

2022 VCE Further Mathematics 1 (NHT) external assessment report

Specific information

This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

The tables provided indicate the correct answer for each question. This report includes further details for some responses that were not as well answered as others.

Section A – Core

Data analysis

Question	Answer
1	C
2	D
3	C
4	B
5	B
6	D
7	D
8	D
9	B
10	E
11	B
12	C
13	E
14	E
15	A
16	E

Question 6

Data concerning two categorical variables can be displayed in a two-way contingency table, as presented in the stem of the question, or as a segmented bar chart.

All the other options can be used to present numerical data.

Question 8

A box plot splits data into four sections. The middle box contains the middle 50%, below the box is 25% and above is 25%. Therefore, in this graph 75% of the data is between 26 (Q1) and 38 (maximum). This is equivalent to 33 people. If the three people with bicep muscle circumference above 34 cm are removed, then 30 people between 26 and 34 are left. This is 68.18%.

Question 9

Three steps are required to solve this question.

Step 1: Determine the total bicep muscle circumference for the 44 people

$$\text{Total bicep muscle circumference } 28.16 \times 44 = 1239.04$$

Step 2: Subtract the bicep muscle circumference measures of the four outliers

$$1239.04 - (21 + 35 + 36 + 38) = 1109.04$$

Step 3: Divide the adjusted total by 40 (total excluding the outliers)

$$1109.04 \div 40 = 27.73$$

Question 11

Residual value = actual value – predicted value.

Using the scatterplot and residual line provided, the residual value $10.4 - 10.85 = -0.45$.

This value is closest to -0.5 .

Recursion and financial modelling

Question	Answer
17	B
18	E
19	B
20	D
21	D
22	D
23	C
24	A

Question 19

Geometric growth refers to the situation where each successive term in a sequence differs by a constant ratio. For growth to occur, the R value must be greater than 1.

Question 21

Two steps are required to solve this question.

Step 1: Determine the interest rate from the amortisation table.

$$I = PRT$$

$$600 = 100,000 \times \frac{2.4}{100} \times T$$

$$T = \frac{1}{4} \text{ of a year (or three months)}$$

Step 2: If the first payment was on 1 January 2021, then the second payment was on 1 April 2021.

Question 24

Four steps are required, three of which use Finance Solver.

<p>Step 1:</p> <p>Determine the regular repayment amount.</p> <p>$N = 20 \times 52$</p> <p>$I\% = 3.8$</p> <p>$PV = 200\,000$</p> <p>$PMT = -274.62$</p> <p>$FV = 0$</p> <p>$P/Y = 52$</p> <p>$C/Y = 52$</p>	<p>Step 2:</p> <p>Determine the amount owing after 10 years.</p> <p>$N = 10 \times 52$</p> <p>$I\% = 3.8$</p> <p>$PV = 200\,000$</p> <p>$PMT = -274.62$</p> <p>$FV = -118767.99$</p> <p>$P/Y = 52$</p> <p>$C/Y = 52$</p>
<p>Step 3:</p> <p>Determine the new time required to fully repay the loan.</p> <p>$N = 478$</p> <p>$I\% = 3.8$</p> <p>$PV = 118767.99$</p> <p>$PMT = -294.62$</p> <p>$FV = 0$</p> <p>$P/Y = 52$</p> <p>$C/Y = 52$</p>	<p>Step 4:</p> <p>Determine the reduction in time.</p> <p>10 years = 520 weeks</p> <p>$520 - 478 = 42$</p>

Section B – Modules

Module 1 – Matrices

Question	Answer
1	A
2	B
3	B
4	C
5	E
6	E
7	C
8	D

Question 7

Using the information from matrix T and the initial state matrix:

$$1 \times 0.4 + 0.15 \times 0.2 + 0 \times 0.2 + 0.35 \times 0.2 = 0.5$$

Fifty per cent of the rodents will be sheltering at location A .

If 1000 were observed sheltering at location A , the total number of rodents must have been 2000.

Question 8

The answer requires T , U and V to be in the rows. It is necessary to first transpose matrix N .

$$NT \times M$$

Module 2 – Networks and decision mathematics

Question	Answer
1	D
2	E
3	D
4	B
5	C
6	A
7	C
8	C

Question 3

A Eulerian trail exists if every edge of a graph is used once, with no repeating edges.

Question 7

If $w = 8$, $x = 6$ and $y = 6$, the maximum flow would be 34 litres per minute.

If $w = 10$, $x = 4$ and $y = 7$, the maximum flow would be 34 litres per minute.

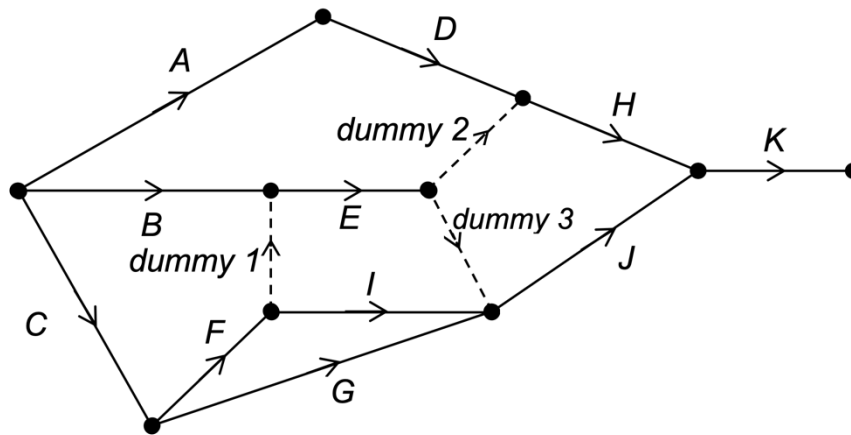
If $w = 10$, $x = 6$ and $y = 6$, the maximum flow would be 35 litres per minute.

If $w = 12$, $x = 4$ and $y = 7$, the maximum flow would be 34 litres per minute.

If $w = 12$, $x = 4$ and $y = 6$, the maximum flow would be 34 litres per minute.

Question 8

A directed network diagram is useful.



A dummy is required because activity I comes after F but not B .

A second dummy is required because activity H comes after D and E but not I or G .

A third dummy is required because activity J comes after E , I and G but not D .

Module 3 – Geometry and measurement

Question	Answer
1	C
2	D
3	B
4	B
5	C
6	A
7	A
8	D

Module 4 – Graphs and relations

Question	Answer
1	B
2	D
3	B
4	C
5	D
6	A
7	E
8	A

Question 5

Profit = revenue – cost

$2000 > 7.5n - (800 + 3n)$, gives $n > 622.22$

The minimum number of smoothies is 623.

Question 6

The relationship between y and x^3 is $y = \frac{1}{4}x^3$

Using this relationship, possible points on the curve would be:

x	2	4	8
y	2	32	128

Question 8

Two steps are required.

Step 1: Determine the time it took for the maximum volume to be reached.

$44 + 8x = 12(12 - x)$, giving $x = 5$, therefore the maximum volume was achieved after 35 minutes.

Step 2: Use the information that the tank emptied at a rate of 12 litres per minute over a seven-minute period

$(42 - 35)$

$7 \times 12 = 84$