Neap:

Trial Examination 2017

VCE Further Mathematics Units 3&4

Written Examination 1

Multiple-choice Question Booklet

Reading time: 15 minutes
Writing time: 1 hour 30 minutes

Student's Name: _____

Teacher's Name: _____

Structure of Booklet

Section	*Number of questions*	*Number of questions to be answered*	*Number of modules*	*Number of modules to be answered*	*Number of marks*
A – Core	24	24			24
B – Modules	32	16	4	2	16
					Total 40

Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, one bound reference, one approved technology (calculator or software) and, if desired, one scientific calculator. Calculator memory DOES NOT need to be cleared. For approved computer-based CAS, full functionality may be used.

Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.

Materials supplied

Question booklet of 25 pages.

Formula sheet.

Answer sheet for multiple-choice questions.

Working space is provided throughout the booklet.

Instructions

Write your **name** and your **teacher's name** on your answer sheet for multiple-choice questions.

Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

At the end of the examination

You may keep this question booklet and the formula sheet.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

SECTION A – CORE

Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.
Choose the response that is **correct** for the question.
A correct answer scores 1; an incorrect answer scores 0.
Marks will **not** be deducted for incorrect answers.
No marks will be given if more than one answer is completed for any question.
Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

Data analysis

Question 1

Consider the set of data below.

Age	Frequency
0–<20	3
20–<40	12
40–<60	10
60–<80	4

Which of the following could be used to calculate the mean age of the data set?

A. $\frac{10 + 30 + 50 + 70}{4}$

B. $10 + 30 + 50 + 70 \div 29$

C. $\frac{(10 \times 3 + 30 \times 12 + 50 \times 10 + 70 \times 4)}{4}$

D. $\frac{(10 \times 3 + 30 \times 12 + 50 \times 10 + 70 \times 4)}{29}$

E. $\frac{(20 \times 3 + 40 \times 12 + 60 \times 10 + 80 \times 4)}{29}$

Question 2

A data set has the following five-number summary: –4, 18, 26, 30, 33.

Which of the following is **not** necessarily true of this data set?

A. The IQR is 12.
B. The median is 26.
C. –4 is an outlier.
D. The range is 37.
E. The mode will be closest to 26.

Use the following information to answer Questions 3–5.

The growth of an insect population is recorded over a five-year period. The 2015 data is shown in the table below.

Month	Insect population (× 1000)
January	1.2
February	1.6
March	2.3
April	3.6
May	3.4
June	4.2
July	4.5
August	3.6
September	3.8
October	4.5
November	4.4
December	4.2

Question 3

Over the five-year period, the seasonal index for May was found to be 0.9.

To the nearest whole number, the seasonally adjusted population for May in 2015 is

A. 2070
B. 2556
C. 3060
D. 3400
E. 3778

Question 4

The mode of the insect population is

A. 3.6, 4.2 and 4.5.
B. 3600, 4200 and 4500.
C. 3700.
D. unable to be found.
E. located between June and July.

Question 5

The time series graph is represented by which of the following?

A.

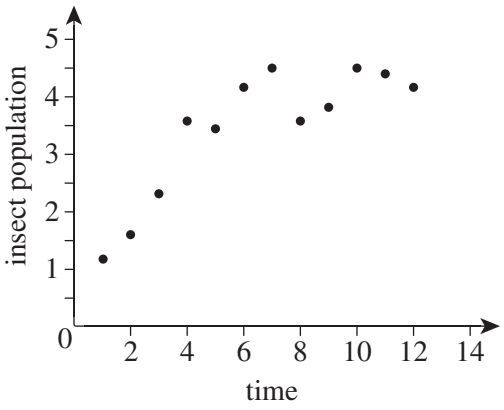
key 1|2 = 1.2

1	2 6
2	3
3	4 6 6 8
4	2 2 4 5 5

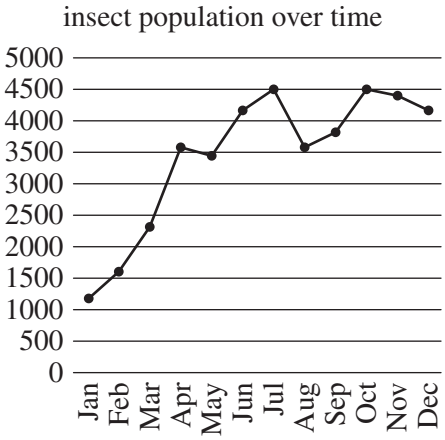
B.

Population	Frequency
1–2	2
2–3	1
3–4	4
4–5	5

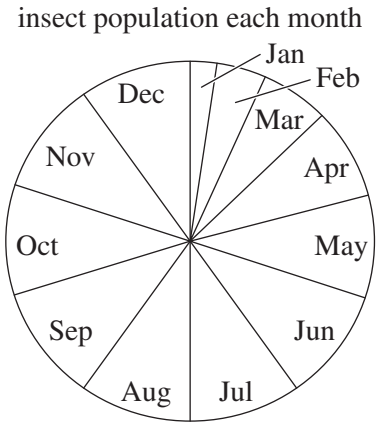
C.



D.



E.



Question 6

A least square regression equation is calculated from statistics collected concerning weight (kg) and height (cm) for people between 1 m and 2 m tall. Two of the points on this line are (170, 80) and (120, 40).

The equation of the least squares regression line is closest to

A. weight = 0.8 × height – 56
B. height = 0.8 × weight – 56
C. weight = 1.25 × height – 110
D. height = 1.25 × weight – 110
E. weight = 0.8 × height + 56

Question 7

A negative correlation of –0.5 has been found between the time spent on social media and playing sport.

Which of these conclusions would follow from this information?

A. People spend more time on social media than playing sport.
B. People spend more time playing sport than on social media.
C. 50% of the reason people do not play sport is due to time spent on social media.
D. 25% of the reason people do not play sport is due to time spent on social media.
E. 25% of the variation in the time that people play sport is due to the variation in the time that they spend on social media.

Question 8

A population has a mean of 45, a standard deviation of 8 and is symmetrically distributed.

95% of the data lies within which of the following boundaries?

A. 37–53
B. 29–61
C. 40–50
D. 30–60
E. 33–57

Question 9

The correlation between the number of emergency hospital beds available and the number of libraries in a city is close to 0.7.

This is an example of

A. random correlation.
B. confounding correlation.
C. both variables responding to a third variable.
D. systematic correlation.
E. cause and effect.

Question 10

Phuket has only two seasons – wet and dry – but is hot all year round. The seasonal index for rainfall in the wet season of Phuket is 1.8.

Which of the following is completely true?

A. 80% of the rain falls in the wet season.
B. The seasonal index for the dry season is 2.2.
C. 90% of the rain falls in the wet season.
D. 80% of the cause of the extra rain is due to it being the wet season.
E. It rains on 80% of the days in the wet season.

Question 11

Consider the data set below.

1, 1, 4, 7, 12, 13, 18, 23, 25, 37, 42, 165

Which of the following pairs of descriptive statistics best represents the central tendency and spread of the data?

A. mean and standard deviation
B. mean and IQR
C. median and range
D. mode and IQR
E. median and IQR

Question 12

The least squares line of $y = 3.2x + 52.1$ is found to apply to a set of data.

The residual for the real data point (5, 70) is closest to

A. –1.9
B. 1.9
C. 3.2
D. 52.1
E. 68.1

Question 13

After an x^2 transformation the values below are found:

- $r = 0.8$
- gradient = 3.4
- y-intercept = –12.8

The least squares line is

A. $y = -12.8 + 3.4x$
B. $y = 3.4 - 12.8x$
C. $y = 0.8 + 3.4x$
D. $y = -12.8 + 3.4x^2$
E. $y = 3.4 - 12.8x^2$

Use the following information to answer Questions 14 and 15.

The stem and leaf plot shown below records the number of times that 25 drivers changed lanes during a 10 km city trip.

key: 3|1 = 31

0	0	1	1	1	2	2	3	4	4	5	6	8	8	8	9
1	0	0	0	0	2	4	6								
2	1	1													
3	1														

Question 14

This data could best be described as

A. symmetrical with an outlier at 31.
B. positively skewed with an outlier at 31.
C. negatively skewed with an outlier at 31.
D. positively skewed with no outliers.
E. negatively skewed with no outliers.

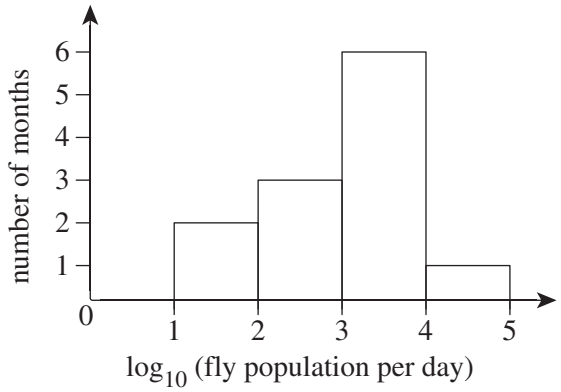
Question 15

Using only the raw data (that is, ignoring any potential outliers), the mean, median and mode of the data, respectively, are closest to

A. 3.1, 8, 0
B. 3.1, 8, 10
C. 8.7, 8, 10
D. 8, 9, 10
E. 9, 9, 0

Question 16

The population of flies is recorded each day for 12 months. The results are shown in the graph below.



The number of months with less than 1000 flies recorded per day was

A. 1
B. 2
C. 3
D. 4
E. 5

Recursion and financial modelling

Question 17

The series 10, –20, 40, –80 … n is most completely described by

A. $t_{n+1} = -2t_n$

B. $t_{n+1} = 2t_n$

C. $t_{n+1} = -2t_n; t_1 = 10$

D. $t_{n+1} = 2t_n; t_1 = 10$

E. $t_n = -2t_{n+1}; t_1 = 10$

Question 18

Megan is earning 5% per annum interest, compounding yearly, on her savings of $10 000.

Which of the following expressions could be used to calculate the balance of her account after 4 years?

A. $t_5 = 10\,000 + 0.05 \times 4$

B. $t_5 = (10\,000 + 0.05)^4$

C. $t_5 = 10\,000 \times 1.05^4$

D. $t_5 = 10\,000 + 4(0.05 \times 2000)$

E. $t_4 = (10\,000 + 0.05)^4$

Question 19

The terms t_1 and t_4 generated by the recurrence relation $t_{n+1} = 2t_n + 2.2$, $t_0 = 6$ are respectively

A. 6 and 14.2

B. 14.2 and 30.6

C. 14.2 and 63.4

D. 14.2 and 129

E. 63.4 and 129

Question 20

A new X-ray machine is purchased for $450 000 and is expected to take 100 000 X-rays before being scrapped for $20 000.

Using the unit depreciation, the rule for the value of the machine after n X-rays is

A. value = $430\,000 - 4.5n$

B. value = $450\,000 - 4.3n$

C. value = $430\,000 - 20\,000n$

D. value = $450\,000 - \dfrac{(450\,000 - 20\,000)n}{100\,000}$

E. value = $430\,000 - \dfrac{(450\,000)n}{100\,000}$

Question 21

An infectious disease is spreading through an isolated community. The total number of patients per day is shown in the table below.

Day	1	2	3	4	5
Number of new patients infected on day *n*	3	9	15	21	27
Total number of infected patients	3	12	27	48	75

Which of the following relationships accurately describes the total number of patients on day n?

A. $t_{n+1} = t_n + 6, t_1 = 3$

B. $t_n = 3n, t_1 = 3$

C. $t_{n+1} = t_n + 3(2n - 1), t_1 = 3$

D. $t_{n+1} = t_n + 3n, t_1 = 3$

E. $t_{n+1} = 3t_n + 9, t_1 = 1$

Question 22

The value of a $40 000 car depreciates by 20% in the first year, then 8% per annum for the next 4 years.

The value of the car after 4 years is closest to

A. $8 000

B. $22 925

C. $24 320

D. $24 918

E. $28 656

Use the following information to answer Questions 23 and 24.

A $25 000 loan for a car is financed over 5 years.

Question 23

The car is financed using hire purchase over 5 years. The flat interest rate is 8% per annum with an initial deposit of 20% required.

The monthly repayment is closest to

A. $409

B. $467

C. $490

D. $583

E. $2 333

Question 24

An alternative to finance the $25 000 loan for the car is using a depreciating balance loan at a rate of 12% per annum, compounding monthly for 5 years.

The total to be paid under this arrangement is closest to

A. $556.11

B. $6935.24

C. $33 367

D. $34 676

E. $40 000

END OF SECTION A

SECTION B – MODULES

Instructions for Section B

Select **two** modules and answer **all** questions within the modules selected in pencil on the answer sheet provided for multiple-choice questions.
Show the modules you are answering by shading the matching boxes on your multiple-choice answer sheet **and** show the module chosen by marking the appropriate box.
Choose the response that is **correct** for the question.
A correct answer scores 1; an incorrect answer scores 0.
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Contents **Page**

Module 1 – Matrices

Before answering these questions, you must **shade** the 'Matrices' box on the answer sheet for multiple-choice questions.

Question 1

At Sunrise College, students are divided into streams *A*, *B*, *C* and *D* depending on their areas of study. There are three campuses of the college – Northern (*N*), Southern (*S*) and Online (*O*). The enrolments are as shown in the matrix below.

$$E = \begin{matrix} \\ A \\ B \\ C \\ D \end{matrix} \begin{matrix} \begin{matrix} N & S & O \end{matrix} \\ \begin{bmatrix} 14 & 20 & 38 \\ 0 & 11 & 19 \\ 8 & 0 & 40 \\ 20 & 14 & 23 \end{bmatrix} \end{matrix}$$

The number of students enrolled in stream *B* at the Online campus is given by element

A. E_{12}
B. E_{22}
C. E_{23}
D. E_{32}
E. E_{33}

Question 2

P is a 5×5 permutation matrix.

The row sum of the third row and the column sum of the fourth column are

A. 1 and 0 respectively.
B. 0 and 1 respectively.
C. equal but unknown.
D. both 1.
E. both 5.

Question 3

Candles are available in three scents; peppermint, rose and jasmine. Jane bought 2 peppermint, 5 rose and 3 jasmine boxes for \$23. Mary bought 3 boxes of each type for \$21 and Peter bought 5 peppermint, 4 rose and 2 jasmine boxes for \$24. Let x, y and z be the cost of a box of peppermint, rose and jasmine boxes respectively.

The matrix $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$ is equal to

A. $\begin{bmatrix} 2 & 5 & 3 \\ 3 & 3 & 3 \\ 5 & 4 & 2 \end{bmatrix} \begin{bmatrix} 23 \\ 21 \\ 24 \end{bmatrix}$

B. $\begin{bmatrix} 2 & 3 & 5 \\ 5 & 3 & 4 \\ 3 & 3 & 2 \end{bmatrix} \begin{bmatrix} 23 \\ 21 \\ 24 \end{bmatrix}$

C. $\frac{1}{24} \begin{bmatrix} -6 & 2 & 6 \\ 9 & -11 & 3 \\ -3 & 17 & -9 \end{bmatrix} \begin{bmatrix} 23 \\ 21 \\ 24 \end{bmatrix}$

D. $\begin{bmatrix} \frac{1}{2} & \frac{1}{5} & \frac{1}{3} \\ \frac{1}{3} & \frac{1}{3} & \frac{1}{3} \\ \frac{1}{5} & \frac{1}{4} & \frac{1}{2} \end{bmatrix} \begin{bmatrix} 23 \\ 21 \\ 24 \end{bmatrix}$

E. $\begin{bmatrix} 2 & 5 & 3 \\ 3 & 3 & 3 \\ 5 & 4 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

Question 4

The state matrix S_{n+1} is determined from S_n by the equation $S_{n+1} = TS_n + P$.

If $T = \begin{bmatrix} 0.9 & 0.2 \\ 0.1 & 0.8 \end{bmatrix}$, $S_1 = \begin{bmatrix} 100 \\ 90 \end{bmatrix}$ and $P = \begin{bmatrix} 4 \\ -5 \end{bmatrix}$, then $S_3 =$

A. $\begin{bmatrix} 112 \\ 77 \end{bmatrix}$

B. $\begin{bmatrix} 120.2 \\ 67.8 \end{bmatrix}$

C. $\begin{bmatrix} 108 \\ 82 \end{bmatrix}$

D. $\begin{bmatrix} 113.6 \\ 76.4 \end{bmatrix}$

E. $\begin{bmatrix} 117.82 \\ 70.18 \end{bmatrix}$

Question 5

Four schools – Northbourne (*N*), Westwood (*W*), Centreville (*V*) and Outer (*O*) – compete in a tournament of minds. The tournament consists of each school playing each other school once. From past experience, a dominance matrix has been composed showing the expected results from each contest. A figure of '1' indicates that the school named in that row defeated the school named in that column, while a figure of '0' is a defeat.

$$\begin{matrix} N & W & V & O \end{matrix}$$
$$\begin{bmatrix} 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \begin{matrix} N \\ W \\ V \\ O \end{matrix}$$

The organisers are revising the rules. The winner of the 2017 tournament can be the school with the

1. highest one-step dominance.

2. highest two-step dominance.

3. highest sum of one- and two-step dominances.

Only one winning school is allowed.

Of these methods, we can correctly state that

A. all three methods produce the same winning school.

B. all methods produce a clear, single winner.

C. only method **3.** distinguishes all four schools with different scores each.

D. Northbourne always wins regardless of the method.

E. Outer never dominates over Northbourne by any methods.

Question 6

Transition matrix T is defined such that but $S_{n+2} = S_n$ but $S_{n+1} \neq S_n$.

If T is a 3×3 matrix such that $S_{n+1} = TS_n$, then

A. $T = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$.

B. T could be $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, but might not be.

C. T is any 3×3 permutation matrix.

D. T could be $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$.

E. T could be $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$.

Question 7

A, B and C are 3×3 matrices. Matrix B is non-singular that no zero elements. We know that $AB = C$.

Which of the following is **not** true?

A. $A = B^{-1}C$ will always find matrix A.
B. $B = A^{-1}C$ will always find matrix B.
C. Matrix A can be singular.
D. Matrix C can be singular.
E. A, B and C could all be binary matrices.

Question 8

Papaya 6 and Papaya 7 brand tablets sell for $300 and $400 respectively.

There are two stores selling each and their sales are summarised in the table below.

	South store	**North store**
Papaya 6	27	37
Papaya 7	61	28

The income, in the form $\begin{bmatrix}\text{South shore}\\ \text{North shore}\end{bmatrix}$ is found by calculating

A. $\begin{bmatrix}27 & 37\\ 61 & 28\end{bmatrix}\begin{bmatrix}300\\ 400\end{bmatrix}$

B. $\begin{bmatrix}27 & 37\\ 61 & 28\end{bmatrix}\begin{bmatrix}400\\ 300\end{bmatrix}$

C. $\begin{bmatrix}27 & 61\\ 37 & 28\end{bmatrix}\begin{bmatrix}300\\ 400\end{bmatrix}$

D. $\begin{bmatrix}27 & 61\\ 37 & 28\end{bmatrix}\begin{bmatrix}400\\ 300\end{bmatrix}$

E. $\begin{bmatrix}400\\ 300\end{bmatrix}\begin{bmatrix}27 & 37\\ 61 & 28\end{bmatrix}$

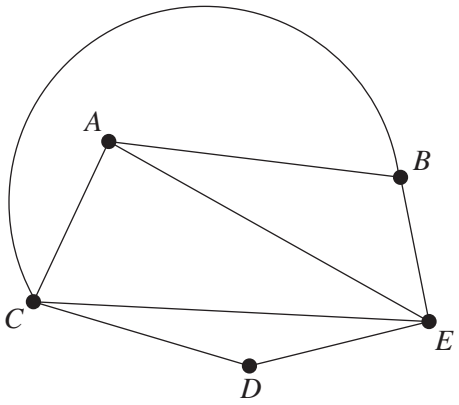
END OF MODULE 1

Module 2 – Networks and decision mathematics

Before answering these questions, you must **shade** the 'Networks and decision mathematics' box on the answer sheet for multiple-choice questions.

Question 1

Consider the network below.

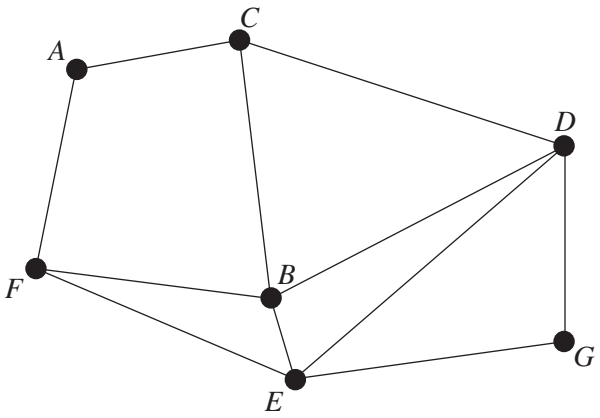


How could this network be changed into one with an Eulerian circuit?

A. Add an edge from *D* to *A*.
B. Remove the edge from *A* to *E*.
C. Remove the edge from *C* to *B*.
D. Remove the edge from *A* to *B*.
E. Add an edge from *A* to *E*.

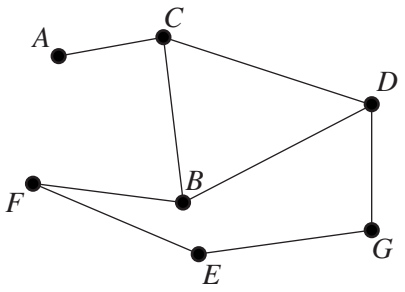
Question 2

Consider the graph below.

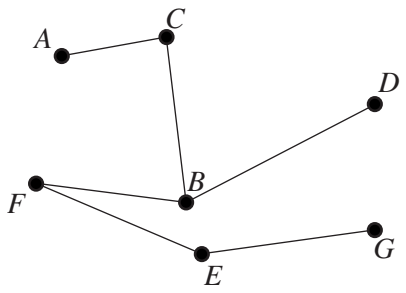


Which of the following graphs is a spanning tree for the above graph?

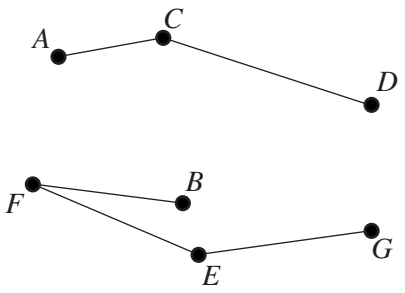
A.



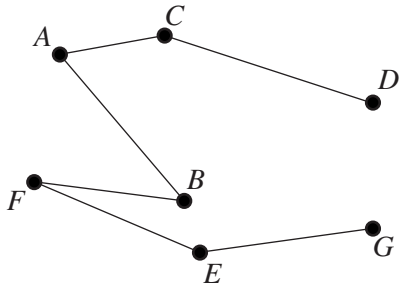
B.



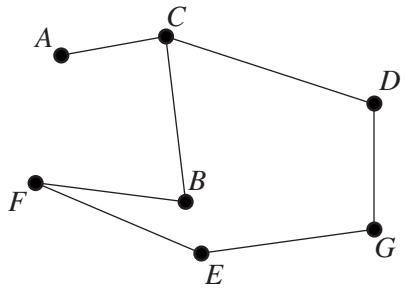
C.



D.



E.



Question 3

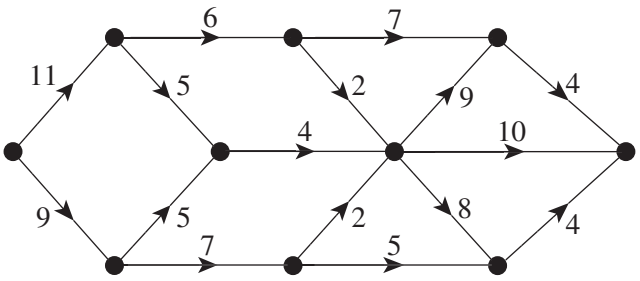
Max has a planar network with 4 vertices. He adds a new vertex and also adds paths to each of the existing 4 vertices.

The number of new faces created is

A. 0
B. 1
C. 2
D. 3
E. 4

Question 4

Consider the network below.



What is the maximum flow through this network?

A. 10
B. 16
C. 17
D. 20
E. 39

Question 5

Clive draws a complete graph with 5 vertices. He wants it to be planar so he must remove at least n edges.

The value of n is

A. 0
B. 1
C. 2
D. 3
E. 4

Question 6

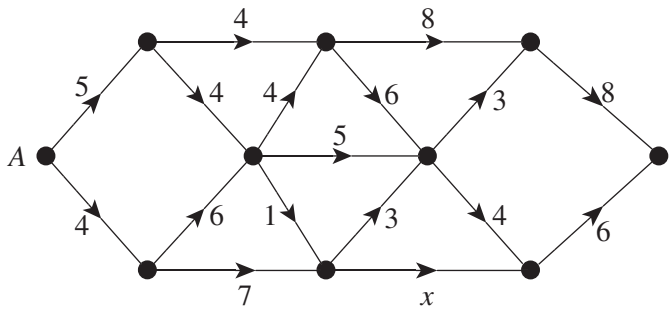
Activity D lies on the critical path for a certain project.

If we increase the duration of D by m minutes, the completion time for the project is

A. reduced.
B. unchanged.
C. increased, but by less than m.
D. increased by m or less.
E. increased by m.

Question 7

Consider the network below.



Using Dijkstra's algorithm or otherwise, the possible values of x so that the length of the shortest path through the network is 23 are

A. $x \leq 6$
B. $x \geq 6$
C. $x \geq 7$
D. $x \leq 7$
E. $x = 7$

Question 8

4 people are being allocated tasks as indicated in the table below. The times that each person will take to complete each task are indicated in minutes.

	Greta	**Muriel**	**Arnold**	**Seth**
Task 1	75	80	95	95
Task 2	70	95	85	90
Task 3	85	95	105	100
Task 4	95	105	105	90

If each person is allocated a different task, the minimum total time for these 4 people to complete these tasks is

A. 325 minutes.
B. 330 minutes.
C. 340 minutes.
D. 345 minutes.
E. 365 minutes.

END OF MODULE 2

Module 3 – Geometry and measurement

Before answering these questions, you must **shade** the 'Geometry and measurement' box on the answer sheet for multiple-choice questions.

Question 1

A sector with radius 6 cm has an area of 32 cm^2.

The subtended angle must be closest to

A. $\frac{8}{9}$ degrees.

B. $\frac{16}{9}$ degrees.

C. 1.78 degrees.

D. 50.93 degrees.

E. 101.86 degrees.

Question 2

A 2.0 kg bag of flour can make thirty standard blueberry muffins. Deluxe size muffins are identical to standard muffins except that they are 25% larger in all dimensions.

The number of deluxe muffins that can be made with a 2.0 kg bag of flour is closest to

A. 7.5
B. 15
C. 19
D. 22.5
E. 24

Question 3

The distance between *P* (12° N, 137° W) and *Q* (12° N, 128° E) is

A. $\frac{95}{360} \times 2\pi \times 6400$

B. $\frac{265}{360} \times 2\pi \times 6400$

C. $\frac{95}{360} \times 2\pi \times 6400\cos(12°)$

D. $\frac{265}{360} \times 2\pi \times 6400\cos(12°)$

E. $\frac{265}{360} \times 2\pi \times 6400\sin(12°)$

Question 4

Landham's Triangle Park is bordered by three roads which are all straight with lengths 1.3 km, 1.5 km and 900 m.

The area of the park is closest to

A. 0.582 km^2

B. 0.585 km^2

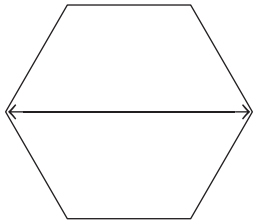
C. 1.164 km^2

D. 1.170 km^2

E. 0.780 km^2

Question 5

This hexagon has perimeter 120 cm.



The width of the hexagon (as indicated in the above diagram) must be

A. 34.6 cm

B. 40.0 cm

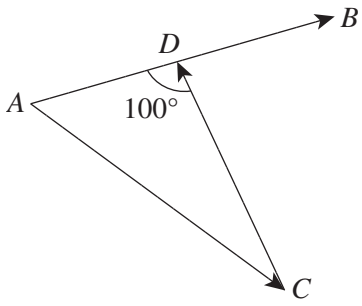
C. 54.6 cm

D. 60.0 cm

E. 69.2 cm

Question 6

Muriel and Martha both set out simultaneously on an orienteering course from the same location (*A*). Muriel travels 2 km on a bearing of 80° T to *B*, while Martha travels 2 km on a bearing of 130° T to *C*. Martha decides that she is on the wrong track and heads back towards Muriel's track as shown on the map below. She radios Muriel and they plan to meet at *D*, which Muriel begins to backtrack towards.



Martha must travel

A. 0.58 km less than Muriel.

B. 0.54 km further than Muriel.

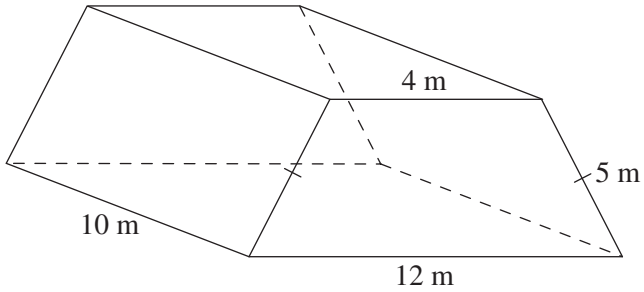
C. 0.58 km further than Muriel.

D. 1.02 km further than Muriel.

E. 1.56 km further than Muriel.

Question 7

A solar dome is built using the design shown below.



It is designed to be capable of retaining heat and using natural light so that it will be energy efficient. The measurements are as shown, but the manufacturers want to ensure that it is large enough.

The volume of the dome is

A. 240 m^3

B. 400 m^3

C. 480 m^3

D. 600 m^3

E. 2400 m^3

Question 8

Jason has received a hollow pyramid as a Christmas present. It is 15 cm tall and has a 100 cm^2 square base. He is unsure how to use it but decides to try it as a pretzel holder. Jason wants to find the longest straight pretzel that can fit into the pyramid.

This longest pretzel has length

A. 10.00 cm

B. 14.14 cm

C. 15.00 cm

D. 16.58 cm

E. 20.62 cm

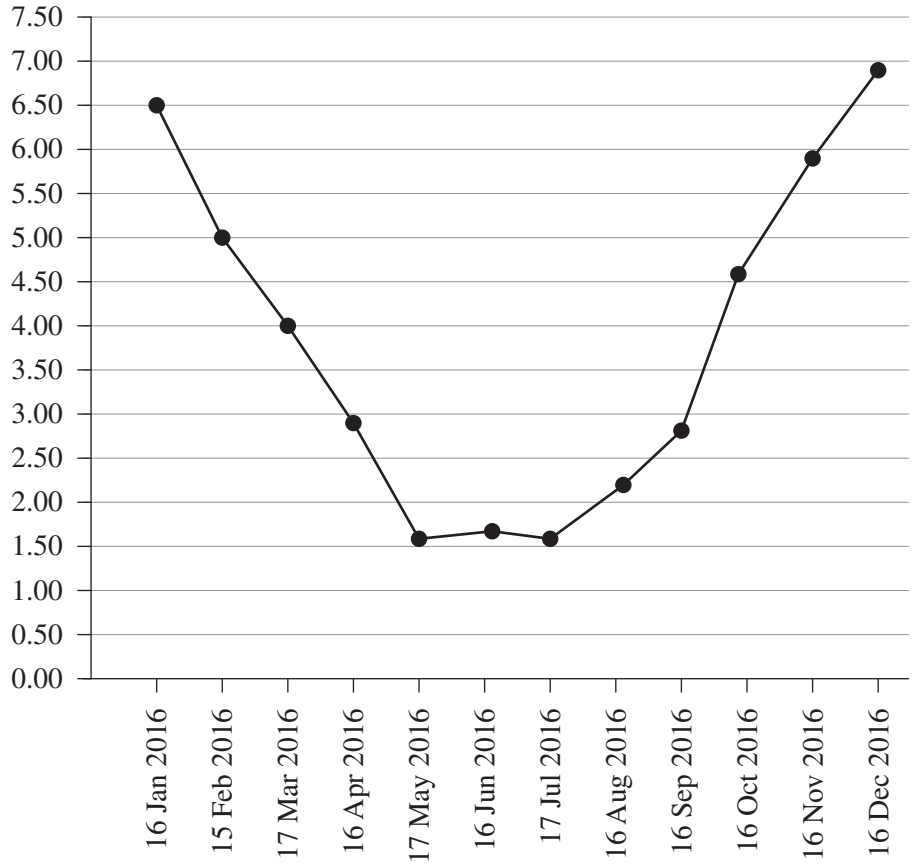
END OF MODULE 3

Module 4 – Graphs and relations

Before answering these questions, you must **shade** the 'Graphs and relations' box on the answer sheet for multiple-choice questions.

Question 1

Johnson's solar energy generation per day is given below.



Over which monthly interval does the generation per day increase fastest?

A. 16 January 2016 to 15 February 2016
B. 16 April 2016 to 15 May 2016
C. 16 June 2016 to 15 July 2016
D. 16 September 2016 to 15 October 2016
E. 16 November 2016 to 16 December 2016

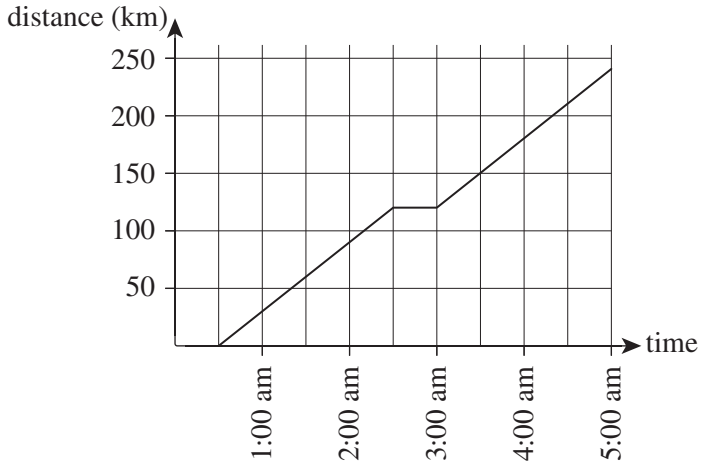
Question 2

The line $3x - 2y = 6$ does **not** pass through

A. (2, 0)
B. (0, –3)
C. (4, 3)
D. (–2, 3)
E. (–4, –9)

Use the following information to answer Questions 3 and 4.

A bus leaves on a journey of 240 km. Its progress is shown in the graph below, with time measured from midnight and distance travelled measured in km.



Question 3

Which of the following statements is **not** true?

A. From the moment the bus leaves until it arrives at its destination, its average speed is 60 km/h.

B. The bus has a 30 minute stop during its journey.

C. The bus' initial speed is 60 km/h (when its journey begins).

D. The total time spent moving by the bus is 4 hours.

E. The bus' maximum speed is 60 km/h.

Question 4

The bus was due to arrive at its destination at 4:30 am. At 3:00 am, the driver notices that he is running behind schedule.

At what speed would he need to drive to arrive at his destination on time?

A. 60 km/h

B. 70 km/h

C. 75 km/h

D. 80 km/h

E. 90 km/h

Question 5

Zoe can buy 2 pies and 3 pizza slices for $14. James has $19, but that is not enough to buy 3 pies and 4 pizza slices.

A possible equation for the cost of x pies and y pizza slices is

A. $C = 4x + 1.75y$

B. $C = 4x + 2y$

C. $C = 4x + 2.25y$

D. $C = 3.5x + 2.5y$

E. $C = 2.0x + 3.2y$

Question 6

Jamie and Mary each have linear programming problems. They each sketch their constraints and thus show their respective feasible regions. All corner points of their feasible regions have integer coordinates. They each have the same objective function, $C = 5x + 3y$. Jamie is surprised to find that when he graphs $C = 100$ on the same graph, the line is parallel to one of the constraints that bounds his feasible region. Mary sketches $C = 100$ on her graph but it is not parallel to any of her constraints.

Which of the following statements is true?

A. There must be an infinite number of solutions to Jamie's problem but only one solution to Mary's.

B. There may be multiple solutions for Jamie's problem and infinite solutions for Mary's.

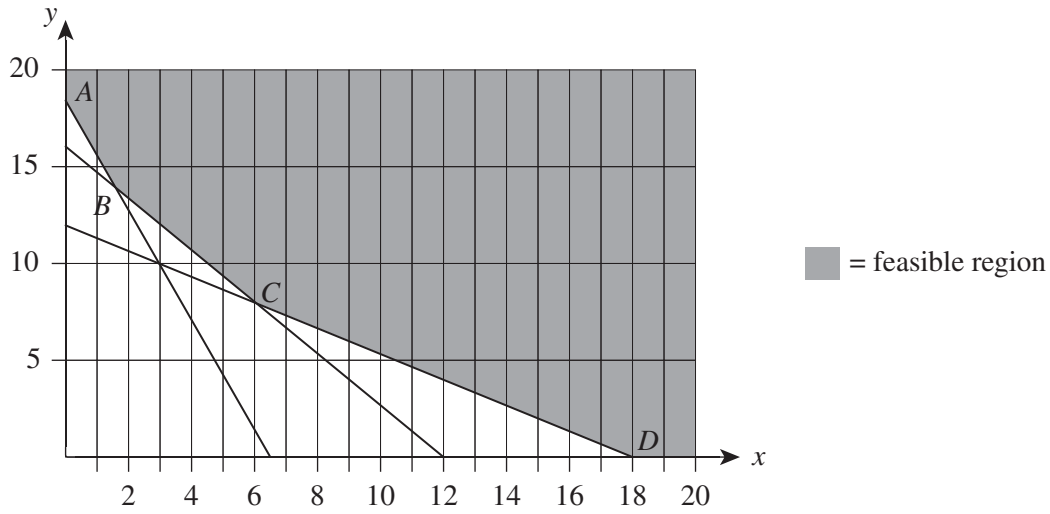
C. There may be multiple solutions for Jamie's problem but only one for Mary's.

D. There may be multiple solutions for Mary's problem but only one for Jamie's.

E. There may be multiple solutions for Mary's problem and there must be multiple solutions to Jamie's problem.

Question 7

A business is trying to reduce their wage cost without reducing their output of products to sell. The constraints are as shown below.



One of the constraints shown is $8x + 3y \geq 54$. Another is $4x + 3y \geq 48$. Once they apply their objective function, the business discovers that the optimal solution is at point B. However, a new wage deal is agreed to and the constraint $2x + 3y \geq 36$ becomes $2x + 3y \geq 44$.

This change will

A. alter both the point at which the solution is found and the minimum total wage cost.

B. alter the point at which the solution is found but not the minimum total wage cost.

C. alter the minimum total wage cost but not the point on the graph at which the solution is found.

D. alter neither the point at which the solution is found nor the minimum total wage cost.

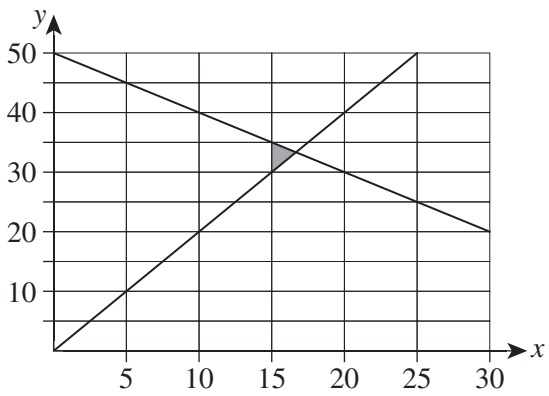
E. not allow us to know the possible changes to the solution.

Question 8

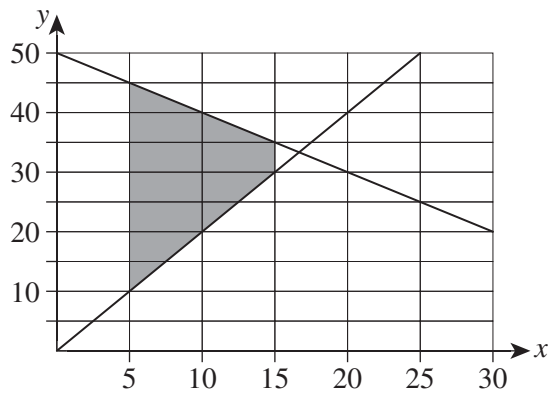
Two suppliers of yoghurt exist for Go Lo supermarkets – Wyndsom and Yallabut dairies. The contracts require that Wyndsom must supply at least twice that which Yallabut supplies. Each week, 50 tonnes (maximum) of yoghurt can be supplied in total. Wyndsom must supply a maximum of 40 tonnes and Yallabut supplies a minimum of 15 tonnes. Let x measure the tonnes supplied by Yallabut and y the tonnes supplied by Wyndsom.

Which of the following graphs shows the feasible region correctly?

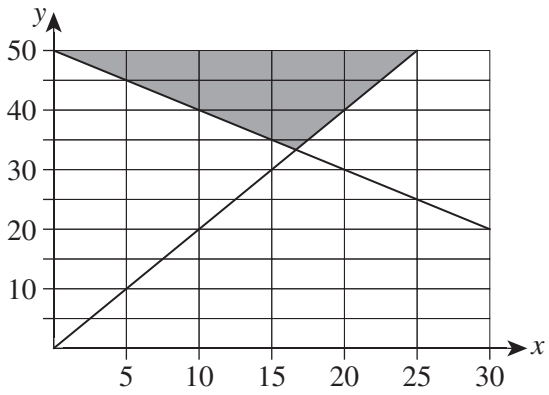
A.



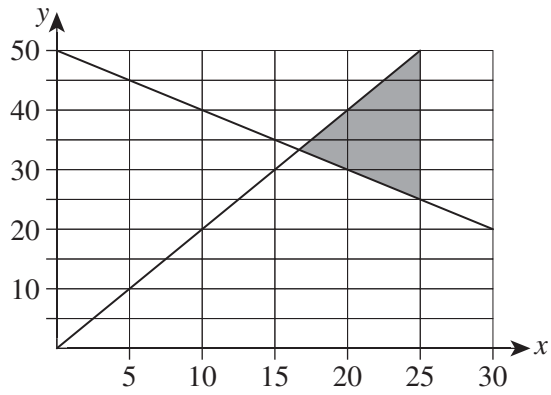
B.



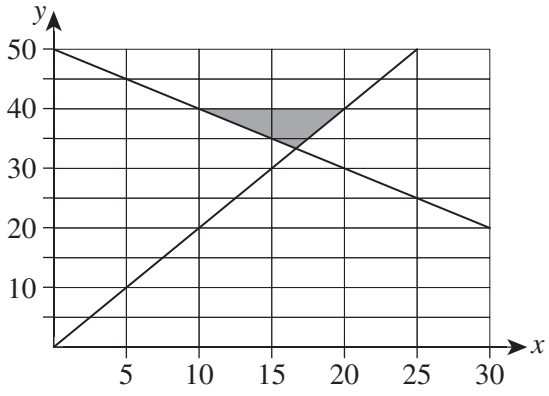
C.



D.



E.



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