Captivate
EDUCATION

Given name/s	
Family name	
Teacher	

Trial 1 external assessment 2027

Question and response book

Specialist Mathematics

Paper 1 — Technology-free

SAMPLE

Time allowed

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

General instructions

- Answer all questions in this question and response book.
- Calculators are not 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

Practice material in the layout of the 2025 QCAA external assessment. Not a QCAA assessment.

Sample pages only. Full paper and marking guide: captivateeducation.com.au/trial-exams/qce/specialist-mathematics

Section 1

Instructions

- 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.
- Choose the best answer for Questions 1–10.
- 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:	●	○	○	○

	A	B	C	D
1.	○	○	○	○
2.	○	○	○	○
3.	○	○	○	○
4.	○	○	○	○
5.	○	○	○	○
6.	○	○	○	○
7.	○	○	○	○
8.	○	○	○	○
9.	○	○	○	○
10.	○	○	○	○

Ensure you have filled an answer bubble for each question.

SAMPLE

Do not write outside this box.

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.

DO NOT WRITE ON THIS PAGE
THIS PAGE WILL NOT BE MARKED

SAMPLE

Do not write outside this box.

QUESTION 11 (5 marks)

Consider the function $f(x) = \dfrac{5x + 1}{(x - 1)(x + 2)}$, where $x \in \boldsymbol{R}$, $x \neq 1$, $x \neq -2$.

a) Express $f(x)$ as the sum of two partial fractions. *[2 marks]*

b) Use your result from Question 11a) to determine $\int_2^4 f(x)\,dx$. Express your answer in the form $\ln(k)$, where k is a rational number. *[3 marks]*

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Specialist Mathematics marking guide and response

Trial 1 external assessment 2027 · Paper 1 — Technology-free · 60 marks

Teacher copy – not for distribution to students.

Where a response does not meet any of the descriptors for a question or a criterion, a mark of '0' will be recorded.

SAMPLE

Marking guide

Multiple choice

Question	Response	Explanation
1	**A**	**Correct:** the assumption restates the proposition for the particular value n = k, keeping the summation index r inside the sum and k on both sides. **Common errors** • (B) replaces the summation index r by k inside the sum, so every term is the same. • (C) leaves n on the right-hand side, so the two sides refer to different values. • (D) is the statement to be proved in the inductive step (n = k + 1), not the assumption.
2	**B**	**Correct:** by De Moivre's theorem $z^6 = (\sqrt{2})^6 \operatorname{cis}(6 \times \pi/4) = 8 \operatorname{cis}(3\pi/2) = -8i$. **Common errors** • (A) sign error in evaluating cis(3π/2). • (C) evaluates the argument as π (3π/2 confused with 3π). • (D) forgets to raise the modulus to the sixth power.

3	**C**	**Correct:** $(1, 2, -1) \times (2, 0, 3) = (2\cdot3 - (-1)\cdot0, (-1)\cdot2 - 1\cdot3, 1\cdot0 - 2\cdot2) = (6, -5, -4)$. **Common errors** • (A) sign error in the $\hat{j}$ component ($a_1b_3 - a_3b_1$ used instead of $a_3b_1 - a_1b_3$). • (B) sign error in the $\hat{k}$ component. • (D) arithmetic slip $1\cdot0 - 2\cdot2 = -2$.
4	**D**	**Correct:** $\sigma/\sqrt{n} = 12/\sqrt{16} = 12/4 = 3$. **Common errors** • (A) uses σ/n. • (B) uses the population standard deviation unchanged. • (C) multiplies by 4 instead of dividing.
5	**A**	**Correct:** $dy/dt = -2Ae^{-2t} = -2(y - 3)$. **Common errors** • (B) fails to distribute the -2 over the constant (solution would be $Ae^{-2t} + 3/2$). • (C) sign error: the solution would grow, not decay. • (D) differentiates as if the solution were a polynomial in t.
6	**C**	**Correct:** $8i = 8\,\text{cis}(\pi/2)$, so $z = 2\,\text{cis}(\pi/6 + 2k\pi/3)$: arguments $\pi/6$, $5\pi/6$ and $3\pi/2$, equally spaced on the circle of radius 2. **Common errors** • (A) shows the cube roots of 8 (argument of 8i taken as 0). • (B) shows the cube roots of $-8i$ (argument taken as $-\pi/2$). • (D) has the correct first root but the roots are not equally spaced by $2\pi/3$.

SAMPLE

7	**B**	**Correct:** the row of zeros with a zero constant means one equation is redundant; the remaining two independent equations in three unknowns give a one-parameter family of solutions — the planes meet in a line. **Common errors** • (A) a unique solution requires three non-zero pivot rows. • (C) no solution requires a row 0 0 0 | c with $c \neq 0$. • (D) coincident planes would give two rows of zeros.
8	**D**	**Correct:** $[\tan^{-1}(x)]_0^{\sqrt{3}} = \tan^{-1}(\sqrt{3}) - 0 = \pi/3$. **Common errors** • (A) confuses $\tan^{-1}(\sqrt{3})$ with $\tan^{-1}(1/\sqrt{3})$. • (B) evaluates $\tan^{-1}(1)$. • (C) uses $\sin^{-1}$ or a supplementary angle.
9	**C**	**Correct:** $x/2 = \cos(t)$, $y/3 = \sin(t)$, so $(x/2)^2 + (y/3)^2 = 1$, i.e. $x^2/4 + y^2/9 = 1$. **Common errors** • (A) swaps the semi-axes. • (B) fails to square the coefficients. • (D) uses the hyperbola form (sign error in the Pythagorean identity).
10	**D**	**Correct:** by the remainder theorem the remainder is $P(-i) = (-i)^3 - i(-i) + 2 = i + i^2 + 2 = i - 1 + 2 = 1 + i$. **Common errors** • (A) evaluates $(-i)^3$ as $-i$. • (B) evaluates $-i(-i) = i^2$ as +1 and drops the 2. • (C) evaluates $-i(-i)$ as +1.

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