2025 VCE General Mathematics 2 external assessment report

Refer to the VCE Mathematics study design and examination criteria and specifications for full details on this study and how it is assessed.

The statistics in this report may be subject to rounding resulting in a total more or less than 100 per cent.

Data analysis

Question 1a.

Marks	0	1	Average
%	16	84	0.9

The median is the average of the 10th and 11th values, which are both 920 000.

= $920 000

Question 1b.

Marks	0	1	Average
%	23	77	0.8

Nominal

Question 1c.i.

Marks	0	1	Average
%	31	69	0.7

$346 466

Students needed to enter the data carefully into their calculator to avoid error.

Question 1c.ii.

Marks	0	1	Average
%	53	47	0.5

House sale prices have a lower spread than apartment sale prices as shown by the lower standard deviation.

The question clearly indicated using the information in Table 2, so using other statistics such as range and IQR was not appropriate.

Question 1d.

Marks	0	1	Average
%	11	89	0.9

House (%)	Apartment (%)
0	**30**
40	**50**
60	**20**
100	100

Question 2a.

Marks	0	1	Average
%	15	85	0.9

$1 300 000 − $400 000

= $900 000

Question 2b.

Marks	0	1	Average
%	18	82	0.8

900 000 + 1.5 × (900 000 − 600 000)

= $1 350 000

Question 3

Marks	0	1	2	Average
%	41	13	47	1.1

Standard deviation $= \dfrac{952\,000 - 1\,400\,000}{-1.60} = 280\,000$

560 000 is three standard deviations below mean and 1 680 000 is one standard deviation above mean, therefore

$$\frac{99.7\%}{2} + \frac{68.0\%}{2}$$

= 83.85%

Most students were able to find the correct standard deviation.

With regards to rounding, students are reminded that the instructions at the beginning of the examination clearly state that 'In all questions where a numerical answer is required, you should only round your answer when instructed to do so.' Students sometimes rounded their answer when an exact answer should have been given. For example, in this question the percentage given needed to be 83.85% not 84%.

Question 4a.

Marks	0	1	Average
%	6	94	1.0

Distance from city centre

Question 4b.

Marks	0	1	Average
%	79	21	0.2

$-\sqrt{0.0806}$

= −0.284

A large proportion of the cohort left their final response as positive 0.284, not recognising that the slope was negative in the equation of the least squares line provided in the question stem.

Question 4c.

Marks	0	1	Average
%	27	73	0.8

Distance from city centre = 0

$1 765 353

Question 4d.

Marks	0	1	Average
%	73	27	0.3

Extrapolation as 2 km lies outside the explanatory variable data range.

Students needed to be careful that they recognised in their answer that while predictions from a regression line focus on the response variable, their effectiveness as interpolation or extrapolation comes from the explanatory variable.

It was not appropriate to refer to the sale price as being outside the data range.

Question 4e.

Marks	0	1	2	Average
%	15	20	65	1.5

strength	**weak**
direction	**negative**

Question 4f.i.

Marks	0	1	Average
%	59	41	0.4

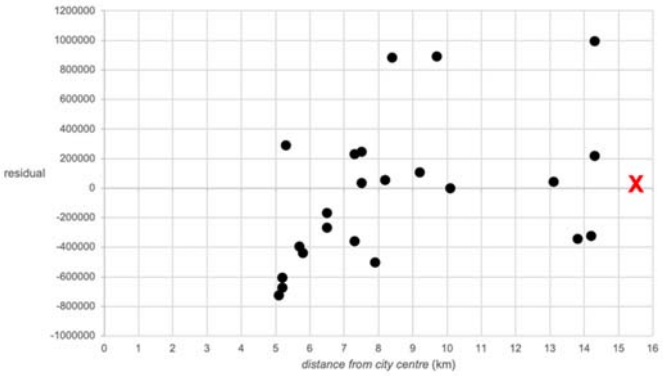
Predicted value = 1 765 353 − 35 054 × 15.5 = 1 222 016

Residual = 1 250 000 − 1 222 016 = 27 984

Students needed to show **all** working that led to the given residual value.

Question 4f.ii.

Marks	0	1	Average
%	55	45	0.5



Students need to be precise when marking a point on a grid, taking particular care with the scale used.

Question 5a.

Marks	0	1	2	Average
%	30	43	28	1.0

Sale price = **1 050 000** + **−8050** × *days*

Significant figures remain problematic and many students did not interpret values from their calculator that were written using exponent notation (such as 1.05E6).

Question 5b.

Marks	0	1	Average
%	56	44	0.5

75% of the variation in *sale price* can be explained by the variation in *days*.

Question 6a.

Marks	0	1	2	Average
%	23	45	32	1.1

Seasonality and irregular fluctuations.

There was no evidence of any increasing or decreasing trend.

It should be noted that irregular fluctuations are present in **all** time series plots.

Overall, students need to be very clear on the key knowledge and key skills contained in the study design for General Mathematics, and to use the formal terminology within the course. This question asked for qualitative features of a time series plot. The possible features are all clearly named within the study design.

Question 6b.

Marks	0	1	2	Average
%	74	14	12	0.4

Two different approaches were permitted here that gave almost identical answers.

September values			
15	20	20	15
Annual averages (total / 12)			
30.083	29.5	29.833	29.75
September proportions (value / avg)			
0.4986	0.6780	0.6704	0.5042

Seasonal Index = (0.4986 + 0.6780 + 0.6704 + 0.5042) / 4

= 0.588

OR

Averages:

Sept = (15 + 20 + 20 + 15) / 4 = 17.5

Totals = (361 + 354 + 358 + 357) / 48 = 29.79…

Seasonal Index (Sept) = 17.5 / 29.79…

= 0.587

Recursion and financial modelling

Question 7a.

Marks	0	1	Average
%	7	93	1.0

$850 000

Question 7b.

Marks	0	1	Average
%	35	65	0.7

As it is calculated on a lower (reducing) balance

Question 7c.

Marks	0	1	Average
%	60	40	0.4

2885.55	**12 845.33**	**811 598.26**

Students were instructed to use the values in the table. Using a finance solver resulted in a different balance to the nearest cent which was not appropriate.

Question 7d.

Marks	0	1	Average
%	59	41	0.4

Finance solver entries

N = 59.9999 ≈ 60

I% = 4.2

PV = 850 000

PMT = −15 730.88

FV = 0

P/Y & C/Y = 12

60 payments in total, therefore

59 payments of $15 730.88 before the final payment.

Question 8ai.

Marks	0	1	Average
%	27	73	0.8

$V_0 = 40\,000$ $V_{n+1} = V_n - 8000$

Question 8aii.

Marks	0	1	Average
%	50	50	0.5

$V_n = 40\,000 - 8000n$

Many students did not demonstrate understanding of the distinction between a rule and recurrence relation and gave a similar answer again as in **part a.i**.

Question 8b.

Marks	0	1	Average
%	31	69	0.7

$$\frac{8000 \times 100}{40\,000}$$

= 20%

Question 9a.

Marks	0	1	Average
%	63	37	0.4

$$Rate = \frac{75}{50\,000} \times 100$$

= 0.15%

Question 9b.i.

Marks	0	1	Average
%	60	40	0.4

Finance solver entries

N = 52

I% = 6.960000

PV = 50 000

PMT = −75

FV = −49 565.34

P/Y & C/Y = 52

Interest rate = 6.96%

Question 9b.ii.

Marks	0	1	Average
%	70	30	0.3

$$R = 1 + \frac{6.96}{100 \times 52}$$

$$= 1.0013$$

Question 10.

Marks	0	1	2	Average
%	77	12	11	0.4

Finance solver entries

N	=	40	20
I%	=	6.4	6.4
PV	=	−650 000	−650 000
PMT	=	22 126.27	22 126.27
FV	=	0	376 159.4283...
P/Y & C/Y	=	4	4

$D_0 =$ **376 159.43** , $D_{n+1} = 1.016 \times D_n +$ **–22 126.27**

Some students found the payment correctly from the calculator but answered as positive 22 216.27

Matrices

Question 11a.

Marks	0	1	Average
%	4	96	1.0

3 × **5**

Question 11b.

Marks	0	1	Average
%	43	57	0.6

Total enrolments each day of the week

Many students gave an answer that suggested that the rows had been summed and not the columns.

Question 11c.

Marks	0	1	Average
%	56	44	0.5

$$\boldsymbol{F} = \begin{bmatrix} \mathbf{1.25} & \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{1.5} & \mathbf{0} \\ \mathbf{0} & \mathbf{0} & \mathbf{0.9} \end{bmatrix}$$

Many responses indicated a poor understanding of what a diagonal matrix is.

Question 12a.

Marks	0	1	Average
%	47	53	0.6

$$S_{2023} = \begin{bmatrix} 0.25 & 0 & 0 & 0 \\ 0.625 & 0.25 & 0 & 0 \\ 0 & 0.625 & 0.1 & 0 \\ 0.125 & 0.125 & 0.9 & 1 \end{bmatrix}^{-1} \begin{bmatrix} 4 \\ 15 \\ 15 \\ 27 \end{bmatrix}$$

$$= \begin{bmatrix} \mathbf{16} \\ \mathbf{20} \\ \mathbf{25} \\ \mathbf{0} \end{bmatrix}$$

Question 12b.

Marks	0	1	Average
%	87	13	0.2

$$S_{2025} = \begin{bmatrix} 13.00 \\ 11.25 \\ 20.87 \\ 42.87 \end{bmatrix}, \quad S_{2026} = \begin{bmatrix} 15.25 \\ 15.93 \\ 19.11 \\ 64.69 \end{bmatrix},$$

15.25 + 15.93 + 19.11

= 50

Many students answered 115 by including the children who had left the centre.

Question 13a.

Marks	0	1	Average
%	33	67	0.7

No child does the same activity in any two consecutive weeks.

Question 13b.i.

Marks	0	1	Average
%	91	9	0.1

$$K^9 \begin{bmatrix} 27 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 10.08562... \\ 9.96484... \\ 6.94954... \end{bmatrix},$$

$$\frac{10.08562... \times 100}{27}$$

= 37.4%

Rounding should only be done at the final step. The expected *number* of children should not have been rounded to 10.

Question 13b.ii.

Marks	0	1	2	Average
%	77	7	17	0.4

$$S_3 = K^2 \begin{bmatrix} 27 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 15.66 \\ 7.776 \\ 3.564 \end{bmatrix},$$

7.776 × 0.24

= 2

For questions worth more than one mark, students are advised to show working. An incorrect answer on its own will not be awarded any marks. A method mark can, where appropriate, be awarded to students who have shown the development of their answer.

Question 14a.

Marks	0	1	Average
%	35	65	0.7

gardening, lunch, music

Question 14b.

Marks	0	1	Average
%	73	27	0.3

drama, cooking, gardening, lunch, music, sport, reading

Question 14c.

Marks	0	1	Average
%	89	11	0.1

Order of the activities rotates on a four-day cycle. There are 10 cycles completed in the 40-day program.

Only a small proportion of students showed an understanding of the effect of the identity matrix.

Networks and decision mathematics

Question 15a.

Marks	0	1	Average
%	12	88	0.9

2 + 4 + 2 + 3 + 3

= 14

Question 15b.

Marks	0	1	Average
%	9	91	0.9

5	+	**4**	=	**7**	+ 2

Question 15c.

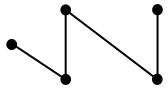
Marks	0	1	Average
%	47	53	0.6

Hamiltonian path

Question 15d.

Marks	0	1	Average
%	19	81	0.8

Sample tree



The tree could be drawn correctly in many ways.

Some students included an edge that was not part of the original graph.

Question 16.

Marks	0	1	2	Average
%	32	48	20	0.9

$x =$ **2** $y =$ **4** $z =$ **2**

The value for y was often given as 3.

Question 17a.

Marks	0	1	Average
%	60	40	0.4

Two vertices (C and E) are of odd degree.

The intended Eulerian Circuit requires all vertices to be of even degree.

Question 17b.

Marks	0	1	Average
%	73	27	0.3

28 + 11 + 23 + 31 + 7 + 7 + 8 + 12 + 22 + 19 + 14 + 14

= 196 m

Question 18a.

Marks	0	1	Average
%	56	44	0.5

Critical paths:

A – D – H – J – L

A – D – I – K – L

Common to both paths are *A, D, L*.

Question 18b.

Marks	0	1	Average
%	54	46	0.5

Latest start time = 20 − 4 − 4 − 3

= 9

Question 18c.

Marks	0	1	Average
%	53	47	0.5

Activity	*B*	*C*	*E*	*F*	*G*
Float	5	1	5	6	1

F

Students need to be careful that if they provide additional information in their response, it must be correct. Only the activity *F* needed to be written to obtain the mark.

Question 18d.

Marks	0	1	Average
%	79	21	0.2

Current time = 25 days

New time = 22 days

Reduce: *A* – 2, *H* – 1, *K* – 1

Minimum additional cost = $1400