



Trial Examination 2016

# 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 29 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.

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

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**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**

The descriptive statistic 8.5 is calculated from the data set shown below.

3, 3, 5, 6, 7, 7, 12, 12, 12, 18

Which of the following does it represent?

- A. mean
- B. median
- C. mode
- D. range
- E. interquartile range (IQR)

**Question 2**

The seasonal indices for the number of lunch orders at a school canteen are shown in the table below.

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Seasonal index	0.8	0.7	0.9	1.2	1.4

If the number of orders taken on Thursday was 84, then the deseasonalised figure is

- A. 1.2
- B. 5
- C. 70
- D. 100.8
- E. 85.2

**Question 3**

A discrete numerical set of data is best represented by

- A. a pie chart.
- B. a histogram.
- C. a frequency table.
- D. an ogive curve.
- E. a frequency polygon.

**Question 4**

The correlation coefficient for two variables,  $x$  and  $y$ , is calculated to be  $-0.9$ .

It is always true that

- A. the gradient is  $-0.9$ .
- B. 90% of the change in  $y$  is due to a change in  $x$ .
- C.  $y$  is the response variable.
- D. as the value of  $x$  increases, the value of  $y$  decreases.
- E. the two variables have opposite signs.

**Question 5**

The back-to-back stem plot below displays the ages of visitors at an art show on a particular Saturday.

Male		Female
	0	5 6
6	1	3 4 6
3 2	2	2 2
9 8 6	3	6
8 8 6 4	4	5 6 6 6 8
7 3 1	5	2 3 3 5 7 9
7 5	6	2 4 5
2	7	2 3

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

- A. The oldest person who attended is 73 years of age.
- B. The data for female ages has a greater range.
- C. The figures for both sexes are symmetrical.
- D. The median of both data sets is 47 years of age.
- E. More females than males attended.

**Question 6**

The following experimental data was recorded.

$t$	0	1	2	3	4	5	6
$n$	45	52	75	90	112	123	140

The  $(2, 75)$  point was found to have been recorded incorrectly. The correct figure should have been  $(2, 83)$ .

Which of the following statements best describes the effect on the univariate statistics for  $n$ ?

- A. There is no effect because the change is too small.
- B. The IQR and range will both slightly increase.
- C. Both the mean and median will slightly increase.
- D. The only change will be a slight increase in the mean.
- E. The 5-figure summary will change.

Use the following information to answer Questions 7 and 8.

This set of data represents a company's mean daily sales over eight consecutive quarters.

Quarter ( $q$ )	1	2	3	4	5	6	7	8
Mean daily sales ( $s$ )	48	44	51	58	54	55	63	60

### Question 7

The 3-point moving mean centred on quarter 5 is

- A. 54.0
- B. 54.1
- C. 55.0
- D. 55.7
- E. 56.0

### Question 8

The trend line for the data is given by the expression  $s = 44 + 2.2q$ .

An estimate for the mean daily sales for the 10th quarter is

- A. 60
- B. 62
- C. 63.8
- D. 66
- E. 68.2

### Question 9

A data set is normally distributed with a mean of 65 and a standard deviation of 15.

The percentage of the data that lies between 50 and 95 is approximately

- A. 34%
- B. 47%
- C. 68%
- D. 81%
- E. 95%

### Question 10

100 adults were surveyed concerning their opinion on Australia becoming a republic.

	Men	Women
Vote yes	48	2
Vote no	30	20

From this two-way table, which observation is **inaccurate**?

- A. The yes/no vote is evenly split for the population.
- B. More men than women were surveyed.
- C. 91% of women surveyed voted no.
- D. 38% of men surveyed voted no.
- E. More women than men voted no.

**Question 11**

A method for smoothing the graph of the raw data to see an underlying trend more clearly is

- A. deseasonalising the data.
- B. transforming the data.
- C. least squares regression.
- D. interpolation.
- E. extrapolation.

**Question 12**

The following experimental data was found.

$x$	10	15	20	25	30	35
$y$	458	1600	1710	1900	4000	5100

After an  $x^2$  transformation is applied, the correlation coefficient is closest to

- A.  $-1.0$
- B.  $-0.9$
- C.  $0.9$
- D.  $1.0$
- E.  $4.2$

**Question 13**

It is found that the correlation coefficient between the number of fast-food outlets and the number of hospital beds in a city is 0.8. This seems to suggest that the fast-food outlets cause a need for more hospital beds, which can be shown to be false. It is possible that both variables respond to the population of the town.

From this information we could say that the correlation result is

- A. a confounding correlation.
- B. a common response correlation.
- C. a coincidence correlation.
- D. an incorrect value.
- E. accurate and useful to draw conclusions from without further interpretation.

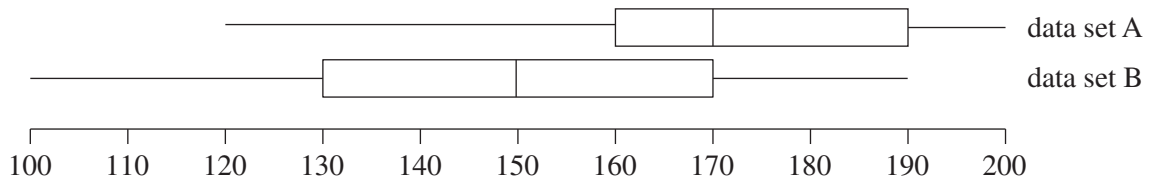
**Question 14**

18, 14, 16, 22, 25, 37, 5, 20

The range, after excluding any outliers, is

- A. 10
- B. 19
- C. 20
- D. 22
- E. 31

**Question 15**

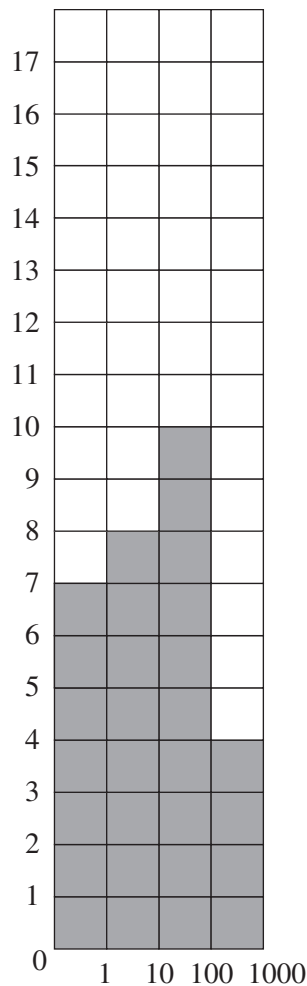


What conclusion can be drawn from the parallel boxplots shown?

- A. Data set B is negatively skewed.
- B. 50% of the data in set B is less than Q1 for set A.
- C. The median of set B is the same as for set A.
- D. The mean of set A is 20 more than the mean of set B.
- E. Set A has a greater range.

**Question 16**

The following data has been plotted using a log scale on the horizontal axis.



Which of the following is most likely to be the median of the data?

- A. 0.7
- B. 7
- C. 9
- D. 80
- E. 400

**Recursion and financial modelling****Question 17**

$$P_{n+1} = 5P_{n-2}, P_0 = 5$$

The terms  $P_1$ ,  $P_2$  and  $P_3$  in the above recursive relationship are

- A. 5, 1, -19
- B. 5, 25, 125
- C. 1, -19, -119
- D. 1, 5, 25
- E. 5, 1, 19

**Question 18**

Gina borrows \$230 000 to purchase a block of land. She repays the loan monthly, at a rate of 5% per annum, to repay the debt after 10 years.

Gina's monthly repayment is closest to

- A. \$1917
- B. \$2438
- C. \$2440
- D. \$4329
- E. \$4879

**Question 19**

An item costing  $M$  depreciates at an average of 2.3% per annum.

After 4 years, the value of the article can be calculated using

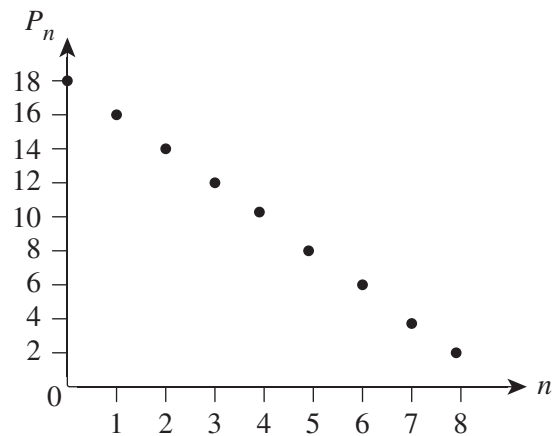
- A.  $M_4 = M_0 \times 1.023^4$
- B.  $M_5 = M_1 \times 1.23^4$
- C.  $M_4 = M_0 \times 0.77^4$
- D.  $M_4 = M_0 - 4 \times 0.977$
- E.  $M_4 = M_0 \times 0.977^4$

**Question 20**

Ann is earning 5% per annum simple interest on her savings of \$2000.

Which of the following expressions can be used to calculate the balance of her account after 4 years where  $t_n$  = the sum after  $n - 1$  years?

- A.  $t_5 = 2000 + 0.05 \times 4$
- B.  $t_5 = 2000 \left(1 + \frac{5}{100}\right)^4$
- C.  $t_5 = (2000 \times 1.05)^4$
- D.  $t_5 = 2000 + 4(0.05 \times 2000)$
- E.  $t_4 = 2000 \times 1.05^4$

**Question 21**

The equation of this recursive relation could be

- A.  $P_{n+1} = P_n - 2, P_0 = 18$
- B.  $P_{n+1} = P_n + 2, P_0 = 18$
- C.  $P_{n+1} = 34 - P_n, P_0 = 18$
- D.  $P_{n+1} = -2P_n + 18$
- E.  $P_{n+1} = -2P_n, P_0 = 18$



**Question 22**

\$25 000 is invested at 4% per annum, calculated and added annually. Each year a further \$10 000 is added to the principal.

To find the value after  $n$  years, you could set up which recursive relation?

- A.  $t_{n+1} = t_n \times 0.04 + 10\,000, t_0 = 25\,000$
- B.  $t_n = t_{n+1} \times 0.04 + 10\,000, t_0 = 25\,000$
- C.  $t_n = t_0 \times 1.04 + 10\,000, t_0 = 25\,000$
- D.  $t_{n+1} = t_n \times 1.04 + 10\,000, t_0 = 25\,000$
- E.  $t_2 = 35\,000 \times 0.04 + 10\,000$

**Question 23**

A loan is advertised as charging 4.5% per annum compounding monthly.

Assuming no repayments are made, what is the effective interest rate over the first 12 months?

- A. 1.045%
- B. 1.046%
- C. 3.5%
- D. 4.5%
- E. 4.6%

**Question 24**

A loan is taken where there are no repayments until the end of the 5-year period.

How much extra interest is charged when the compounding period is changed from monthly to daily on a loan of \$25 000 at 5% per annum?

- A. \$16.12
- B. \$96.88
- C. \$112.75
- D. \$32 003.97
- E. \$32 083.97

**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.

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.

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**Module 1 – Matrices**

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

**Question 1**

If  $P = \begin{bmatrix} 1 & 2 & 4 \\ 3 & 0 & -1 \\ 1 & -2 & 2 \end{bmatrix}$ , then  $P_{1,2} =$

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

**Question 2**

If  $Q = \begin{bmatrix} 2 & 4 \\ 1 & 2 \end{bmatrix}$ , then

- A.  $Q^{-1}$  is undefined.
- B.  $Q^{-1} = \begin{bmatrix} 2 & -4 \\ -1 & 2 \end{bmatrix}$
- C.  $Q^{-1} = \begin{bmatrix} -2 & 4 \\ 1 & -2 \end{bmatrix}$
- D.  $Q^{-1} = \begin{bmatrix} -2 & 1 \\ 4 & -2 \end{bmatrix}$
- E. we can show that  $QQ^{-1} = Q^{-1}Q = I$ .

**Question 3**

If  $P = \begin{bmatrix} 1 & 2 & 4 \\ 3 & 0 & -1 \\ 1 & -2 & 2 \end{bmatrix}$ ,  $Q = \begin{bmatrix} 2 & 1 \\ 3 & 0 \\ 4 & 2 \end{bmatrix}$ , then  $PQ + Q =$

A. undefined

B.  $\begin{bmatrix} 26 & 10 \\ 5 & 1 \\ 8 & 7 \end{bmatrix}$

C.  $\begin{bmatrix} 24 & 9 \\ 2 & 1 \\ 4 & 5 \end{bmatrix}$

D.  $\begin{bmatrix} 48 & 18 \\ 4 & 2 \\ 8 & 10 \end{bmatrix}$

E.  $\begin{bmatrix} 26 & 10 \\ 5 & 1 \\ 4 & 5 \end{bmatrix}$

**Question 4**

If  $P$  is a permutation matrix, then  $P^2$

- A. is undefined.
- B. is defined and is also a permutation matrix.
- C. is defined but is not a permutation matrix.
- D. is defined and may or not be a permutation matrix, depending on the value of  $P$ .
- E. may or not be defined depending on the value of  $P$ .

**Question 5**

Given that  $\begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix} \times Q = \begin{bmatrix} 4 & 2 \\ -6 & 4 \end{bmatrix}$ ,  $Q$  is equal to

A.  $\begin{bmatrix} -10 & 16 \\ -20 & 18 \end{bmatrix}$

B.  $\begin{bmatrix} 5 & -8 \\ 10 & -9 \end{bmatrix}$

C.  $\frac{1}{5} \begin{bmatrix} 34 & -4 \\ -16 & 6 \end{bmatrix}$

D.  $\frac{1}{5} \begin{bmatrix} -17 & 2 \\ 8 & -3 \end{bmatrix}$

E.  $\frac{1}{5} \begin{bmatrix} 17 & -2 \\ -8 & 3 \end{bmatrix}$

Use the following information to answer Questions 6–8.

Greenhills City Book Club has two branches, San Juan and Shaw. Books borrowed from either San Juan or Shaw may be returned to either branch.

After analysis over 2015, the following is noted:

- 85% of books borrowed from San Juan are returned to the same branch; the rest are returned to Shaw.
- 75% of books borrowed from Shaw are returned to Shaw; the rest are returned to San Juan.
- In total, there are 800 books at San Juan and 960 at Shaw in January 2016.

Each loan is for one month and we will assume that under normal circumstances, no books are returned early or late. We will also assume that under normal circumstances, all books are borrowed each month.

### Question 6

If this trend continues, the number of books at each branch in March 2016 will be

- A. 920 and 840 at San Juan and Shaw respectively.
- B. 992 and 768 at San Juan and Shaw respectively.
- C. 1035 and 725 at San Juan and Shaw respectively.
- D. 1050 and 710 at San Juan and Shaw respectively.
- E. 1061 and 699 at San Juan and Shaw respectively.

### Question 7

The steady state solution in the format  $\begin{bmatrix} \text{San Juan} \\ \text{Shaw} \end{bmatrix}$  is

- A.  $\begin{bmatrix} 660 \\ 1100 \end{bmatrix}$
- B.  $\begin{bmatrix} 800 \\ 960 \end{bmatrix}$
- C.  $\begin{bmatrix} 880 \\ 880 \end{bmatrix}$
- D.  $\begin{bmatrix} 920 \\ 840 \end{bmatrix}$
- E.  $\begin{bmatrix} 1100 \\ 660 \end{bmatrix}$

**Question 8**

There is a problem, however. Every month, 4 books that would have been returned to San Juan and 2 books that would have gone to Shaw are not returned. Each month 6 books are purchased and stored at the Shaw branch.

The club wishes to write an equation predicting the number of books at both branches after  $n$  months in the

format  $B = \begin{bmatrix} \text{San Juan} \\ \text{Shaw} \end{bmatrix}$ .

The correct equation is

A.  $B_{n+1} = \begin{bmatrix} 0.85 & 0.25 \\ 0.15 & 0.75 \end{bmatrix} B_n + \begin{bmatrix} -4 \\ 4 \end{bmatrix}$

B.  $B_{n+1} = \begin{bmatrix} 0.85 & 0.25 \\ 0.15 & 0.75 \end{bmatrix} B_n + \begin{bmatrix} -4 \\ -2 \end{bmatrix}$

C.  $B_{n+1} = \begin{bmatrix} 0.85 & 0.25 \\ 0.15 & 0.75 \end{bmatrix} \left( B_n + \begin{bmatrix} -4 \\ 4 \end{bmatrix} \right)$

D.  $B_{n+1} = \begin{bmatrix} 0.85 & 0.25 \\ 0.15 & 0.75 \end{bmatrix} \left( B_n + \begin{bmatrix} -4 \\ -2 \end{bmatrix} \right)$

E.  $B_{n+1} = \begin{bmatrix} 0.85 & 0.15 \\ 0.25 & 0.75 \end{bmatrix} \left( B_n + \begin{bmatrix} -4 \\ 4 \end{bmatrix} \right)$

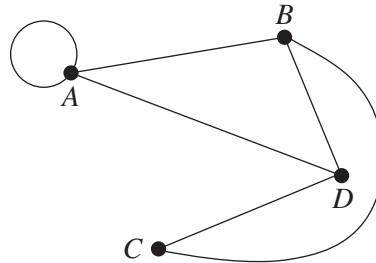
**END OF MODULE 1**

**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.



The network can be represented by matrix

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

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

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

D. 
$$\begin{bmatrix} 4 & 0 & 0 & 0 \\ 0 & 3 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 3 \end{bmatrix}$$

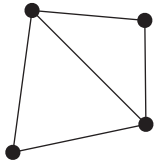
E. 
$$\begin{bmatrix} 2 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$$



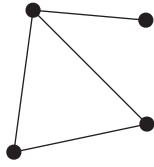
**Question 2**

Which of the graphs below has an Eulerian circuit?

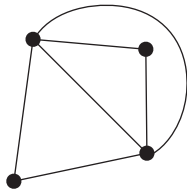
**A.**



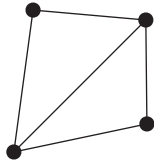
**B.**



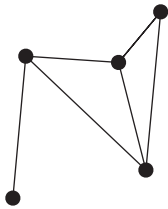
**C.**



**D.**

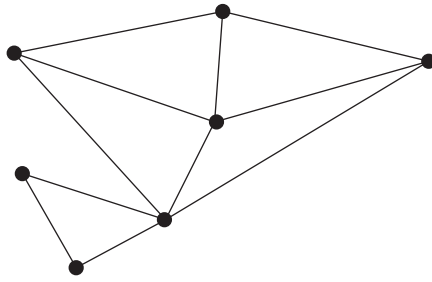


**E.**



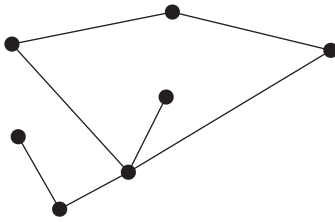
**Question 3**

Consider the graph below.

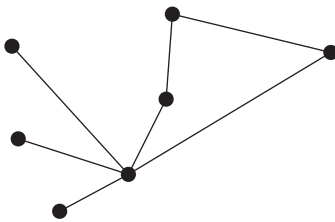


A possible spanning tree for the graph is

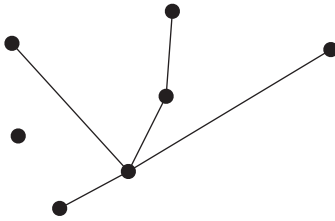
A.



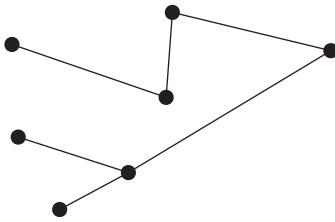
B.



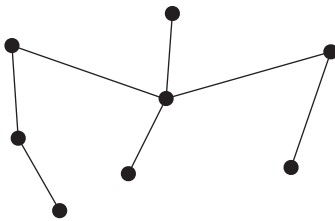
C.



D.



E.



**Question 4**

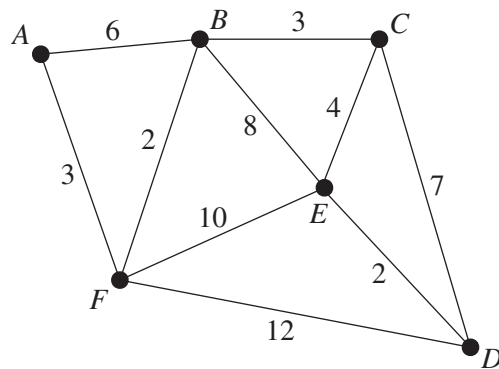
Ruth drew a graph with 6 vertices.

The sum of the degree of all the vertices could **not** be

- A. 8
- B. 9
- C. 10
- D. 12
- E. 16

**Question 5**

Consider the network below.



The shortest path between  $A$  and  $D$  in the network is

- A. 12
- B. 14
- C. 15
- D. 16
- E. 18

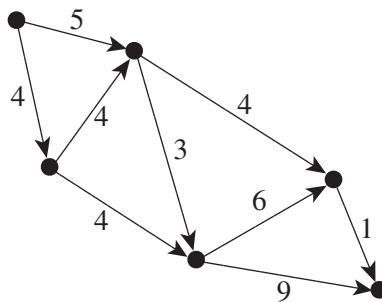
**Question 6**

Bert has a planar graph but wants to change it. He will add 2 vertices and 3 faces.

He will need to add

- A. 1 edge.
- B. 2 edges.
- C. 3 edges.
- D. 4 edges.
- E. 5 edges.

**Question 7**

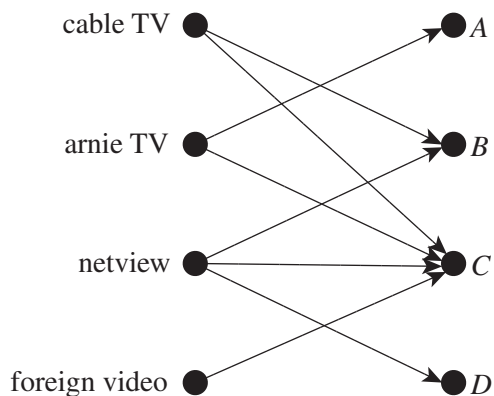


The maximum flow in the above network is

- A. 7
- B. 8
- C. 9
- D. 10
- E. 19

**Question 8**

The bipartite graph shown below illustrates the distribution of various services in a series of households.



All 4 households are asked to name their single favourite of the 4 services (they must be receiving it already). All 4 name different services, so each of the 4 services is listed as a favourite by 1 household.

Household *B* prefers

- A. cable TV.
- B. arnie TV.
- C. netview.
- D. foreign video.
- E. This cannot be determined from the information given.

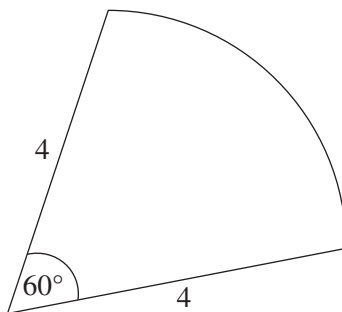
**END OF MODULE 2**

**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**

Consider the arc below.



The length of the arc is closest to

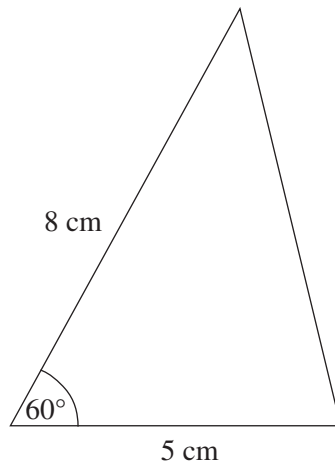
- A. 4.19
- B. 8.38
- C. 12.57
- D. 25.13
- E. 50.26

**Question 2**

A certain map has scale 1 : 2500.

A road that is 50 m long will appear on the map as length

- A. 2 mm
- B. 5 mm
- C. 2 cm
- D. 20 cm
- E. 2 m

**Question 3**

The above triangle has an area of

- A.  $10.0 \text{ cm}^2$
- B.  $17.3 \text{ cm}^2$
- C.  $20.0 \text{ cm}^2$
- D.  $34.7 \text{ cm}^2$
- E.  $40.0 \text{ cm}^2$

**Question 4**

Magnusson ( $12^\circ\text{S } 155^\circ\text{W}$ ) and Nonmel ( $12^\circ\text{N } 170^\circ\text{E}$ ) are

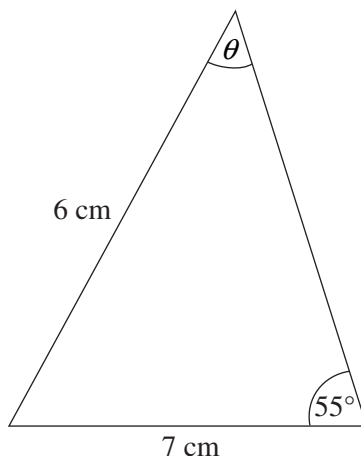
- A.  $\frac{15}{180} \times 2\pi \times 6400$  apart.
- B.  $\frac{35}{180} \times 2\pi \times 6400$  apart.
- C.  $\frac{15}{180} \times 2\pi \times 6400 \cos(12)$  apart.
- D.  $\frac{35}{180} \times 2\pi \times 6400 \cos(12)$  apart.
- E.  $\frac{12}{180} \times 2\pi \times 6400$  apart.

**Question 5**

Bardwell Hospital, which specialises in heart operations, decides to place a giant replica of a human heart in front of the building. Instead of being the same length as a human heart (12 cm), the giant heart will be 3.6 m long, but otherwise identical.

The volume of the giant heart will be

- A. 30 times that of a human heart.
- B. 300 times that of a human heart.
- C. 900 times that of a human heart.
- D. 2700 times that of a human heart.
- E. 27 000 times that of a human heart.

**Question 6**

The angle labelled  $\theta$  in the above diagram could be

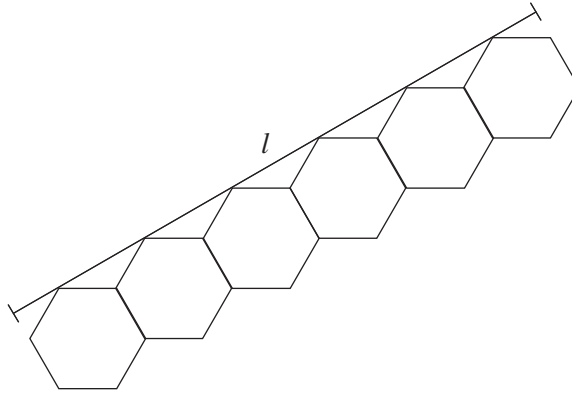
- A. 17.9°
- B. 44.6°
- C. 64.2°
- D. 115.8°
- E. 107.1°

**Question 7**

Agnes has an orienteering course in the shape of an isosceles triangle. The longest side is 150 m, while the shorter sides are both 120 m.

The largest angle can be found using

- A.  $\cos(\theta) = \frac{150^2 - 120^2 - 120^2}{2 \times 120 \times 120}$
- B.  $\cos(\theta) = \frac{150^2 - 120^2 - 120^2}{2 \times 150 \times 120}$
- C.  $\cos(\theta) = \frac{120^2 + 120^2 - 150^2}{2 \times 120 \times 120}$
- D.  $\cos(\theta) = \frac{120^2 + 120^2 - 150^2}{2 \times 150 \times 120}$
- E.  $\cos(\theta) = \frac{120}{150}$

**Question 8**

Bees form honeycomb using a series of regular hexagons.

If each hexagon has a side length of 5 mm, then the series of 6 hexagons shown here would have length ( $l$ ) where

- A.  $l = 2.00$  cm
- B.  $l = 3.00$  cm
- C.  $l = 4.00$  cm
- D.  $l = 5.20$  cm
- E.  $l = 6.00$  cm

**END OF MODULE 3**

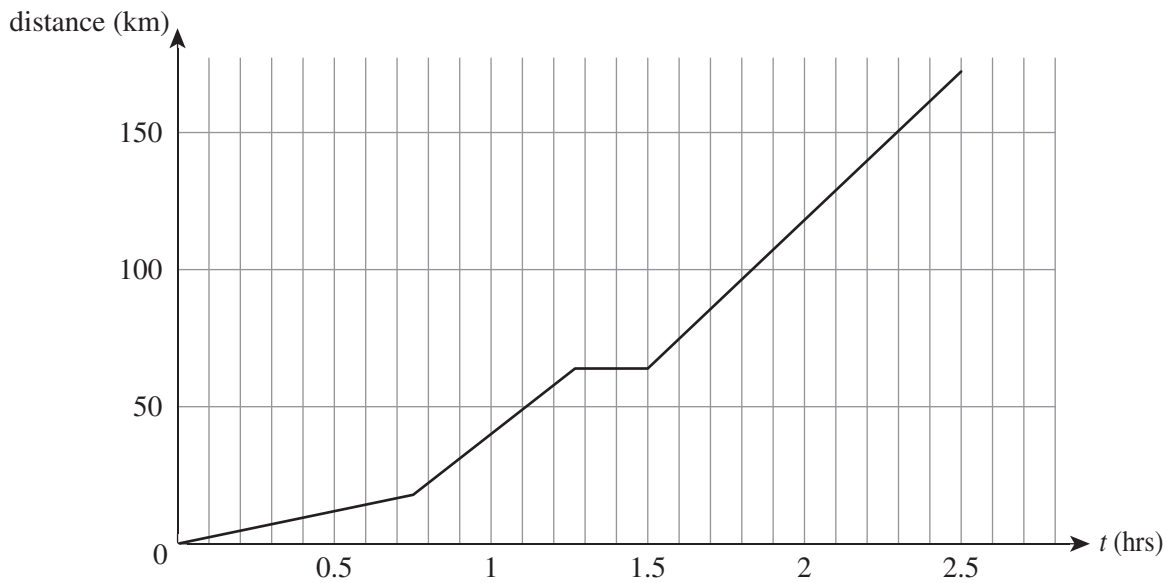


**Module 4 – Graphs and relations**

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

**Question 1**

Simone drives to Ballarat from Melbourne, but stops for food on the way. The graph showing her location is given below.



At what time after she began did Simone stop for food?

- A. 1.0 hour
- B. 1.20 hours
- C. 1.25 hours
- D. 1.50 hours
- E. 2.50 hours

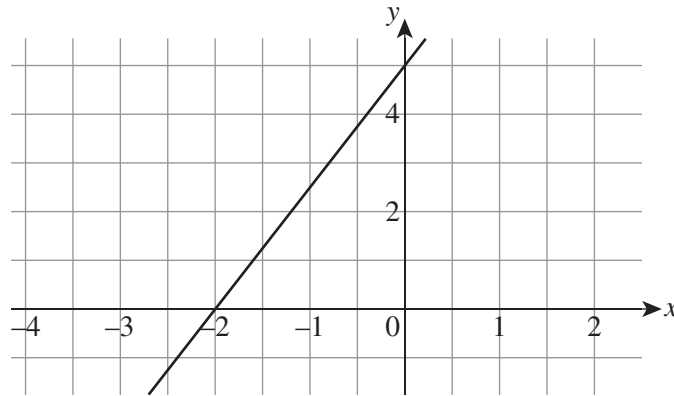
**Question 2**

A point that does **not** satisfy the inequality  $3x - 4y \leq 12$  is

- A. (4, 0)
- B. (0, 3)
- C. (0, -3)
- D. (4, -3)
- E. (4, 3)

**Question 3**

Consider the graph below.



The equation of the straight line shown is

- A.  $y = 5x - 1$
- B.  $y = -2x + 5$
- C.  $5x + 2y = 10$
- D.  $-5x + 2y = 10$
- E.  $5x - 2y = 10$

**Question 4**

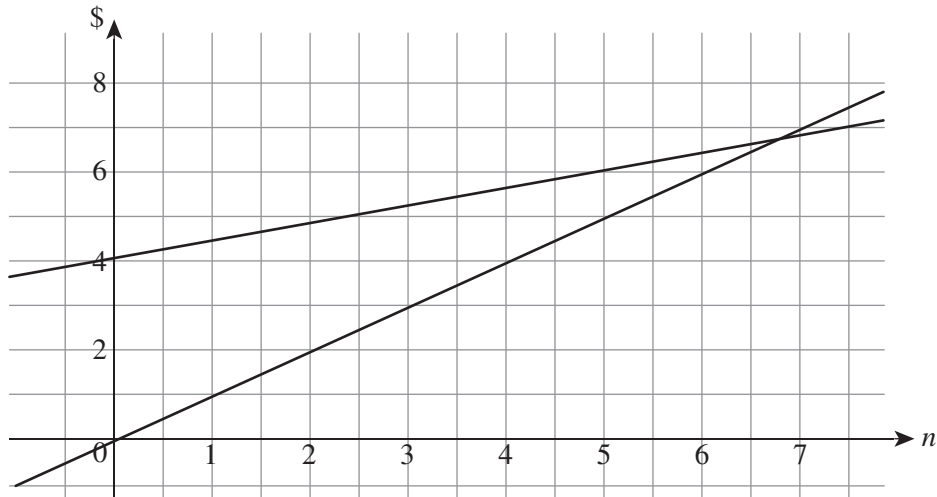
At a formal dance there must not be a difference of more than 10 between the number of boys and girls attending.

If  $x$  = number of boys and  $y$  = number of girls, then the correct set of constraint(s) is

- A.  $y \geq x - 10$
- B.  $y \leq x + 10$
- C.  $\begin{cases} y \geq x - 10 \\ y \leq x + 10 \end{cases}$
- D.  $\begin{cases} y \geq 10x \\ y \leq \frac{x}{10} \end{cases}$
- E.  $\begin{cases} y \leq 10x \\ y \geq \frac{x}{10} \end{cases}$

**Question 5**

Travellers on the Occident Express are charged \$1.00 for each section of the train line they travel within. Travellers cannot be charged for travel through only part of a section. They must pay for the entire section. A members card costs \$4.00, but allows passengers to pay \$0.40 per station instead of \$1.00. A traveller correctly forms equations  $C_p = n$  and  $C_m = 4 + 0.4n$  for ordinary passengers and members respectively, where  $n$  is the number of sections travelled within. They also decide to graph these to obtain a diagrammatical means of determining all of the possible costs of each. The graph is shown below.

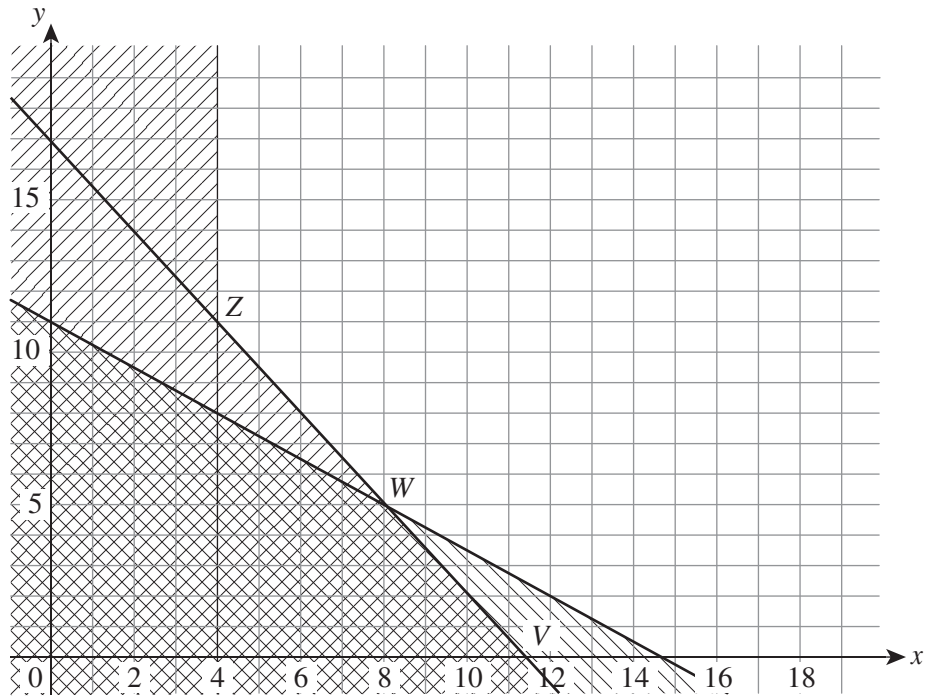


This graph is

- A. adequate and appropriate, as it correctly shows both equations.
- B. adequate and appropriate, as it complies with the information in the question.
- C. inadequate and inappropriate, as it does not correctly show both equations.
- D. inadequate and inappropriate, as it does not show the information in the question.
- E. inappropriate, as it ignores the fact that only whole numbers of sections are allowed.

**Question 6**

The graph below shows the feasible region for a linear programming problem.



The minimum value of function  $C = 3x + 4y$  occurs at point/s

- A. V
- B. W
- C. Z
- D. V and W equally
- E. W and Z equally

Use the following information to answer Questions 7 and 8.

'Flat and Green' are a lawn mower company. They make two mowers: the standard and the deluxe. The standard takes a worker 8 hours to assemble and can sell at a profit of \$420. The deluxe takes a worker 13 hours to assemble and sells at a profit of \$790. The factory has 10 workers, each working an 8-hour day. The company will make  $x$  standard and  $y$  deluxe mowers each week. They wish to make the largest possible profit.

**Question 7**

The assembly constraint is

- A.  $8x + 13y \leq 10$
- B.  $8x + 13y \geq 10$
- C.  $8x + 13y \geq 80$
- D.  $8x + 13y \leq 80$
- E.  $x + y \leq 1210$

**Question 8**

The objective is to

- A. maximise  $x + y$ .
- B. minimise  $x + y$ .
- C. maximise  $420x + 790y$ .
- D. minimise  $420x + 790y$ .
- E. maximise  $8x + 13y$ .

**END OF MULTIPLE-CHOICE QUESTION BOOKLET**