2019 VCE Further Mathematics 2 (NHT) examination 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.

Section A – Core

Data analysis

Question 1a.

type of mammal

Question 1b.

Mean: 9.2 hours

Standard deviation: 4.2 hours

Question 1c.

31.6%

Question 1d.

5.4 hours

Question 2a.

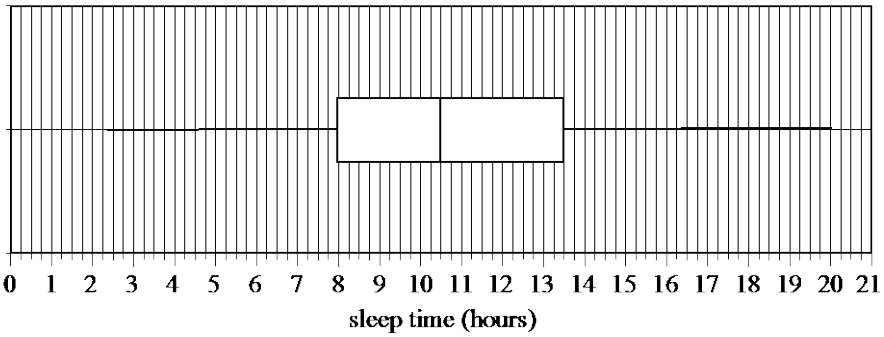
Lower fence = $8.0 - 1.5 \times 5.5 = -0.25$

The minimum value $2.5 > -0.25$, therefore not an outlier

Upper fence = $13.5 + 1.5 \times 5.5 = 21.75$

The maximum value $20.0 < 21.75$, therefore not an outlier

Question 2b.



Question 3a.

gestation period

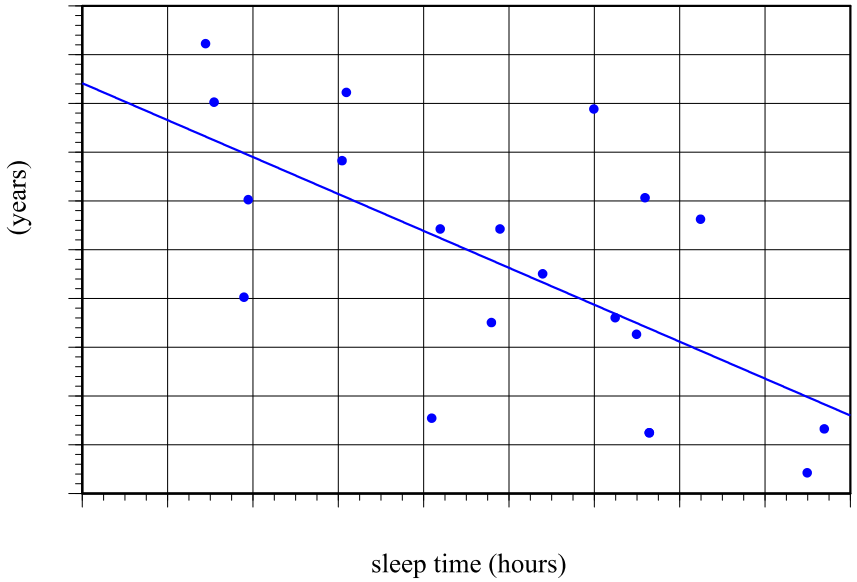
Question 3b.

life span = 7.58 + 0.101 × *gestation period*

Question 3c.

0.904

Question 4a.



The graph can be drawn using the two endpoints (0, 42.1) and (18, 7.9).

Question 4b.

Strength: moderate

Direction: negative

Question 4c.

On average, *life span* decreases by 1.9 years for each additional hour of *sleep time*.

Question 4d.

41.6% of the variation in *life span* can be explained by the variation in *sleep time*.

Answers that referred to the variance in each variable were not acceptable.

Question 4e.

Predicted value = 42.1 – 1.9 × 12 = 19.3

Residual = 39.2 – 19.3 = 19.9

Question 5a.

Likelihood of attack	***Exposure to attack* during sleep**		
	low (=1)	medium (=2)	high (=3)
low (=1)	4	0	0
medium (=2)	1	0	2
high (=3)	1	0	4

Question 5bi.

15

Question 5bii.

50%

Question 5biii.

A statement that clearly indicated the contention is supported with a **change** or **difference** in one category of *likelihood of attack* considered and a statement similar to one of the following using column percentages was required. Approximate percentages were acceptable.

- The percentage of animals with low *likelihood of attack* decreases with increased *exposure to attack* during sleep – low exposure 91%, medium exposure 89%, high exposure 11%
- The percentage of animals with medium *likelihood of attack* changes with increased *exposure to attack* during sleep – low exposure 6%, medium exposure 0%, high exposure 11%
- The percentage of animals with high *likelihood of attack* increases with increased *exposure to attack* during sleep – low exposure 3%, medium exposure 11%, high exposure 79%

Recursion and financial modelling

Question 6a.

$3064

Question 6b.

$\frac{200}{25} = \$8$

Question 6c.

$G_n = 3264 - 8 \times n$

Question 6d.

The depreciation must be greater than 3264 – 2500 = $764

$$\frac{764}{8} = 95.5$$

therefore falls below $2500 after 96 concerts.

Question 7a.

From the recurrence relation $T_5 = 2545.33$

Interest earned = 2545.33 – 2500 = $45.33

Question 7b.

$V_0 = 2500 \quad V_{n+1} = 1.0034V_n + 150$

Question 7c.

5.87%

Question 8a.

$3000

Question 8b.

18 months

A finance solver approach to calculate the future value after three months without withdrawals:

N=	3
I%=	3.12
PV=	–32667.68
PMT=	0
FV=	**32923.15098**
P/Y= C/Y=	12

Then to determine the number of payments after the change:

N=	**8.7744…**
I%=	3.12
PV=	–32923.15098
PMT=	3800
FV=	**0**
P/Y= C/Y=	12

Number of payments after the change = 8 payments of $3000 and 1 smaller payment

Total number of months the annuity will last = 6 + 3 + 8 + 1 = 18

Section B – Modules

Module 1 – Matrices

Question 1a.

2

Question 1b.

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Question 1ci.

Table tennis

Question 1cii.

$$\begin{bmatrix} 2 & 0 & 0 \end{bmatrix} \times \begin{bmatrix} 515 \\ 550 \\ 580 \end{bmatrix} = \begin{bmatrix} 1030 \end{bmatrix}$$

Question 1d.

$$\begin{bmatrix} 1 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}$$

Question 2a.

$0.15 \times 100 + 0.25 \times 400 + 0.20 \times 100 + 0.50 \times 1400 = 835$

Question 2b.

356

Question 3

$v = 0.65 \quad w = 0.15 \quad x = 0.85$

v = 1 — 0.35 = 0.65

C_3 to *Not* C_3 = 0.35 × 600 = 210

Need *Not* C_3 to C_3 to be 210

w × 1400 = 210

Hence w = 0.15

x = 1 — 0.15 = 0.85

Question 4a.

$$\begin{bmatrix} 0 \\ 40 \\ 0 \\ 10 \end{bmatrix}$$

Question 4b.

666

$$W_1 = \begin{bmatrix} 400 \\ 640 \\ 380 \\ 630 \end{bmatrix} \quad W_2 = \begin{bmatrix} 396 \\ 666 \\ 417 \\ 621 \end{bmatrix}$$

Module 2 – Networks and decision mathematics

Question 1a.

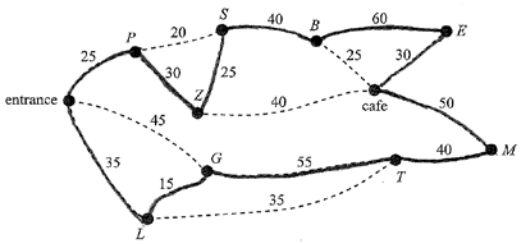
45 metres

Question 1bi.

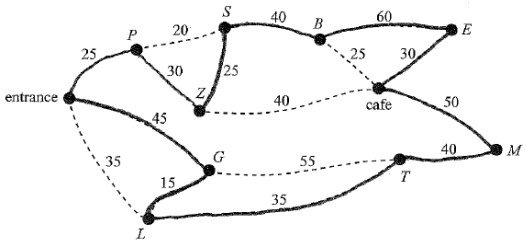
Hamiltonian cycle

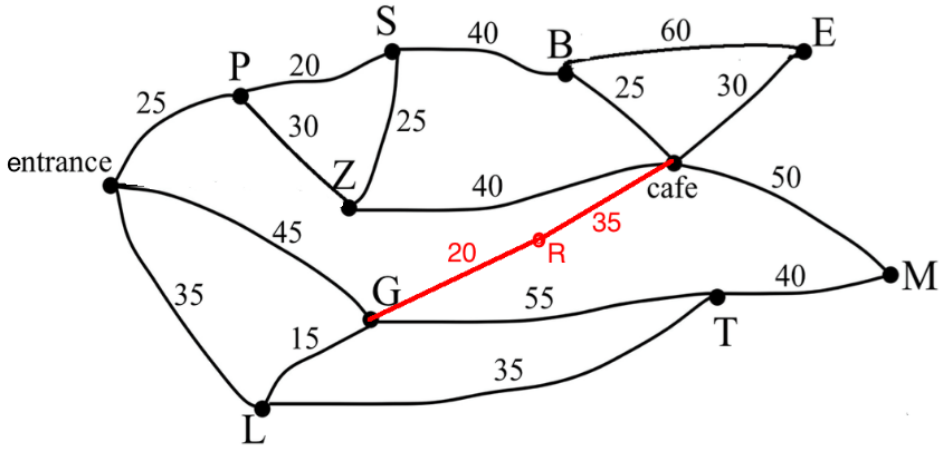
Question 1bii.

EPZSBECMTGLE or *EPZSBECMTLGE*



Question 1c.





Question 1d.
85 metres

Question 2a.

D, *G* and *I*

Question 2b.

A-*C*-*D*-*F*-*G*-*I*

Question 2c.

2

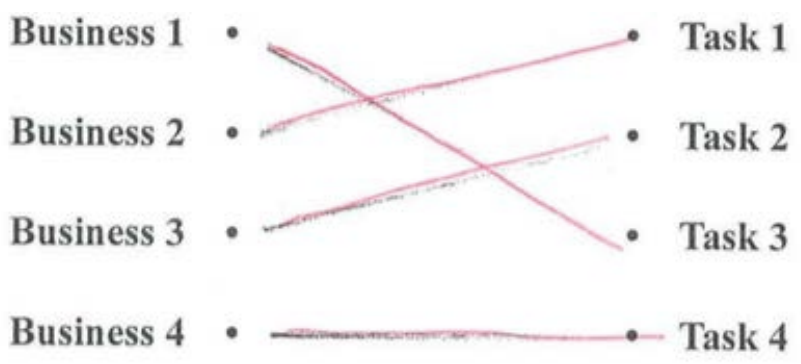
Question 3a.

A = 2 *B* =1 *C* =1 *D* = 0

Question 3b.

	Task 1 Constructing the pathways	Task 2 Constructing the new reptile exhibit	Task 3 Heating and lighting the new exhibit	Task 4 Landscaping the surrounding grounds
Business 1	*A*	5	0	2
Business 2	*B*	5	0	3
Business 3	*C*	0	2	0
Business 4	*D*	1	1	0

Question 3c.



Question 3d.

$200 000

Module 3 – Geometry and measurement

Question 1a.

Rany

Question 1b.

4756 km

Question 1c.

5.40 am Tuesday

Question 2ai.

Area = $\frac{1}{2}\times 12\times 12\times \sin(60°)$ or equivalent = 62.4, correct to one decimal place

Question 2aii.

374 m^2

Question 2b.

60 m^2

Question 2ci.

Area ratio $1:4$, therefore length ratio $1:2$

$\frac{1}{2}$of 20 =10

Question 2cii.

1.34 metres

$h=10-\sqrt{10^2-5^2}$

Question 3a.

33 km

Question 3b.

57 km

angle *GTC* = $180°-(16°+51°)=113°$

distance = $\sqrt{42^2+25^2-2\times 42\times 25\times \cos 113°}$

Question 3c.

$164°$

Module 4 – Graphs and relations

Question 1a.

$4t + 8c = 260$

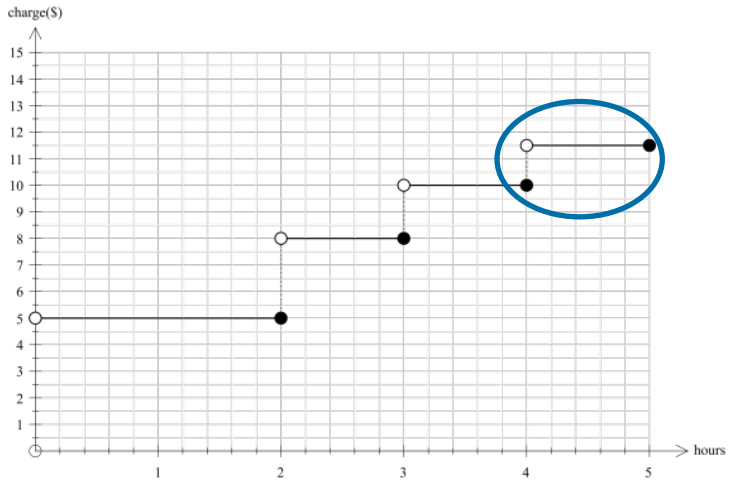
Question 1b.

$25

Question 2a.

$10

Question 2b.



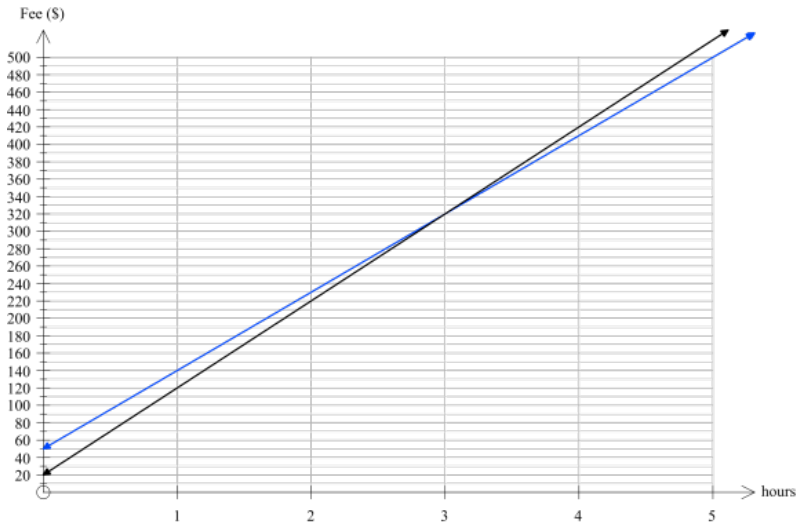
Question 2c.

$16 and $18

Question 3a.

$50 and $90

Question 3b.



Question 4a.

The total number of jackets sold will be at least 40 but at most 100.

Question 4b.

$4600

Question 4c.

$4400

Question 4d.

$3000

Maximum profit at $(65,35)$ occurs on the line $x+y=100$, which has slope of -1.

New profit function must have the same slope, therefore $P=30x+30y$

Profit = $30\times65+30\times35=\$3000$