Cambridge Assessment International Education

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CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/63**

Paper 6 Investigation and Modelling (Extended) **October/November 2025**

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 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 50.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

[Turn over

Section A

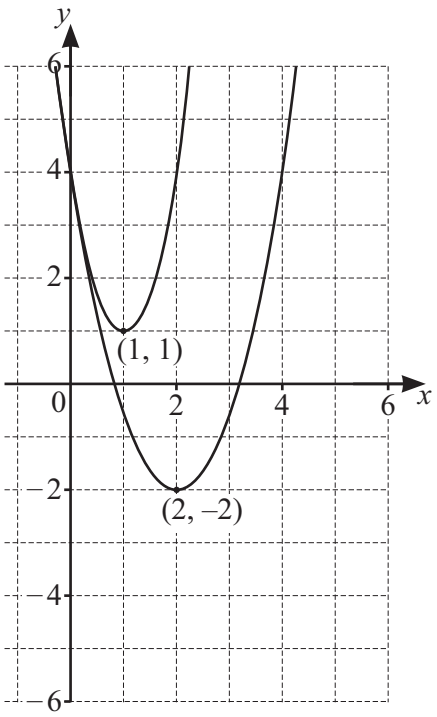
INVESTIGATION THE VERTEX OF THE QUADRATIC FUNCTION

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

In this task, you will investigate the change in the vertex of the quadratic function $y = ax^2 + bx + c$ as a or b changes.

1 In this question, the value of a changes.
The value of b and the value of c stay the same.

(a)



The diagram shows the graphs of these functions.

$y = 1.5x^2 - 6x + 4$

$y = \quad 3x^2 - 6x + 4$

These functions are quadratic functions of the form $y = ax^2 + bx + c$ where $b = -6$ and $c = 4$.
The value of a changes.

The coordinates of the minimum points of the quadratic functions are shown on the diagram.
These points are the vertices of the quadratic functions.

(i) On the diagram, sketch the graph of $y = x^2 - 6x + 4$. [2]

(ii) The *line of vertices* is the line that joins the vertices of the quadratic graphs.

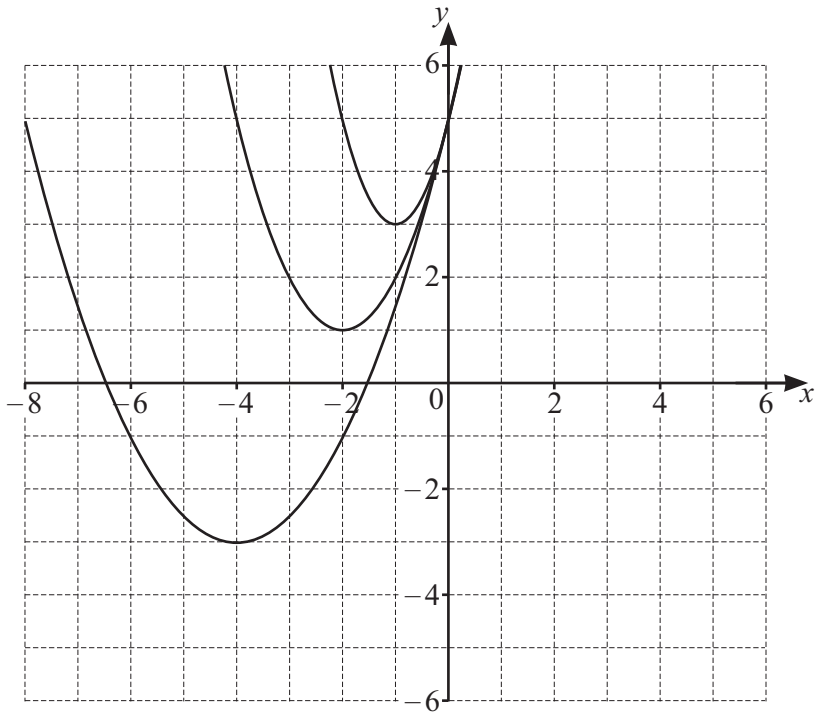
Find the equation of the line of vertices.

..... [3]

(iii) Does the vertex of $y = 0.5x^2 - 6x + 4$ lie on the line in **part (ii)**?

..... [3]

(b)



The diagram shows the graphs of these functions.

$y = 0.5x^2 + 4x + 5$

$y = \quad x^2 + 4x + 5$

$y = \quad 2x^2 + 4x + 5$

These functions are quadratic functions of the form $y = ax^2 + bx + c$ where $b = 4$ and $c = 5$. The value of a changes.

Find the equation of the line of vertices.

..... [2]

(c) (i) Complete the table.
You may use any patterns you notice.

	Quadratic function	Equation of the line of vertices
part (a)(ii)	$y = ax^2 - 6x + 4$	
part (b)	$y = ax^2 + 4x + 5$	
	$y = ax^2 - 8x + 20$	$y = -4x + 20$
	$y = ax^2 - 12x + 30$	
	$y = ax^2$	$y = 5x - 2$

[3]

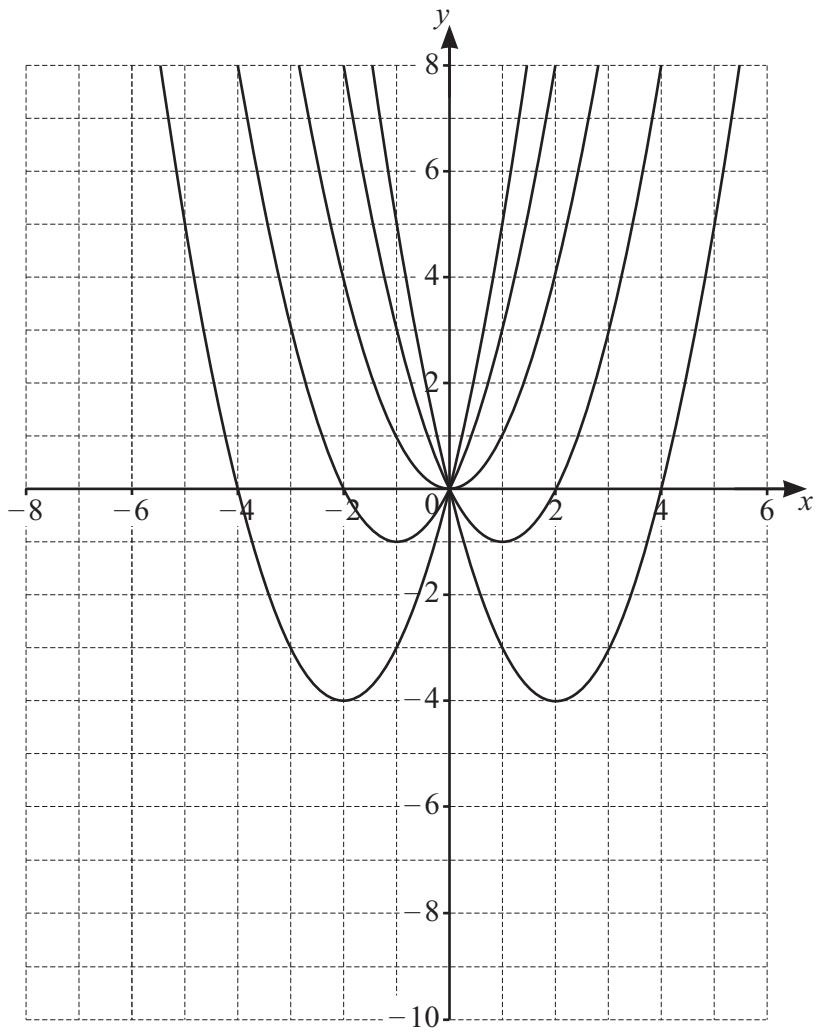
(ii) In quadratic functions of the form $y = ax^2 + bx + c$, the value of b and the value of c stay the same.
The value of a changes.

Complete the equation of the line of vertices.

$y =$ ..... $x +$ ..... [2]

2 In this question, the value of b changes.
The value of a and the value of c stay the same.

(a)



The diagram shows the graphs of these functions.

$y = x^2 + 4x$ $y = x^2 + 2x$ $y = x^2$ $y = x^2 - 2x$ $y = x^2 - 4x$

These functions are quadratic functions of the form $y = ax^2 + bx + c$ where $a = 1$ and $c = 0$.
The value of b changes.

(i) On the diagram, sketch the graphs of $y = x^2 + 6x$ and $y = x^2 - 6x$. [3]

(ii) Draw a smooth curve through the vertices of the 7 graphs. [1]

(iii) Find the equation of the smooth curve through the vertices.

..... [2]

(b) In this part, quadratic functions of the form $y = ax^2 + bx + c$ have $a = 2$ and $c = 0$.
The value of b changes.

Find the equation of the curve through the vertices.
You may use sketches on your calculator to help you.

..... [2]

(c) In this part, quadratic functions of the form $y = ax^2 + bx + c$ have constant non-zero values for a and c.
The value of b changes.

Find the equation of the curve through the vertices.

..... [2]

Section B

MODELLING CLUB FEES

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

In this task, you will look at the relationship between the number of members of a club and the fee for each member.
The fee for each member is the amount of money that each member pays to the club.

3 A club has 200 members.
The fee for each member is \$100.

(a) Show that the total fees that all the members pay to the club are \$20 000.

[1]

(b) 40 members leave the club.

(i) The club wants to increase the fee for each member by \$20.

Find the change in total fees.

..... [3]

(ii) The club decides to increase the fee for each member so that the total fees are still \$20 000.

Calculate the new fee for each member.

..... [2]

4 A club has 200 members.
The fee for each member is \$100.

x members leave the club.
The club wants the total fees to be \$20 000.

(a) Write down an expression for the new fee that each member pays.

..... [1]

(b) The increase in the fee for each member is \$$y$.

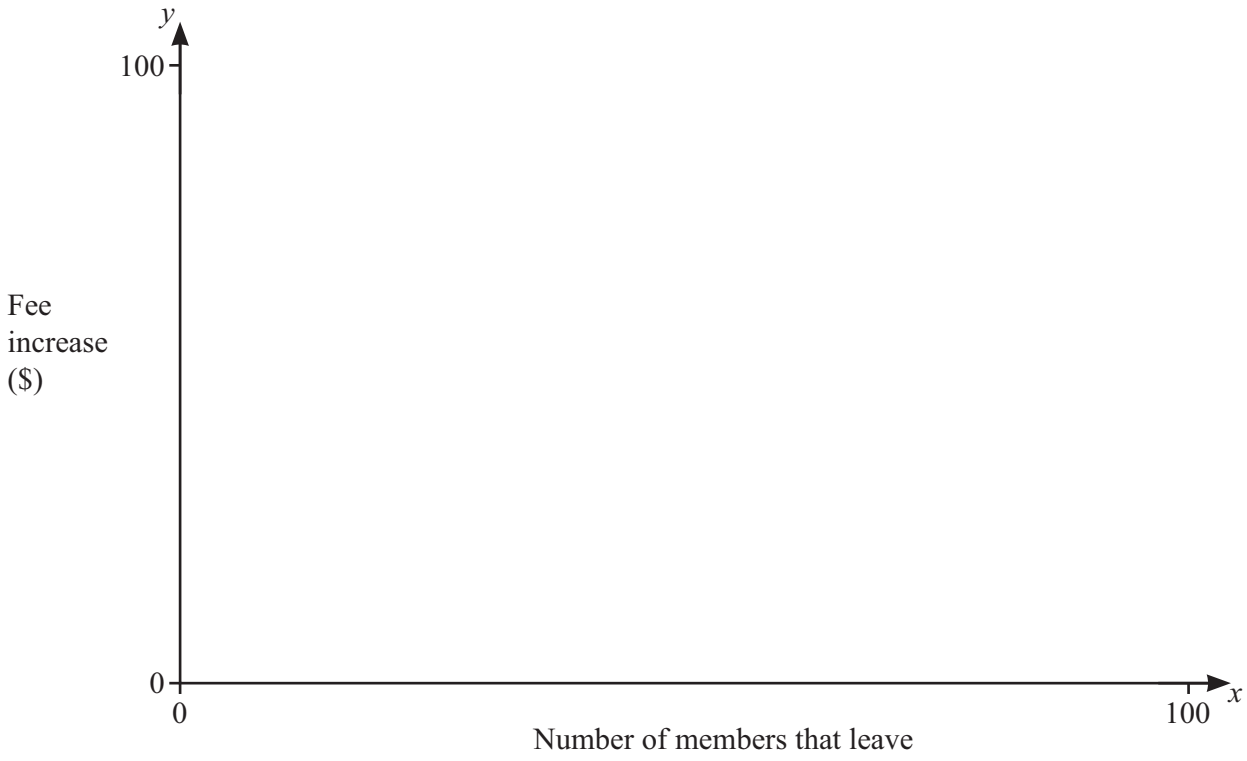
Show that a model for the increase in the fee is $y = \frac{100x}{200 - x}$.

[3]

(c) Write down the values of x for which the model is valid.

..... [1]

(d) Sketch the graph of the model $y = \frac{100x}{200-x}$ for values of x between 0 and 100.



[2]

(e) Some members leave the club.
The club uses the model $y = \frac{100x}{200-x}$ and finds that the fee increase is \$13.

Find the number of members that left the club.

..... [2]

5 Another club has N members.
The fee for each member is \$$F$.

x members leave the club.
The club increases the fee for each member by \$$y$.

(a) (i) Write down an expression for the total fees before the increase in the fee.

..... [1]

(ii) Complete the expression for the total fees after the increase in the fee.

(..... − .....)(..... + ...) [2]

(b) The total fees in **part (a)(i)** and **part (a)(ii)** are the same.

Find a model for x in terms of N, F and y.
Write your answer as a single fraction.

..... [4]

(c) 20 members leave the club.
The club increases the fee for each member by \$10 so that the total fees in **part (a)(i)** stay the same.

Find a model for N in terms of F.

..... [3]

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