)$.



[3]

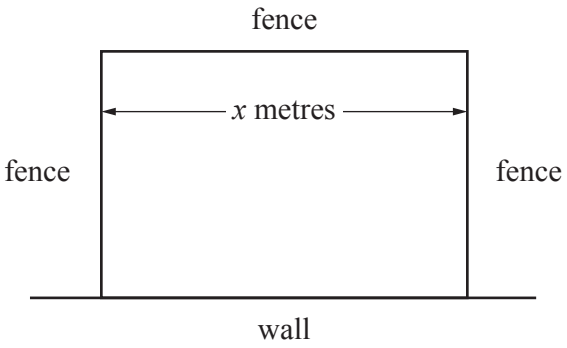
(d) Find the maximum area of the field and the length which gives this maximum area.

Area = ...

Length = ... [2]

8 The farmer uses a wall as one side of the field.

The farmer uses 500 metres of fencing for this field.



(a) The length of the field is x metres.

Find a model for the area of the field, $B\,\text{m}^2$.

..... [3]

(b) Which model gives the greater maximum area of the field, the model for A or the model for B? Find the difference between these two maximum areas.

Model .....

Difference ..... [3]

9 The farmer uses the model $A = x(300 - x)$.

These are the costs for making the field:

- grass seed \$0.27 per square metre
- fertiliser \$0.08 per square metre
- a total of \$7000 for fencing and labour.

(a) The cost to make a rectangular field with length x metres is \$$C$.

Show that the model for C is $C = 105x - 0.35x^2 + 7000$.

[3]

(b) Use your answer to **Question 7(d)** to find the cost of making the field with maximum area.

..... [2]

(c) The farmer keeps sheep in a field.

Each sheep has an area of 450 square metres.
The farmer is given \$5 for each sheep.

He uses the money that he receives for the sheep to reduce his costs for making the field.

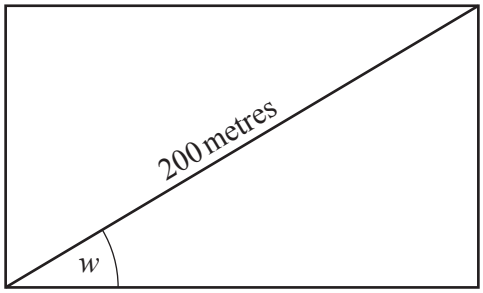
(i) Use this information to change the model in **part (a)**.

..... [2]

(ii) Find the cost for the field with the maximum area.

..... [2]

10 The farmer makes a rectangular field.
The length of the diagonal is 200 metres.



(a) Show that a model for the area, $A\,\text{m}^2$, of this new field is $A = 40000(\sin w)(\cos w)$.

[2]

(b) Sketch the graph of the model.



[2]

Question 10(c)(i) and (ii) are printed on the next page.

(c) (i) Find the maximum area of this field.

..... [1]

(ii) When the area is the maximum, find the length of the fence.

..... [2]

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