LUI | | | | | | | | | | | School code | | | | |

School name

Given name/s

Family name

Attach your barcode ID label here

Book of books used

External assessment 2023

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 book provided.
- Planning paper will not be marked.

Section 1 (38 marks)

- 7 short response questions

Clear zone — margin trimmed off after completion of assessment

Queensland Government | QCAA Queensland Curriculum & Assessment Authority

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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.

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QUESTION 1 (5 marks)

A triathlon relay has three sections: swim (S), cycle (C) and run (R). The matrix shows the average number of minutes for three athletes, Jane (J), Knox (K) and Levi (L), to complete each section.

$$\begin{array}{c} \\ \text{J} \\ \text{K} \\ \text{L} \end{array} \begin{array}{c} \begin{array}{ccc} \text{S} & \text{C} & \text{R} \end{array} \\ \begin{bmatrix} 40 & 56 & 66 \\ 36 & 60 & 72 \\ 25 & 48 & 78 \end{bmatrix} \end{array}$$

Use the Hungarian algorithm to predict the minimum total relay time if assigning each athlete to completing one section.

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QUESTION 2 (4 marks)

Buffalo fly bites cause skin wounds on cattle. The table shows the average number of skin wounds per animal in a herd for two years.

	Autumn	Winter	Spring	Summer
2021	285	28	195	460
2022	276	22	170	392

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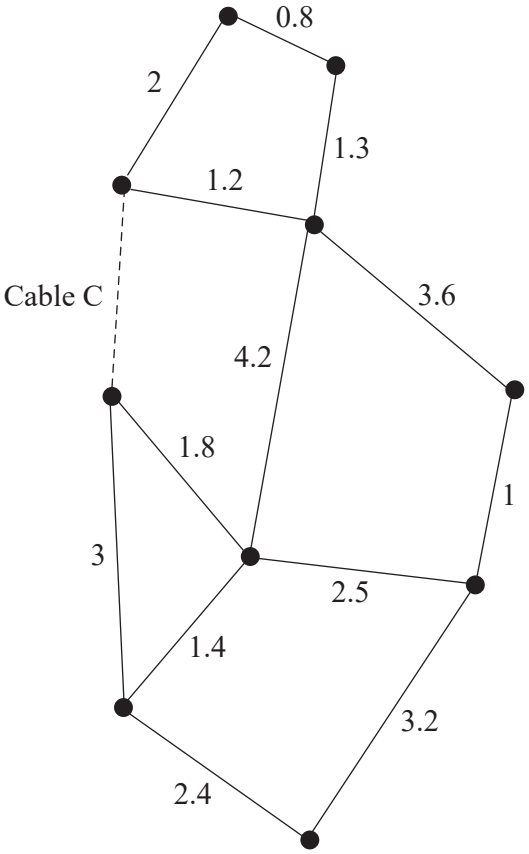
QUESTION 3 (5 marks)

The diagram represents a network of 10 ski stations connected by chairlift cables. The length (km) of each cable is shown, except for cable C, which is closed for maintenance. When cable C reopens, the minimum total cable length required to connect all stations will decrease by 1 km.

Determine the length of cable C and the minimum total cable length required to connect all stations when cable C reopens.



Note: If you make a mistake in the diagram, cancel it by ruling a single diagonal line through your work and use the additional response space at the back of this question and response book.

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QUESTION 4 (5 marks)

Hiroki believes that more fish are caught on warmer days. Jiro believes that the number of fish caught in a day is more dependent on the number of people fishing.

Bivariate datasets for six days are shown.

Temperature, t (°C)	32	26	20	27	23	29
Number of fish caught, f	530	400	320	220	180	120

Number of people fishing, p	46	58	38	34	30	28
Number of fish caught, f	530	400	320	220	180	120

Calculate the correlation coefficient for each dataset and use the results to identify the explanatory variable for the stronger linear association. Use the least-squares line equation for the stronger linear association to predict the number of fish caught on a 25 °C day when 50 people are fishing.

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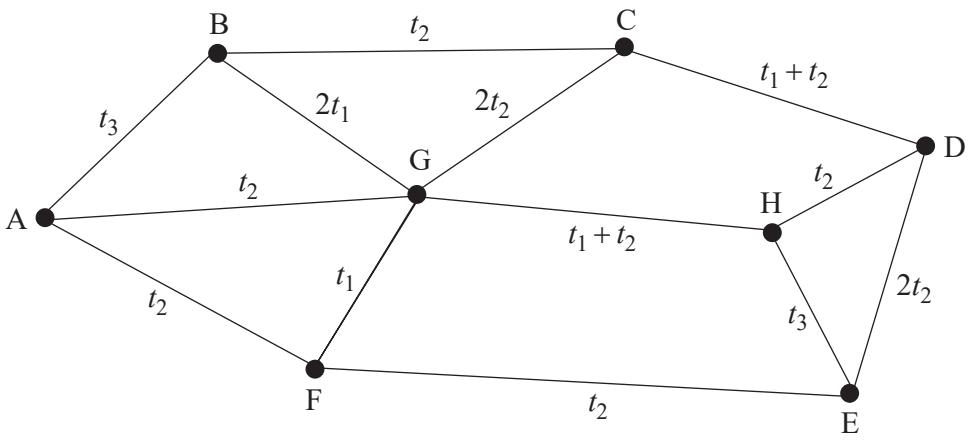
QUESTION 5 (7 marks)

At 9:00 am, a security guard begins their patrol of the eight work sites represented in the network diagram, starting and ending at site A. They drive at 40 km/h on the roads between sites and check every site once for 15 minutes.

The length (km) of each road corresponds to the terms of the arithmetic sequence $t_n = t_1 + 2(n - 1)$, where $t_1 = 1$.

Determine the earliest possible time the security guard can finish their patrol, and identify the route they must follow.



Note: If you make a mistake in the diagram, cancel it by ruling a single diagonal line through your work and use the additional response space at the back of this question and response book.

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QUESTION 6 (7 marks)

The table shows the average superannuation account balance for workers of various ages in two different industries. The coefficient of determination, R^2, for age versus account balance is 0.95 for industry A and 0.96 for industry B. 40-year-old Leigh works in the industry for which age explains a higher percentage of the account balance variation. Tony is 10 years older than Leigh and works in the other industry.

Age (years)	Account balance ($)	
	Industry A	Industry B
22	7500	8100
32	42 000	60 000
42	98 000	120 000
52	160 000	210 000
62	290 000	360 000
72	400 000	480 000

Use linear models to predict the difference in current superannuation account balances for Leigh and Tony.

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QUESTION 7 (5 marks)

Five years ago, a retiree invested $100 000 in a compound interest account earning 3.8% p.a. compounding monthly. They now intend to use the balance of the account to begin a perpetuity that will return 4% p.a. compounding annually and pay them $6000 each year.

Provide advice to the retiree about whether their compound interest investment is large enough to finance the perpetuity.

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 3

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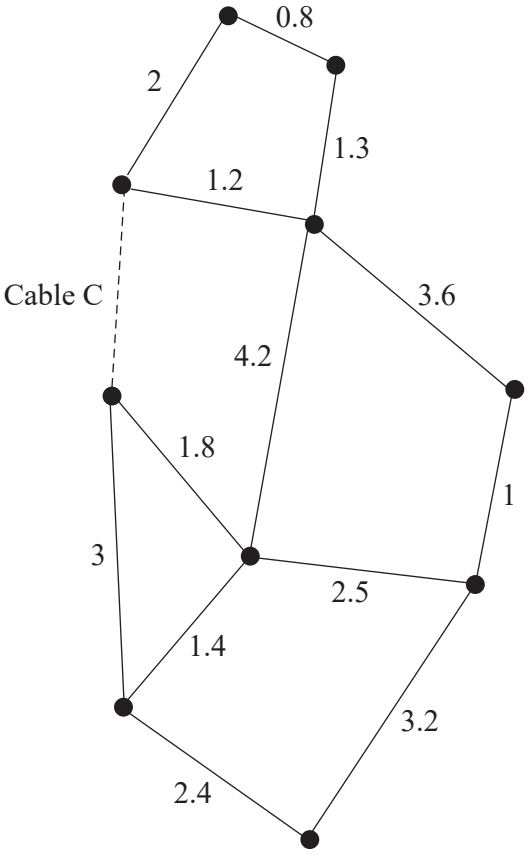

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ADDITIONAL RESPONSE SPACE FOR QUESTION 5

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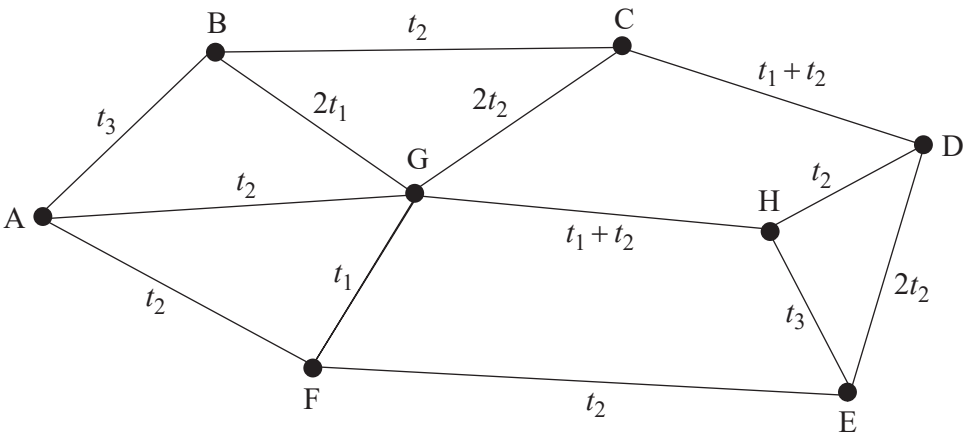

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