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School code

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School name

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Given name/s

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Family name

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Attach your
barcode ID label here

Book of books used

External assessment 2022

Question and response book

Specialist Mathematics

Paper 2 — Technology-active

Time allowed

- Perusal time — 5 minutes
- Working time — 90 minutes

General instructions

- Answer all questions in this question and response book.
- QCAA-approved calculator **permitted**.
- QCAA formula book provided.
- Planning paper will not be marked.

Section 1 (10 marks)

- 10 multiple choice questions

Section 2 (50 marks)

- 9 short response questions



Section 1

Instructions

- Choose the best answer for Questions 1–10.
- This section has 10 questions and is worth 10 marks.
- Use a 2B pencil to fill in the A, B, C or D answer bubble completely.
- If you change your mind or make a mistake, use an eraser to remove your response and fill in the new answer bubble completely.

	A	B	C	D
Example:	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	A	B	C	D
1.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Section 2

Instructions

- Write using black or blue pen.
 - Questions worth more than one mark require mathematical reasoning and/or working to be shown to support answers.
 - If you need more space for a response, use the additional pages at the back of this book.
 - On the additional pages, write the question number you are responding to.
 - Cancel any incorrect response by ruling a single diagonal line through your work.
 - Write the page number of your alternative/additional response, i.e. See page ...
 - If you do not do this, your original response will be marked.
 - This section has nine questions and is worth 50 marks.
-

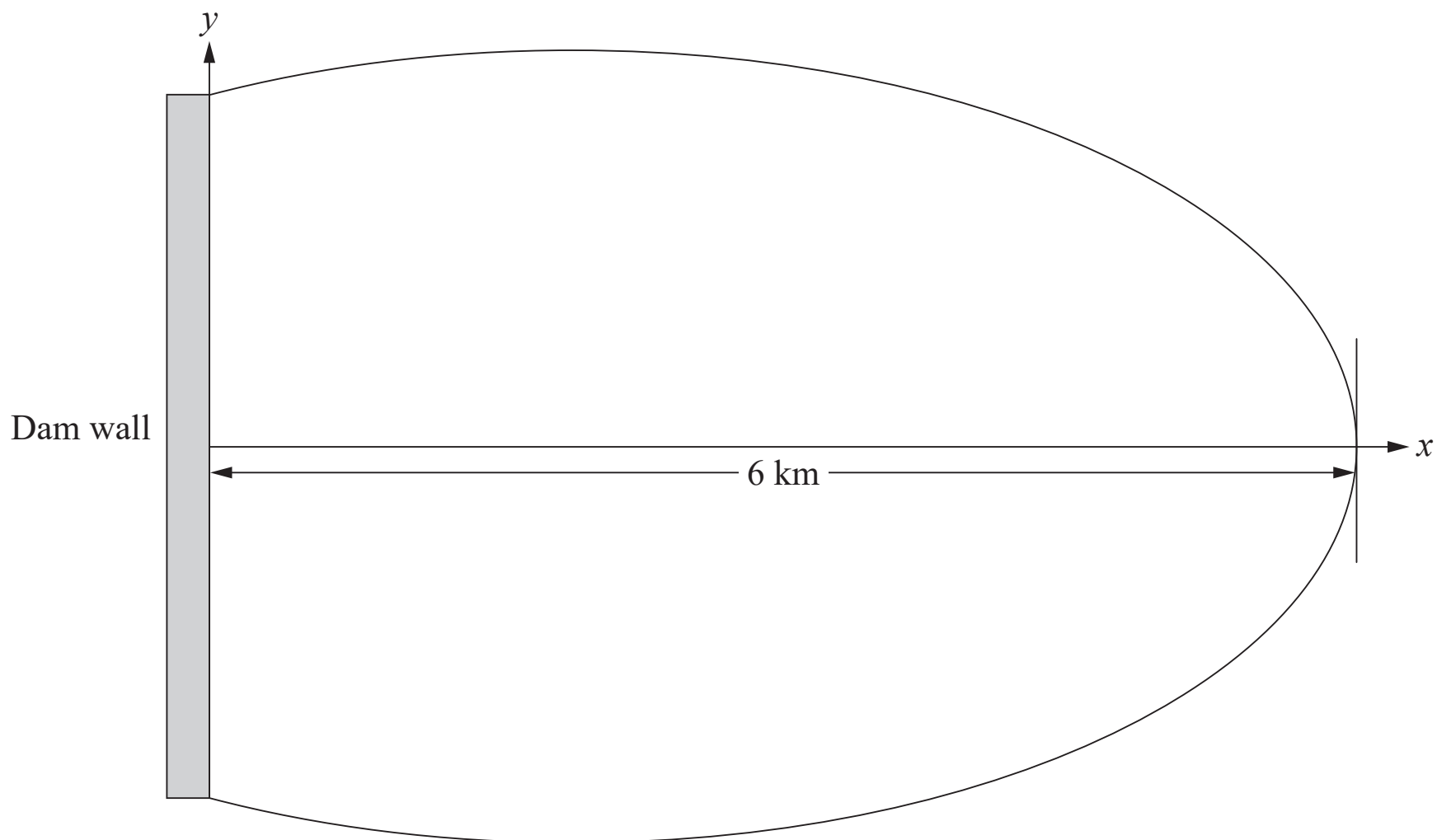
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QUESTION 11 (6 marks)

An aerial view of the surface of a dam, 6 km in length, is symmetrically positioned on a Cartesian plane as shown. A dam wall is located along the y -axis.

The surrounding edge of the dam can be modelled by the ellipse $\frac{(x-2)^2}{16} + \frac{y^2}{9} = 1$, for $0 \leq x \leq 6$.



Not to scale

- a) Use Simpson's rule with four strips to determine an approximate area of the surface of the dam.

[4 marks]

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QUESTION 12 (5 marks)

A scientist collects data for a species of tree frog in a protected area. Details for the female tree frog population are shown in the table.

Age (years)	0–1	1–2	2–3	3–4
Population in Year 1	150	101	84	62
Birth (breeding) rate	0.4	0.7	0.5	0.1
Survival rate	0.6	0.3	0.2	0

The scientist uses a Leslie matrix model to make predictions about the female tree frog population.

- a) State the initial population matrix. *[1 mark]*

- b) Determine the Leslie matrix. *[1 mark]*

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QUESTION 13 (5 marks)

An article claims that the mean starting salary of graduates in Australia is currently \$64 800 with a standard deviation of \$4500.

To check the validity of this claim, an employment agent intends to collect data on the starting salaries of a random sample of 360 graduates.

- a) Determine the probability that the sample mean starting salary will be between \$64 000 and \$65 000. *[2 marks]*

From the data, the agent calculates a confidence interval for the population mean starting salary of (\$64 589, \$65 811).

- b) Determine the sample mean. *[1 mark]*

- c) Comment on the reasonableness of the article's claim based on this confidence interval. *[2 marks]*

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QUESTION 15 (5 marks)

Consider points A(3, -1, 3) and B(1, 1, 6).

a) Determine \overrightarrow{AB} .

[1 mark]

b) Determine the Cartesian equation of the line that passes through points A and B.

[2 marks]

Point A lies on the plane, φ , and \overrightarrow{AB} is perpendicular to this plane.

c) Determine the Cartesian equation of the plane.

[2 marks]

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