2025 VCE General Mathematics 1 external assessment report

Specific information

The examination comprised 40 multiple-choice questions covering all areas of study.

- Questions 1–16: Data analysis
- Questions 17–24: Recursion and financial modelling
- Questions 25–32: Matrices
- Questions 33–40: Networks and decision mathematics

Students were permitted to use approved CAS technology during this examination.

The tables below indicate the percentage of students who chose each option. Grey shading indicates the correct response. The statistics in this report may be subject to rounding, resulting in a total of more or less than 100 per cent.

Question	Correct answer	% A	% B	% C	% D	% N/A	Comments
1	D	4	5	17	75	0	Sum all columns = 4 + 11 + 3 + 9 + 5 + 7 = 39 The median is the 20th value. The 20th value is in the fourth column (*bag size* 4).
2	D	20	2	1	76	0	Total = 1 × 4 + 2 × 11 + 3 × 3 + 4 × 9 + 5 × 5 + 6 × 7 = 138
3	D	7	4	7	82	0	From inspection of the boxplots: • The interquartile range for Sample T (≈ 5.6) is NOT greater than the interquartile range for Sample H (≈ 7.8). • The median for Sample T (≈ 76.5) is NOT more than 10 years greater than the median for Sample H (≈ 67.2). • The third quartile for Sample H (≈ 70.8) is NOT greater than the first quartile for Sample T (≈ 73.6). • Life expectancy in all Sample T countries exceeds the median life expectancy in Sample H is TRUE because minimum of sample T (≈ 68) > median in sample H (≈ 67.2).
4	D	5	13	30	52	1	*Population density* = 6 028 460 ÷ 720 = 8372.8611 $\log_{10}(8372.8611) = 3.92287$ which sits between 3.5 and 4.0

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5	C	6	10	81	3	1	The information 2.5% of the heights were greater than 178.9 cm gives the equation $\bar{x} + 2s = 178.9$ The information 16% of the heights were less than 157.6 cm gives the equation $\bar{x} - s = 157.6$ Solving $\bar{x} + 2s = 178.9$ and $\bar{x} - s = 157.6$ for m and s gives $\bar{x} = 164.7$ and $s = 7.1$
6	C	5	10	79	6	0	Lower fence = 74.9 − 1.5 × (78.5 − 74.9) = 69.5 Three of the listed values are less than 69.5, hence outliers.
7	B	2	86	6	6	0	42 ÷ (28 + 42 + 35) = 40%
8	D	9	5	7	79	0	The most appropriate way to graphically display this data is a segmented bar chart. Each bar represents a gender with the segments being number/percentage of respondents for each colour.
9	A	66	6	23	4	0	Use two points from the scatterplot to determine the equation of the least squares line. For example, (27, 12) and (44, 9) Slope $= \frac{9-12}{44-27} = -0.176$ Using point (27, 12) and $y = a + bx$, $a \approx 16.8$
10	D	22	7	8	63	0	Reject Options B and C as causation cannot be concluded. Option D is correct from graph and correlation coefficient.
11	C	5	10	81	4	0	Apply a $\log_{10}$ transformation the *life* data. The least square equation is: $\log_{10}(life) = 1.7879... + 0.038298... \times doctors$
12	C	14	14	61	10	1	Apply a squared transformation to the *doctors* data. The least square equation is: $life = 63.1165... + 2.8419... \times doctors^2$ Using this equation, the predicted $life = 63.1165 + 2.8419 \times 2^2$ Hence predicted $life = 74.48 \approx 74.5$
13	C	10	8	76	5	0	The five values with *week 8* in the middle are 50, 38, 32, 35, 41 In rank order: 32, 35, 38, 41, 50 Median = 38
14	D	13	1	1	85	0	Time series shows decreasing trend with irregular fluctuations
15	B	8	81	6	5	0	Calculation 1: (78 + 187 + 106 + 166) ÷ 4 = 134.25 Calculation 2: (187 + 106 + 166 + 124) ÷ 4 = 145.75 Centring = (134.25 + 145.75) ÷ 2 = 140

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16	B	8	50	18	23	0	$\text{seasonal index} = \frac{\text{actual figure}}{\text{deseasonalised figure}}$ $\text{deseasonalised figure} = \frac{\text{actual figure}}{\text{seasonal index}}$ $\text{deseasonalised figure} = \frac{\text{actual figure}}{1.75} = \text{actual figure} \times 0.57$ Multiplying by 0.57 is equivalent to a 43% reduction (100 − 57)%
17	D	32	6	9	53	0	$\text{Balance} = \text{P} + \text{I} = \text{P} + \frac{PRT}{100}$ $\text{Balance} = 4000 + \frac{4000 \times 4 \times 3}{100}$ $\text{Balance} = 4000 + 4000 \times 0.04 \times 3$ $\text{Balance} = 4000 + 3(0.04 \times 4000)$
18	D	14	15	19	52	0	When $d = 0$ a geometric sequence exists. Reject options A and B. When $0 < R < 1$ the sequence generated will be decreasing.
19	B	17	49	25	8	1	Two possible methods include: 1. Continue the table using a flat rate deduction of \$4000 per year and a reducing balance factor of 0.92, or 2. Solve $60\,000 - 4000n = 60\,000 \times 0.92^n$ for n which gives $n = 5.582\ldots$ The value using flat rate depreciation will first be lower after 6 years.
20	A	55	19	7	18	0	Loss of value = \$12 000 − \$7680 = \$4320 Hours used = 960 × 2 = 1920 Depreciation per hour = \$4320 ÷ 1920 = \$2.25
21	C	8	16	69	6	1	Annual payment (5% of \$250 000) = \$12 500 Years required to equal \$250 000 (\$250 000 ÷ \$12 500) = 20 One more year required to first exceed \$250 000.
22	A	68	13	12	6	1	Use Finance Solver to find the interest rate, where, N = 3 × 52, PV = −4000, Pmt = −50, FV = 14 000, CpY = PpY = 52 Solve for I%. I% = 8.3723… ≈ 8.4%
23	B	10	41	17	32	1	Step 1. The nominal interest rate = nom(4.51,26) = 4.415% p.a. Step 2. Use Finance Solver to find total balance, where, N = 5 × 26, I% = 4.415, PV = −5000, Pmt = 0, CpY = PpY = 26 Solve for FV. FV = \$6233.8910… ≈ \$6233.89 Step 3. The interest earned = \$6233.89 − \$5000 = \$1233.89 ≈ \$1234

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24	A	52	16	17	14	1	Step 1. Use Finance Solver to find the time to new balance, where, I% = 4.8, PV = −800 000, Pmt = 6000, FV = 521 118.96, CpY = PpY = 12 Solve for N = 84.0000… = 84 payments = 7 years Step 2. Use Finance Solver to find time to zero balance, where, I% = 4.8, PV = −521 118.96, Pmt = 4767.66, FV = 0, CpY = PpY = 12 Solve for N = 144.000… = 144 payments = 12 years Step 3. Total length of annuity = 7 + 12 = 19 years
25	A	83	9	5	3	0	Binary matrix only contains 1s and 0s Permutation matrix has one 1 in each row and column. Eliminate B. Identity matrix only has 1s on the main diagonal and 0s elsewhere. Eliminate C. Diagonal matrix has all entries outside the main diagonal as 0. Eliminate D.
26	C	8	3	84	4	0	Row 2 × column 1, 1 × 3 + 6 × 5
27	C	4	6	76	13	0	For the inverse of E to exist the determinant ≠ 0. det = mn − (−9 × 4) = mn + 36 The product mn must be negative therefore m and n must have different signs. Option C gives det = −36 + 36 = 0
28	C	1	4	93	2	0	Check each option: A does not directly communicate with C. Eliminate option A. B does not directly communicate with E. Eliminate option B. All direct links work. F does not directly communicate with D. Eliminate option D.
29	A	84	9	5	1	0	Check row 1 for correct birth rates, no loop at year 1 so the birth rate for year 1 = 0. This eliminates options C and D. Referring to the life-cycle diagram only option A has the correct birth rates for years 2, 3 and 4 and the correct survival rates.
30	B	10	73	12	5	1	Only 3 elements are negative once completed. $\begin{bmatrix} 1^2-1 & 1^2-2 & 1^2-3 & 1^2-4 \\ 2^2-1 & 2^2-2 & 2^2-3 & 2^2-4 \\ 3^2-1 & 3^2-2 & 3^2-3 & 3^2-4 \\ 4^2-1 & 4^2-2 & 4^2-3 & 4^2-4 \end{bmatrix} = \begin{bmatrix} 0 & -1 & -2 & -3 \\ 3 & 2 & 1 & 0 \\ 8 & 7 & 6 & 5 \\ 15 & 14 & 13 & 12 \end{bmatrix}$

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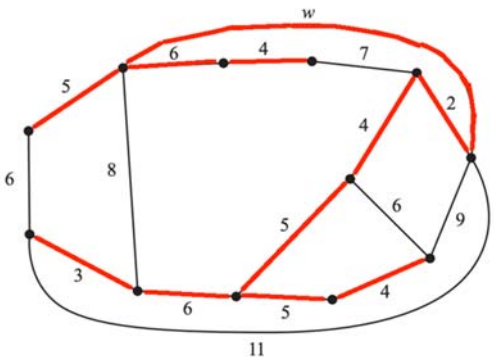
31	B	5	70	14	10	1	$A + B$ is not defined. Eliminate option A. C^TBD is defined. C^T is a 2 × 3 matrix which can be multiplied by matrix B (3 × 1) which can be multiplied by matrix D (1 × 3). BD = 3 × 3 which cannot be added to C. Eliminate option C. DA is not defined. Eliminate option D.
32	B	10	63	6	21	1	Use the information is provided to add the missing elements to matrix D. • Maggie and Ophelia each won three of their four games. This information is already in matrix D. • Kyle won two of his four games. Will need to add one 0 and one 1 to row K corresponding row in matrix D. • Lian and Neil each won one of their four games. Will need to add one 0 and one 1 to rows L and N in matrix D. • Kyle defeated Neil. Kyle must beat Neil. Add 1 to row K, column N and 0 to row K, column L. Hence $D = \begin{matrix} \\ K \\ L \\ M \\ N \\ O \end{matrix} \begin{matrix} \begin{matrix} K & L & M & N & O \end{matrix} \\ \begin{bmatrix} 0 & 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 \end{bmatrix} \end{matrix}$ Correct $D + D^2$ gives option B.
33	B	7	76	6	11	0	Only 2 Hamiltonian cycles can be created when starting at E. $EDCBAFE$ and $EFABCDE$.
34	C	8	4	85	3	0	A bridge is an edge in a network whose removal will disconnect the network. Any of the top 3 edges, when removed, cause the graph to be disconnected.
35	B	8	65	15	12	1	 5 + 6 + 4 + w + 2 + 4 + 5 + 3 + 6 + 5 + 4 = 44 + w

Question	Correct answer	% A	% B	% C	% D	% N/A	Comments
36	A	77	12	3	7	0	Cut 1 cuts 6 edges, 4 of which have the direction of flow from source to sink. 7 + 3 + 5 + 12 = 27
37	B	13	73	10	3	1	Minimum cut is 7 + 4 + 6 = 17. The three edges flowing directly into the sink.
38	A	47	47	4	1	1	The shortest path is 900 + 500 + 400 + 800 + 1100 = 3700
39	B	8	71	11	10	1	Follow the two steps of the Hungarian algorithm given. Step 1 subtract the minimum entry in each row from each element in that row to obtain a new table of values. This produces the table in option A. Reject option A. Step 2 use the table produced from step 1, subtract the minimum entry in each column from each element in that column. This produces the table in option B. Reject option C, this table is generated by following step 2 only. Reject option D, this table is generated by following step 2 first followed by step 1.
40	C	24	19	39	16	1	The network below is created from the precedence table. It requires a dummy activity between the end of B and start of G. The latest start of B is 12 and the earliest is 4. Float of 8.