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External assessment

Question and response book

# General Mathematics

## Paper 2

### Time allowed

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

### General instructions

- Answer all questions in this question and response book.
- Write using black or blue pen.
- QCAA-approved scientific calculator permitted.
- QCAA formula sheet provided.
- Planning paper will not be marked.

### Section 1 (40 marks)

- 7 short response questions



## Section 1

### Instructions

- 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 seven questions and is worth 40 marks.
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**DO NOT WRITE ON THIS PAGE**

**THIS PAGE WILL NOT BE MARKED**

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**QUESTION 1 (5 marks)**

A water tank contains 12 500 L of water. The tap is accidentally left on and the tank loses 135 L per minute. The tap is turned off when the tank has 5000 L of water left.

Use a mathematical model to determine how long the tap was left on to the nearest minute.

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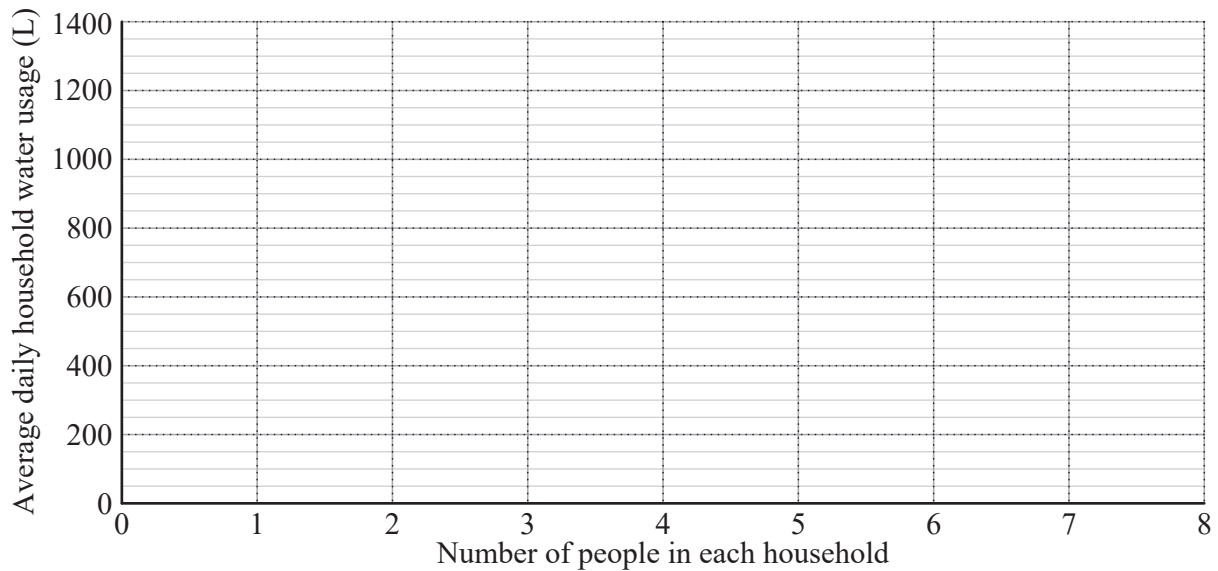
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**QUESTION 2 (5 marks)**

The number of people living in each household and the average daily household water usage, measured in litres (L), were recorded for 10 households.

<b>Number of people in each household</b>	6	2	4	5	5	4	3	1	6	7
<b>Average daily household water usage (L)</b>	990	160	320	480	410	280	240	130	940	1340

Calculate Pearson’s correlation coefficient and then evaluate the appropriateness of using this coefficient for the association between daily water usage and the number of people living in a household.



**Note:** If you make a mistake in the graph, cancel it by ruling a single diagonal line through your work and use the additional graph on page 17 of this question and response book.

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**QUESTION 3 (6 marks)**

The least-squares line for a sample of five data points was found to be  $y = 2.1875x + 0.0625$ , with a correlation coefficient of  $r = 0.875$ .

Determine a set of values for  $p$  and  $q$ , given that these values differ by 3.

$x$	4	3	8	4	6
$y$	$p$	4	16	8	$q$

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**QUESTION 4 (5 marks)**

The following data shows the profits per quarter for a company for the last two years.

	Quarter	Profit (\$'000s)
<b>2018</b>	1	64
	2	98
	3	116
	4	122
<b>2019</b>	1	87
	2	156
	3	180
	4	177

Deseasonalise the data and plot this on the same set of axes as the original data in the graph on the next page.

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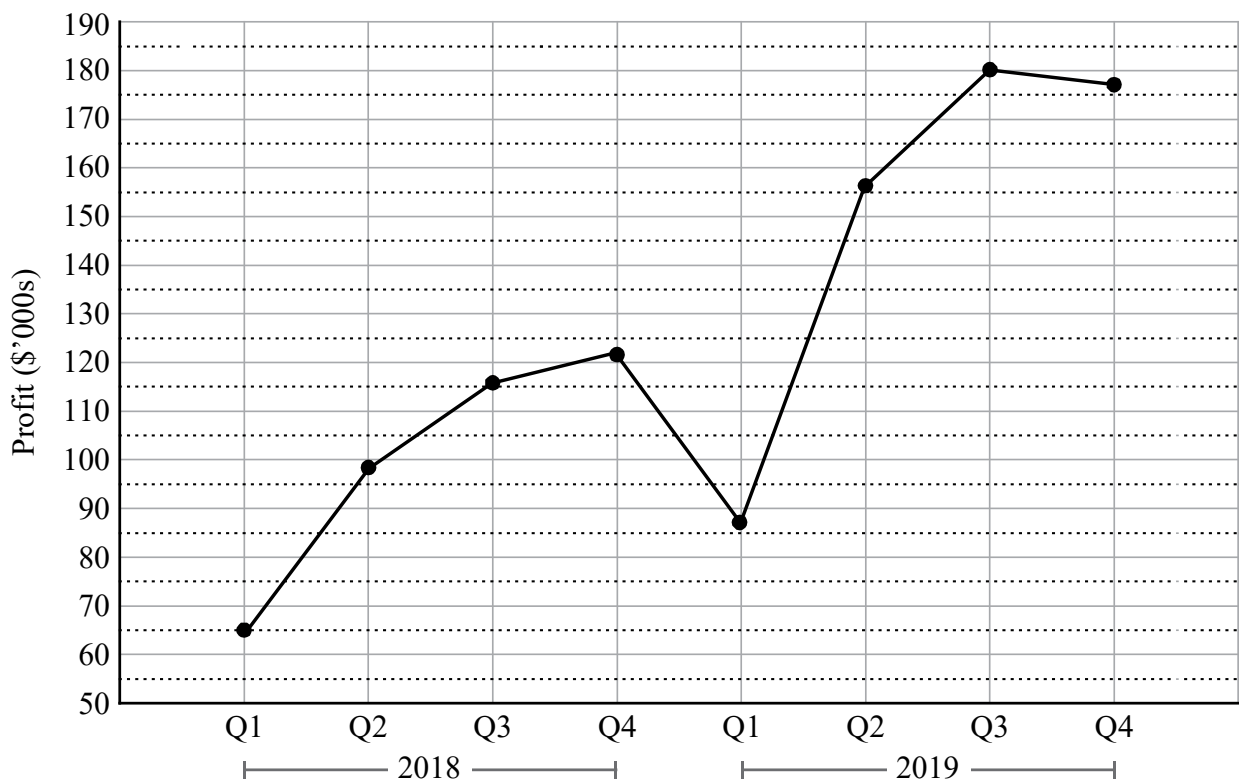
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**Note:** If you make a mistake in the graph, cancel it by ruling a single diagonal line through your work and use the additional graph on page 18 of this question and response book.

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**QUESTION 5 (5 marks)**

A company has three tasks to allocate to three contractors. Each of the contractors has a quote recorded for each task, shown in the table. The quotes are in thousands of dollars (\$'000s).

Contractor	Task 1	Task 2	Task 3
A	3	3	1
B	4	7	2
C	4	4	1

Use a matrix method to determine the minimum cost if each contractor is allocated one task.

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**QUESTION 6 (7 marks)**

A company needs to complete the following project as quickly as possible. Each task can only be completed by a single employee and must be completed before that employee can start the next task.

<b>Task</b>	<b>Time (days)</b>	<b>Prerequisite</b>
A	3	—
B	4	—
C	2	A
D	8	C
E	5	C
F	4	B
G	3	B
H	1	E, F
I	2	G
J	3	H, I

The owner believes that this project can be completed in minimal time with only three employees. Evaluate the reasonableness of this belief.

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**QUESTION 7 (7 marks)**

A couple saved for their retirement by making the same monthly payments for 20 years into an account that earned 4.2% p.a. compounded monthly.

At the age of 65, the couple retired and used all their savings to purchase a perpetuity with an interest rate of 5.76% p.a. compounded monthly, paying \$3600 each month.

How much did they save each month to prepare for their retirement?

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**END OF PAPER**

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**ADDITIONAL PAGE FOR STUDENT RESPONSES**

Write the question number you are responding to.

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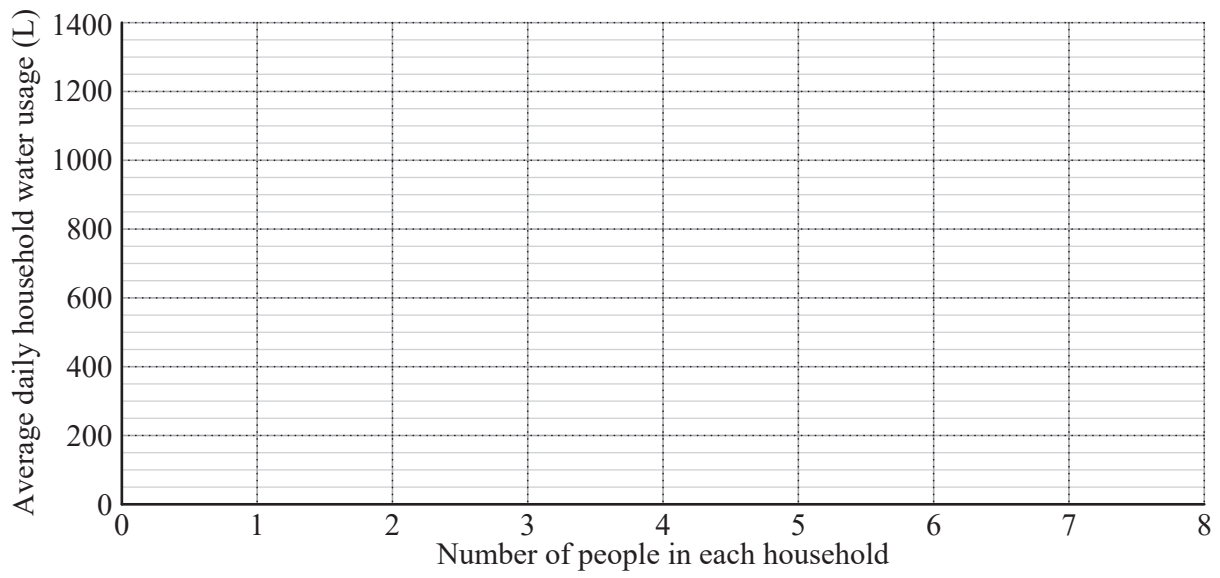






## ADDITIONAL RESPONSE SPACE FOR QUESTION 2

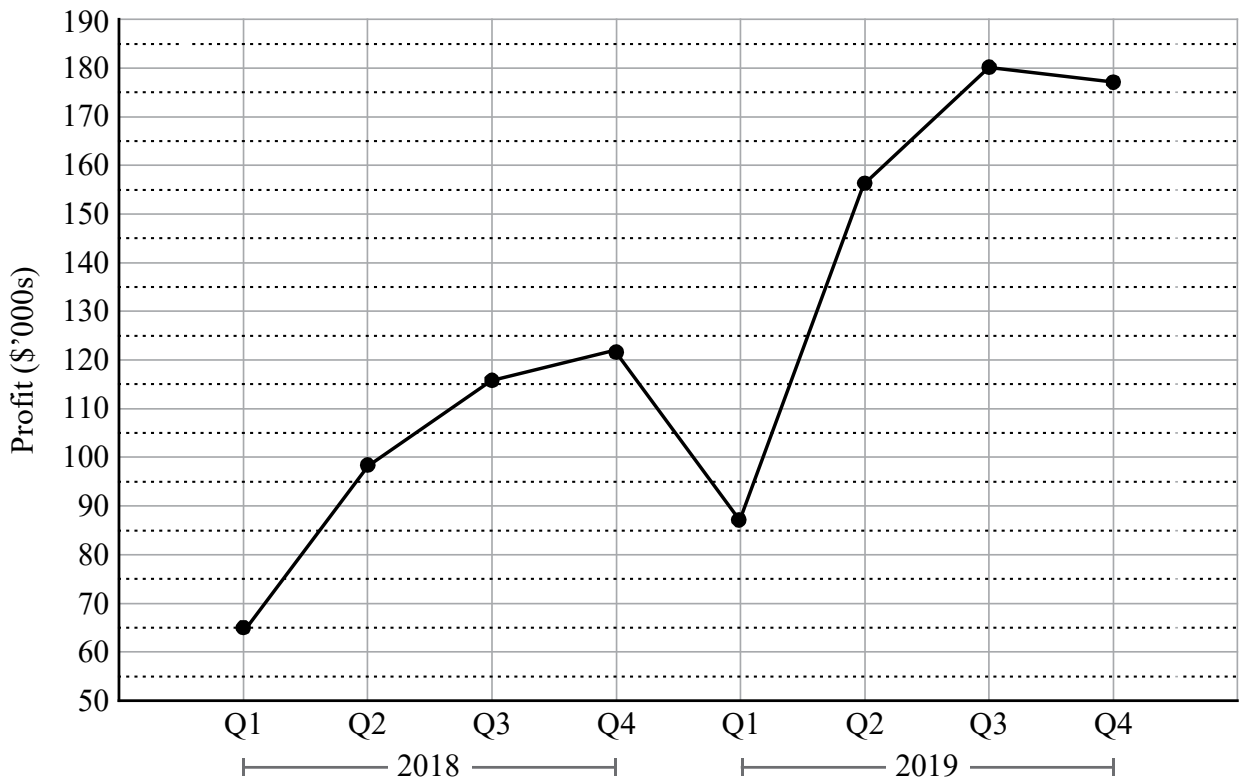
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### ADDITIONAL RESPONSE SPACE FOR QUESTION 4

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