2016
VCE
Further Mathematics
Trial Examination 1

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VICTORIAN CERTIFICATE OF EDUCATION
2016

FURTHER MATHEMATICS

Trial Written Examination 1 (Facts, skills and applications)

Reading time: 15 minutes
Total writing time: 1 hour 30 minutes

MULTIPLE-CHOICE QUESTION BOOK

Structure of book

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 exam 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 book of 45 pages.
- Formula sheet
- Answer sheet for multiple-choice questions.
- Working space is provided throughout the book.

Instructions
- Check that your **name and student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

At the end of the examination
- You may keep this question book.

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 book are **not** drawn to scale.
└───┘

Data analysis

Question 1

A company that sells jeans has 20 different outlets. The results of the sales of jeans at each outlet on a particular day are listed below.

```
3 | 4
3 | 5  6  8
4 | 0  1  1  2  3
4 | 5  6  6  7  8        Key  3/4= 34
5 | 0  1
5 | 6  7
6 | 4
6 | 6
```

What percentage of the outlets sold more than 50 pairs of jeans on this particular day?

A.   20%

B.   25%

C.   30%

D.   35%

E.   40%

Question 2

A referendum is held to see if people want a republic or not. The results showing the number of males and females who voted yes or no are to be represented in a graph. Which one of the following graphs would be best to show these results?

A.   A scatter plot

B.   Parallel box plots

C.   A back-to-back stem and leaf

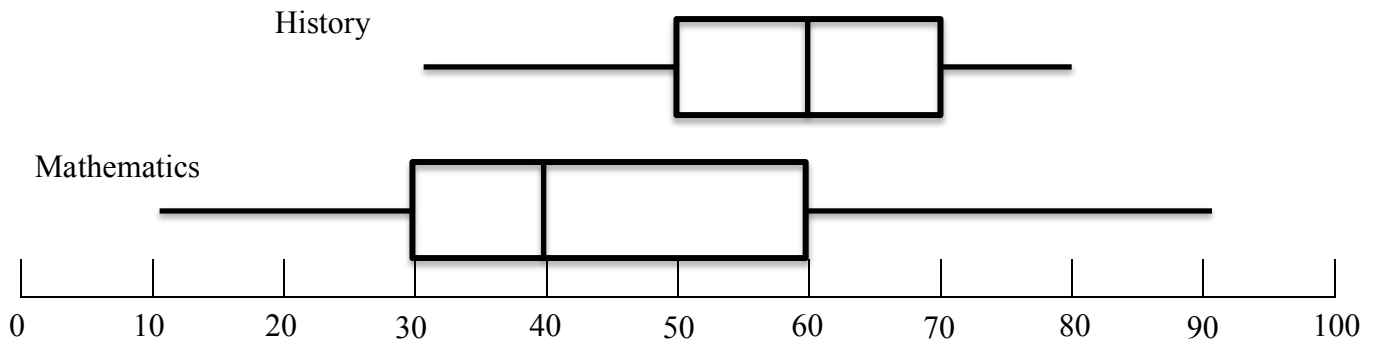D.   A segmented bar graph

E.   A segmented histogram

Question 3

The height of year 12 students is normally distributed with a mean of 170 cm and a standard deviation of 5 cm. What proportion of year 12 students will have a height greater than 160 cm?

A.   99.5%

B.   97.5%

C.   95%

D.   92.5%

E.   84%

Question 4

The box plots below show the distribution of results in a Mathematics and a History exam.

Which one of the following statements is **NOT** true?

A   For History, any score less than 30 would be an outlier.

B.   The median History score was greater than the median Mathematics score.

C.   25% of the History scores were less than 50.

D.   75% of Mathematics scores were greater than the lowest score in History.

E.   50% of the History scores were greater than 60.

Question 5

A university English exam has a mean mark of 70% and a standard deviation of 10%. To achieve honours a student needs at least 90%. If 5000 students sit the exam, how many students would be expected to get honours?

A.   25

B.   75

C.   100

D.   120

E.   125

Question 6

Students at a university were asked to rate their lecturer on a scale from 1 to 20. The scatter plot below shows the ratings given by 8 students and the results of each of these 8 students on the final exam.
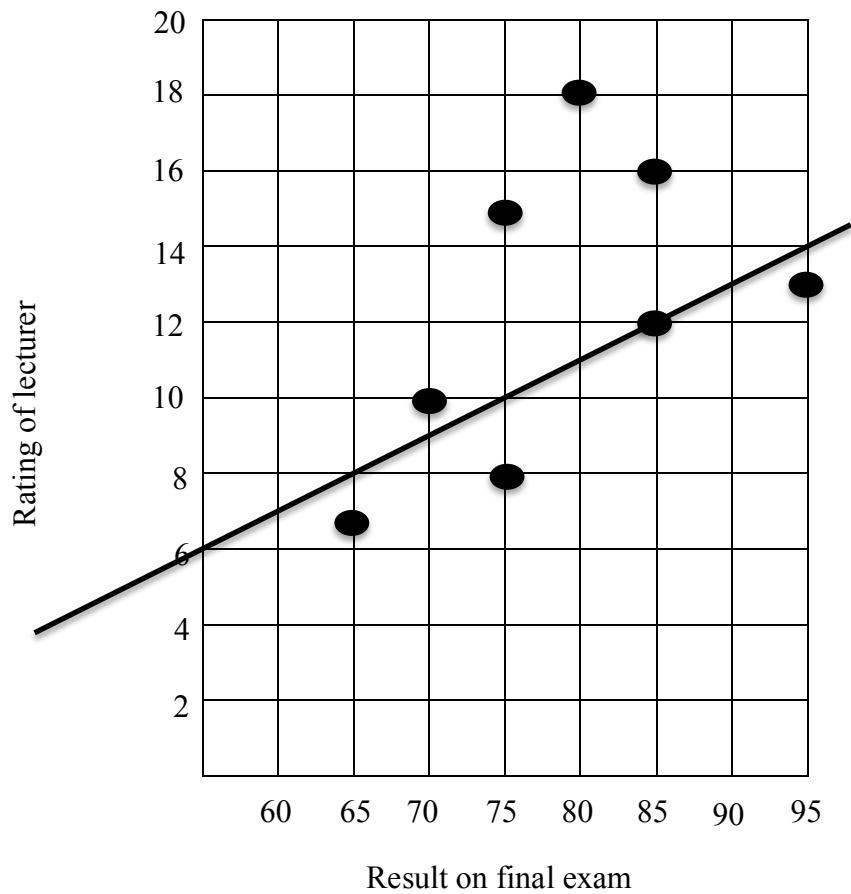
The least squares regression line has been fitted to the graph. The equation of this line is closest to

A.   Rating of lecturer $= 0.2 \times$ Result on final exam $+ 6$

B.   Result on final exam $= 5 \times$ Rating of lecturer $+ 6$

C.   Rating of lecturer $= 0.2 \times$ Result on final exam $- 5$

D.   Result on final exam $= 5 \times$ Rating of lecturer $- 6$

**E.**   Rating of lecturer $= 5 \times$ Result on final exam $- 6$

Question 7

The least squares regression line for the number of items sold and the price per item has the equation *Number of items sold* $= 608.47 - 4.53 \times$ *price per item*.
The coefficient of determination is 0.278.

Which one of the following statements is true?

A.   The value of Pearson's correlation coefficient would be close to -0.5

B.   There is a weak positive relationship between the number of items sold and the price per item.

C.   There is a weak negative relationship between the number of items sold and the price per item.

D.   27.8% of the variability in the number of items sold is caused by the change in the price.

E.   27.8% of the variability in price is caused by the change in the number of items sold.

Question 8
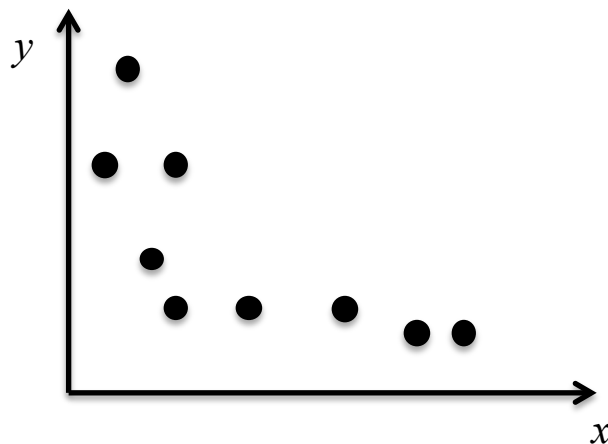
To transform the relationship between *x* and *y* to linearity we could apply which one of the following transformations?
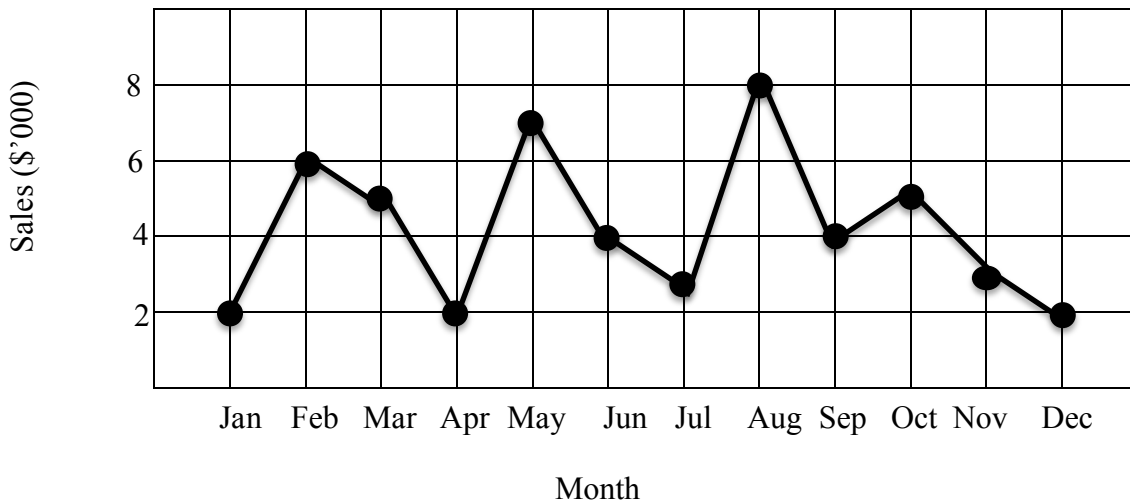
A. $y = x^2$

B. $x = y^2$

C. $y = \log(x)$

D. $y = b + ax^2$

E. $y = b + ax$

Question 9
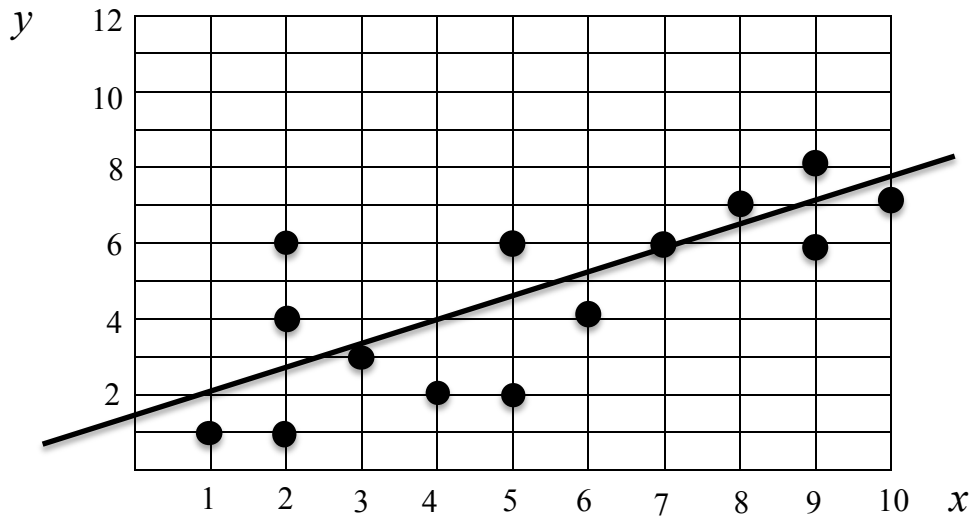
The least squares regression line has been fitted to the above scatter plot. Which one of the following is closest to the residual plot for the above data?

A.

B.

C.

D.

E.

Question 10

A business has monthly sales as shown in the above time series graph.

The five-median smoothed value for April is

A. $3,600

B. $4,000

C. $4,400

D. $4,800

E. $5,000

Use the following information to answer Questions 11 and 12

The seasonal indices for 2015 are given in the Table below.

Season	Spring	Summer	Autumn	Winter
Index		0.89	1.06	1.13

Question 11

The value of the seasonal index for spring is

A.   0.70

B.   0.92

C.   0.77

D.   1.07

E.   2.08

Question 12

A seasonally adjusted figure for Winter 2015, when the original sales figure was $70,500 , is closest to

A. $17,625

B. $60,888

C. $62,389

D. $76,630

E. $79,6651.13

Question 13

Spring	Summer	Autumn	Winter
2073	2414	2339	1967

The above table shows the number of people who stayed at the Hotel Astra during each season of 2014. Based on these figures, it could be said that

A. The seasonal index for summer was 1.20.

B. The deseasonalised figure for summer was about 3000.

C. The deseasonalised figure for summer was about 1500.

D. The hotel occupancy was about 5% below the average for summer.

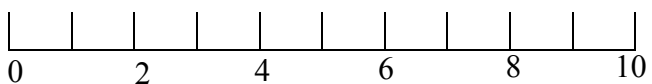**E.** The hotel occupancy was about 10% above the average for summer.

Question 14

The histogram below shows the number of books read by a class during a read-a-thon week.
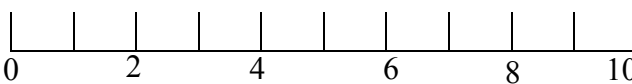
Number students (vertical axis)

Number books read (horizontal axis)
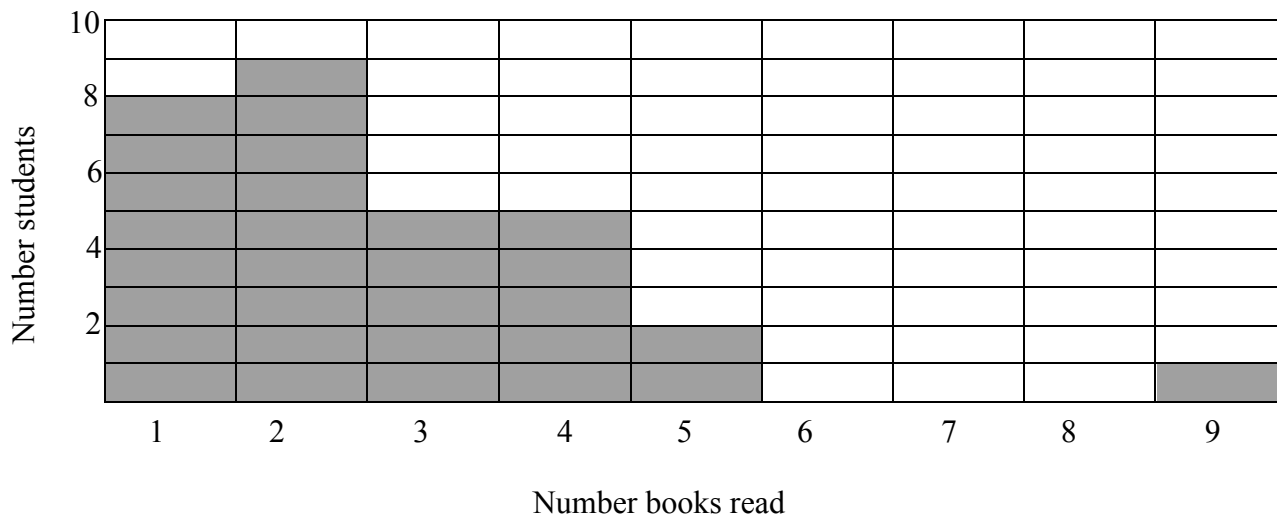
Which one of the following box plots would best represent this data?

A.

B.

C.
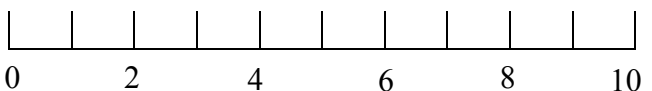
D.
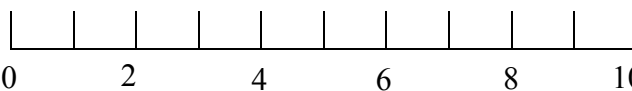
E.
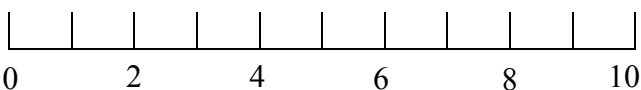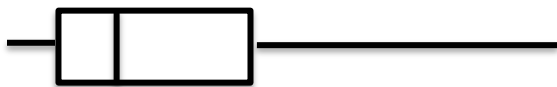
Question 15

Student	Maths	Biology
A	65	54
B	72	85
C	58	56
D	47	59
E	88	81
F	95	86
G	77	80

The above table gives the percentage results in Maths and Biology of seven students. Which one of the following could be a least squares regression line for this data?

A.

(10,14)

B.

(10,28)

C.

(10,28)

D.

(14,28)

E.

(10,14)
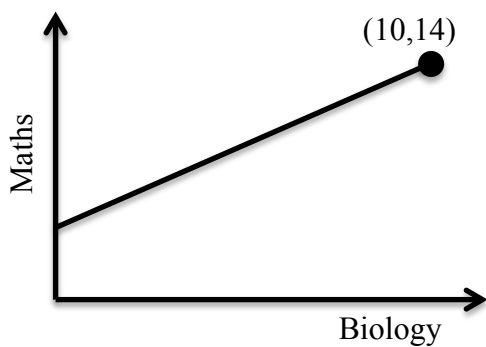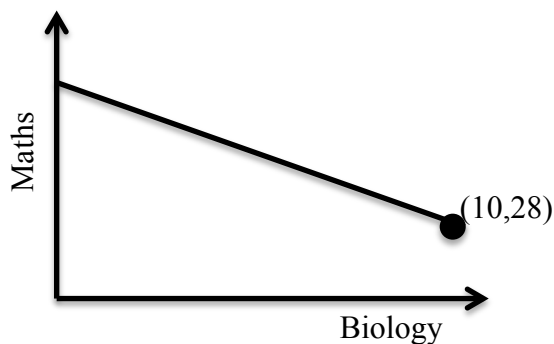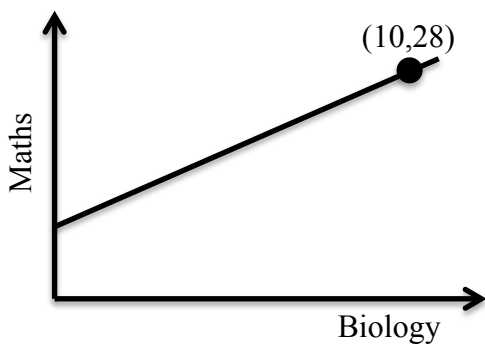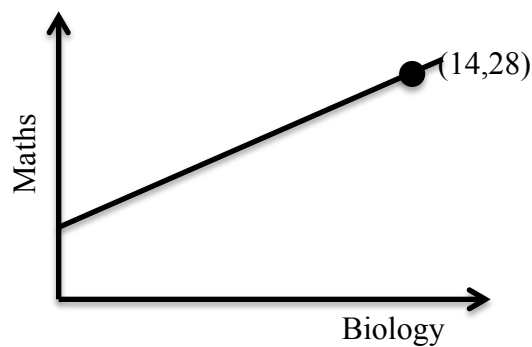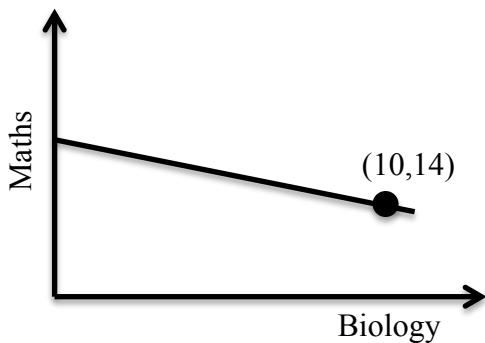
Question 16

x	1	2	3	4	5
y	20	19	16	11	4

When Sam plotted the above scatter plot he found that it was non linear. He applied the x^2 transformation to linearise the data and used this to obtain an equation from which he could predict y values. From this equation, the predicted value of y when $x = 3.2$ is closest to

A.   12.9

B.   13.4

C.   13.8

D.   14.5

E.   19.3

Recursion and financial modelling

Question 17

Jason borrows $4000 from the bank. When he comes to repay the money in full at the end of 5 years, he owes the bank $5,120. The annual simple interest rate charged by the bank is closest to

A.   3.6 %

B.   5.6 %

C.   13.6 %

D.   15.6 %

E.   25.6 %

Question 18

The difference equation $w_{n+1} = 3w_n - 4$ where $w_0 = 2$ generates the sequence

A. $2, 2, 2, 2 \ldots$

B. $2, 4, 6, 8 \ldots$

C. $2, -2, 2, -2 \ldots$

D. $2, -4, 6, -8 \ldots$

E. $2, 0, -2, -4 \ldots$

Question 19

Each year a car depreciates at the rate of 10% of its value at the end of the previous year. If the car was bought new for $50,000, after how many years will the car first be worth less than $25,000?

A.   5

B.   6

C.   7

D.   8

E.   9

Question 20

Gina borrows $80,000 to begin a business. The interest rate is 6.5% per annum, compounding quarterly. The effective interest rate is closest to

A.   6.6%

B.   6.7%

C.   6.8%

D.   6.9%

E.   7.0%

Question 21
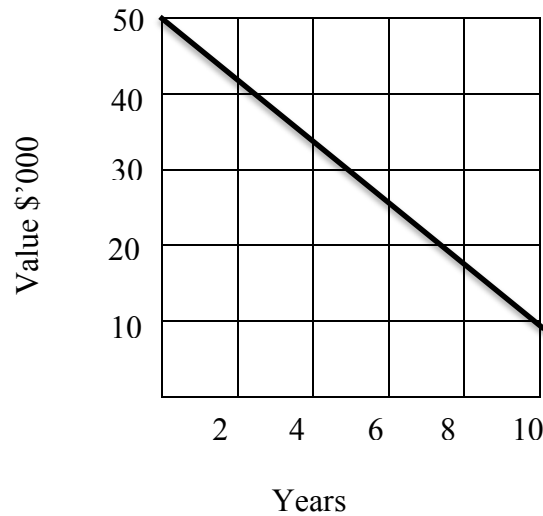
A company finds that its printing machine reaches its scrap value after 10 years. The above graph shows the value of the machine over its lifetime. Which one of the following best models this situation?

A. $V_{n+1} = 50V_n - 10$ $V_0 = 1000$

B. $V_{n+1} = 50V_n + 10$ $V_0 = 1000$

C. $V_{n+1} = 5V_n$ $V_0 = 5000$

D. $V_{n+1} = V_n - 4000$ $V_0 = 50000$

E. $V_{n+1} = V_n - 40000$ $V_0 = 50000$

Question 22

Meg places her $300,000 superannuation payout in a perpetuity, which pays 8% per annum compounding monthly. Which one of the following statements is true?

A.   She will receive $2000 each year for the rest of her life.

B.   She will receive $24,000 at the end of the first month.

C.   This money will last for 12.5 years

D.   The amount left after 10 years will be more than $300,000

E.   The amount left after 10 years will be $300,000

Question 23
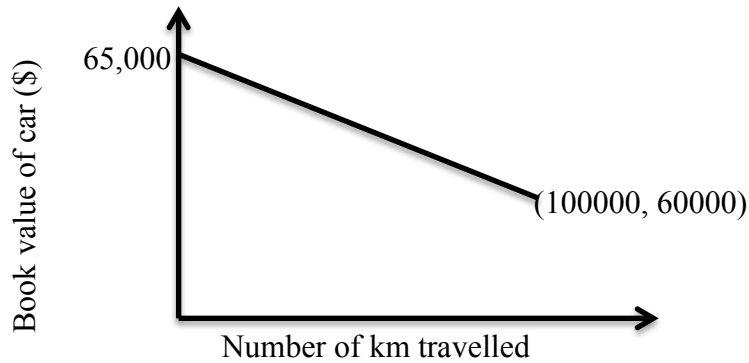
The above graph shows the depreciation of a car. The rate of depreciation per kilometre is

A. $0.005

B. $0.006

C. $0.05

D. $0.06

E. $0.65

Question 24

In 2011, Jane borrows $200,000 at 6.2% interest per annum, compounding monthly. She repays $1,600 per month for 5 years. After this time, she negotiates a new interest rate of 5.8% per annum on the outstanding balance and increases her monthly repayments to $2,000. The year she will repay the loan in full is

A.   2023

B.   2025

C.   2027

D.   2029

E.   2031

END OF SECTION A

SECTION B - Module

<table>
<tr><td colspan="2">Instructions for Section B</td></tr>
</table>

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** writing the name of the module in the box provided.
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.
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Unless otherwise indicated, the diagrams in this book are **not** drawn to sale.

Contents   Page

Module 1: Matrices

Before answering these questions you **must** shade the 'Matrices' box on the answer sheet for multiple-choice questions and write the name of the module in the box provided.

Question 1

Which one of the following is a triangular matrix?

A.

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

B.

$$\begin{bmatrix} 1 & 5 & 2 & 1 \\ 0 & 2 & 3 & 2 \\ 0 & 0 & 3 & 6 \\ 0 & 0 & 0 & 4 \end{bmatrix}$$

C.

$$\begin{bmatrix} 0 & 1 & 2 & 3 \\ 1 & 0 & 1 & 0 \\ 2 & 5 & 0 & 0 \\ 6 & 0 & 0 & 0 \end{bmatrix}$$

D.

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

E.

$$\begin{bmatrix} 1 & 2 & 5 & 6 \\ 0 & 1 & 3 & 6 \\ 1 & 0 & 1 & 4 \\ 2 & 1 & 0 & 1 \end{bmatrix}$$

Question 2

Given $P = \begin{bmatrix} 2 & 1 & 2 \\ 3 & 0 & 4 \end{bmatrix}$　$Q = \begin{bmatrix} 4 & 6 & 2 \\ 1 & 3 & 5 \\ 0 & 0 & 0 \end{bmatrix}$　$R = \begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix}$　$S = \begin{bmatrix} 4 \\ 0 \\ 5 \end{bmatrix}$

Which one of the following is **NOT** defined?

A.　Q^2

B.　R^2

C.　RP

D.　PS

E.　PR

Question 3

$X = 3 \begin{bmatrix} 6 & -1 \\ 3 & -2 \end{bmatrix}$

X^{-1} equals

A.　$6 \begin{bmatrix} -1 & 0.5 \\ -1.5 & 3 \end{bmatrix}$

B.　$\begin{bmatrix} -6 & 3 \\ -9 & 18 \end{bmatrix}$

C.　$\begin{bmatrix} -18 & 9 \\ -3 & 6 \end{bmatrix}$

D.　$-\dfrac{1}{27} \begin{bmatrix} -2 & 1 \\ -3 & 6 \end{bmatrix}$

E.　$\dfrac{1}{81} \begin{bmatrix} -6 & 3 \\ -9 & 18 \end{bmatrix}$

Question 4

Max, Lynn and James each need to buy the following number of kilograms of tomatoes, carrots and zucchini.

$$
\begin{array}{c}
\begin{array}{ccc} \text{Max} & \text{Lynn} & \textit{James} \end{array} \\
\begin{array}{c} \textit{Tomatoes} \\ \textit{Carrots} \\ \textit{Zucchini} \end{array}
\begin{bmatrix} 2 & 4 & 1 \\ 3 & 2 & 2 \\ 1 & 2 & 7 \end{bmatrix}
\end{array}
$$

The cost per kilogram of these vegetables is given in the following matrix.

$$
\begin{array}{c}
\textit{Tomatoes} \\ \textit{Carrots} \\ \textit{Zucchini}
\end{array}
\begin{bmatrix} \$4 \\ \$3 \\ \$2 \end{bmatrix}
$$

Which one of the following matrix calculations can be used to determine the amount of money spent by each of these three people?

A.

$$
\begin{bmatrix} 2 & 4 & 1 \\ 3 & 2 & 2 \\ 1 & 2 & 7 \end{bmatrix}
\begin{bmatrix} 4 \\ 3 \\ 2 \end{bmatrix}
$$

B.

$$
\begin{bmatrix} 2 & 4 & 1 \\ 3 & 2 & 2 \\ 1 & 2 & 7 \end{bmatrix}
\begin{bmatrix} 4 & 3 & 2 \end{bmatrix}
$$

C.

$$
\begin{bmatrix} 4 \\ 3 \\ 2 \end{bmatrix}
\begin{bmatrix} 2 & 4 & 1 \\ 3 & 2 & 2 \\ 1 & 2 & 7 \end{bmatrix}
$$

D.

$$
\begin{bmatrix} 2 & 3 & 1 \\ 4 & 2 & 2 \\ 1 & 2 & 7 \end{bmatrix}
\begin{bmatrix} 4 \\ 3 \\ 2 \end{bmatrix}
$$

E.

$$
\begin{bmatrix} 4 & 3 & 2 \end{bmatrix}
\begin{bmatrix} 2 & 3 & 1 \\ 4 & 2 & 2 \\ 1 & 2 & 7 \end{bmatrix}
$$

Question 5

Four systems of simultaneous linear equations are given below.

$4x + 4y = 13$ $6x - y = 3$

$5x = -5y + 6$ $4x - 8y = 5$

$6y - 3x - 15 = 0$ $8x + 4y = 10$

$4y = 2x + 5$ $2x = 2.5 - y$

How many of these systems of simultaneous equations are inconsistent systems?

A.   0

B.   1

C.   2

D.   3

E.   4

Question 6

P, Q, R and S are matrices. $R = 6P \times Q$, where R is a square matrix. P is a $3 \times m$ matrix.
Q is a $p \times q$ matrix and S is a $2 \times t$ matrix. $Q + S$ is defined.
Which one of the following is true?

A. PQ is a 3×2 matrix

B. $p = 3$

C. $t = 3$

D. $m = 3$

E. R^{-1} is a 2×3 matrix

Question 7

A meteorologist has found that if it rains on any day, then the probability that it will rain the next day is 0.3 and if it does not rain on any day then the probability that it will not rain the next day is 0.6. If it rains on Monday, then the probability that it will rain on the Thursday of that week is closest to

A.   0.3

B.   0.4

C.   0.5

D.   0.6

E.   0.7

Question 8

$$M = \begin{array}{c} \\ P \\ Q \\ R \\ S \end{array} \begin{array}{cccc} P & Q & R & S \\ \left[\begin{array}{cccc} 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & X \\ 0 & 1 & 0 & 1 \\ 1 & X & 1 & 0 \end{array}\right] \end{array}$$

The above matrix shows the wins, draws and losses when four teams compete in a round robin. In this matrix, 1 represents a win, 0 represents a loss and X represents a draw. If a team gets 2 points for a win, 1 point for a draw and 0 points for a loss, then which one of the following could be used to find the point score for each team?

A.

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

B.

$$\begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix} \begin{bmatrix} 2 & 1 & 0 \end{bmatrix}$$

C.

$$\begin{bmatrix} 2 & 2 & 3 \\ 5 & 3 & 4 \\ 4 & 4 & 4 \\ 3 & 5 & 2 \end{bmatrix} \begin{bmatrix} 2 & 1 & 0 \end{bmatrix}$$

D.

$$\begin{bmatrix} 1 & 0 & 3 \\ 1 & 1 & 2 \\ 2 & 0 & 2 \\ 2 & 1 & 1 \end{bmatrix} \begin{bmatrix} 2 \\ 1 \\ 0 \end{bmatrix}$$
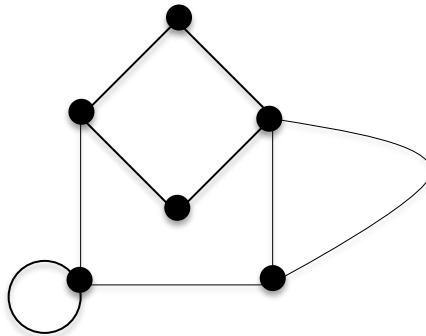
E.

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

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 and write the name of the module in the box provided.

Question 1
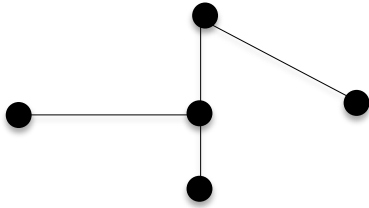

Which one of the following is true?

The above planar graph has

A.   10 edges and 6 vertices

B.   5 faces and 3 odd vertices

C.   4 faces and 3 odd vertices

D.   5 faces and 2 odd vertices
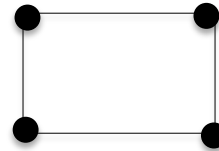
E.   4 faces and 2 odd vertices
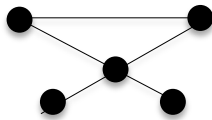
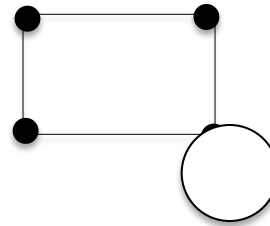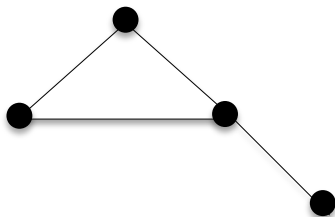**Question 2**

Which one of the following is a tree?

A.

B.

C.

D.

E.

Question 3
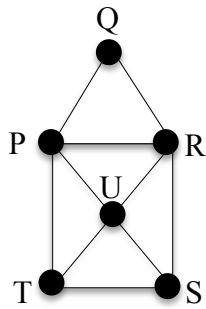
To make an Eulerian circuit from the above graph, we could connect an extra road between

A.　　P and T

B.　　T and S

C.　　R and T

D.　　T and Q

E.　　U and T

Question 4
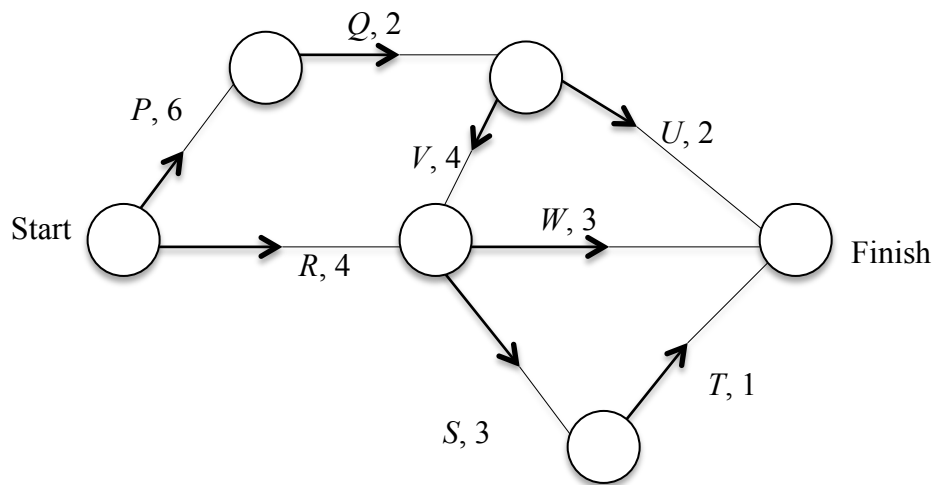
Which activity or activities do not have to be completed before activity W starts?

A.   T and U only.

B.   R and V only.

C.   P, Q, R and V only.

D.   U and V only.

E.   S, T and U only.

Question 5

A TV cable is to be connected to each of the country houses, P, Q, R, S, T, U and V. The distance in kilometres between the houses is shown on the graph below.
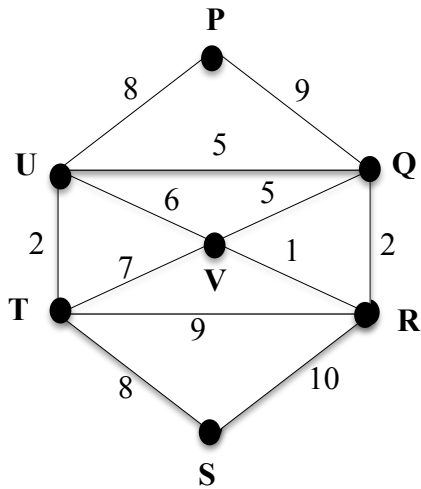
The minimum length of cable required is

A. 10 km

B. 15 km

C. 18 km

D. 20 km

E. 26 km

Question 6

Adam, Ben, Carla and Dianne are to compete in a competition, which includes swimming, cycling, hurdles and running.
Adam can run and hurdle, Ben can cycle and swim. Carla can swim, hurdle and cycle and Dianne can cycle. If each person participates in just one event in the competition, which one of the following is true?

A.   Ben swims and Adam hurdles.

B.   Carla hurdles and Adam runs.

C.   Ben cycles and Carla swims.

D.   Dianne cycles and Carla swims.

E.   Dianne cycles and Adam hurdles.

Question 7
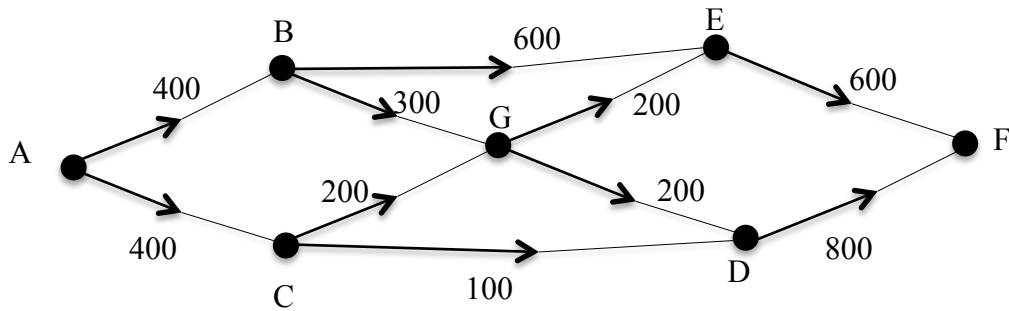
The above graph shows the number of litres of water that can flow through a series of pipes each hour from A to F. The maximum number of litres that can reach F in an hour is

A.   600

B.   700

C.   900

D.   1100

E.   140

Question 8
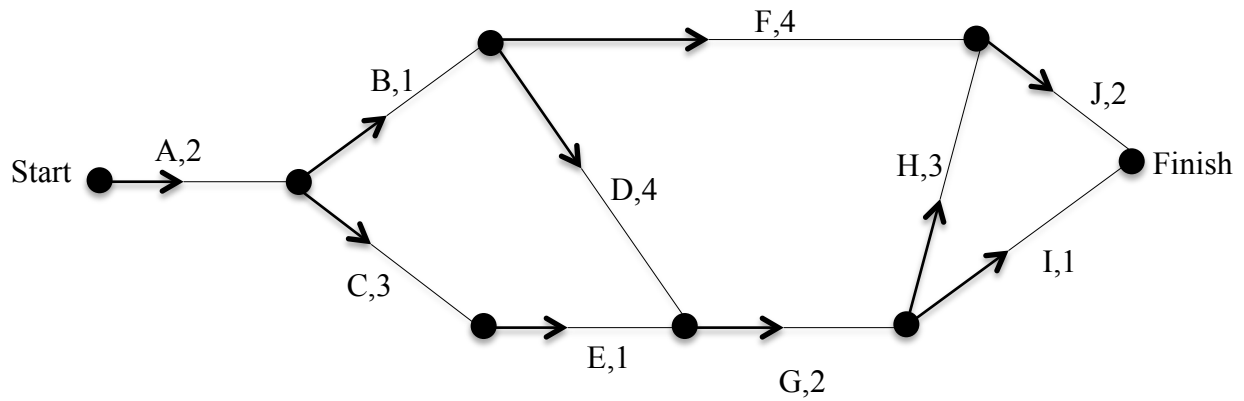
The above activity network shows the expected number of days each activity will take to complete and the prerequisites for each activity. What is the float time for activity I?

A.   2 days

B.   3 days

C.   4 days

D.   5 days

E.   6 days

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 and write the name of the module in the box provided.
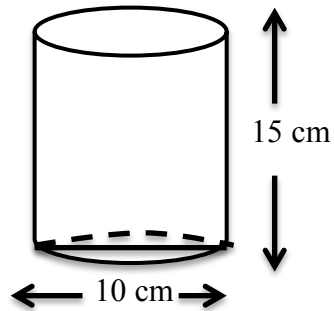
Question 1

The volume of the above shape is closest to

A.   471 cm^3

B.   589 cm^3

C.   942 cm^{30}

D.   1178 cm^3

E.   4712 cm^3

Question 2
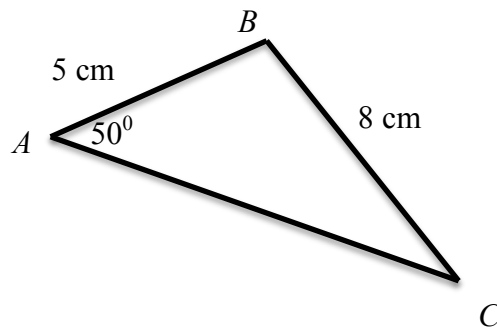
The size of $\angle ABC$ is closest to

A. 30^0

B. 60^0

C. 70^0

D. 80^0

E. 100^0
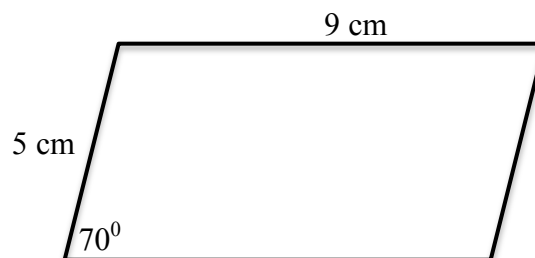
Question 3

The area of the above parallelogram is closest to

A. 42 cm^2

B. 43 cm^2

C. 44 cm^2

D. 45 cm^2

E. 46 cm^2

Question 4
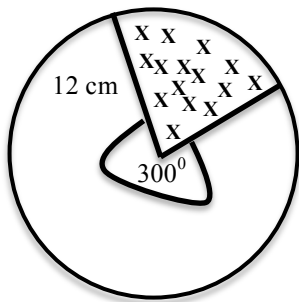
The above circle has a radius of 12 cm. The crossed area of the circle is cut out to make a cone.
The diameter of the circular base of the cone is closest to

A.   1 cm

B.   2 cm

C.   4 cm

D.   6 cm

E.   7 cm

Question 5

Tom starts a run from point A and runs 11 km at a bearing of 070^0 to point B. He then runs 9 km east to point C. The distance of C from A is closest to

A.   11.6 km

B.   14.2 km

C.   15.9 km

D.   19.7 km

E.   134.3 km

Question 6
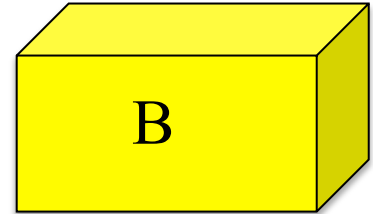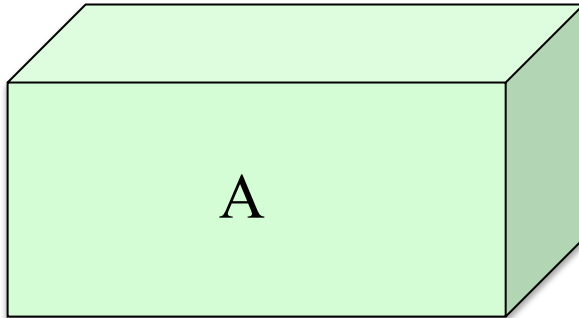
A and B are similar shapes, with volumes of 156 cm^3 and 22.4 cm^3 respectively. If the surface area of B is 52 cm^2, then the surface area of A is closest to

A.   99 cm^2

B.   125 cm^2

C.   148 cm^2

D.   181 cm^2

E.   190 cm^2

Question 7
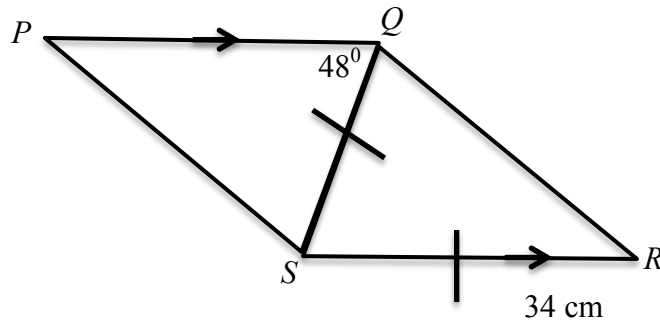
The length of QR is closest to

A. 20.7 cm

B. 27.7 cm

C. 34.0 cm

D. 55.6 cm

E. 60.0 cm

Question 8

Assume that the radius of the Earth is 6400 km. Santiago is located at 35^0 S, 90^0 W and Sydney has a latitude of 35^0 S and a longitude of 150^0 E. The shortest distance between these two cities is closest to

A. 7688 km

B. 10980 km

C. 15377 km

D. 21960 km

E. 25895 km

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 and write the name of the module in the box provided.

Question 1
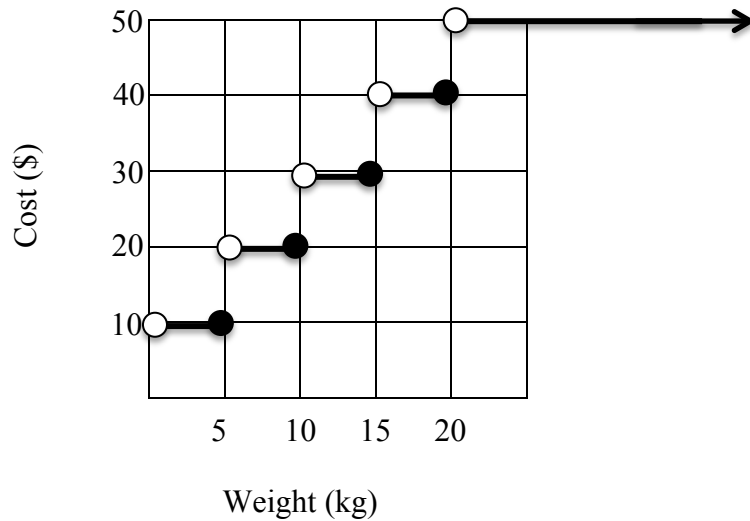
The above graph shows the cost of sending parcels in a certain country. Jane lives in this country and wants to send a parcel to each of her two sisters who live in different areas of this country. One of the parcels has a weight of 25 kg and the other has a weight of 15 kg. How much postage will Jane have to pay?

A. $60

B. $70

C. $80

D. $90

E. $100

Question 2
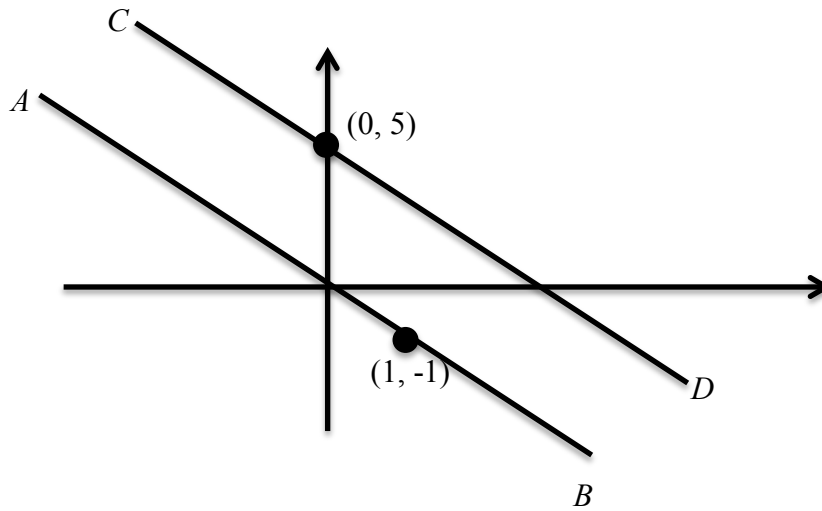
AB and *CD* are parallel lines. The equation of the line *CD* is

A. $x + y = 0$

B. $x + y = -1$

C. $x - y = -1$

D. $x + y = 5$

E. $x - y = 5$

Question 3

Time (hours)
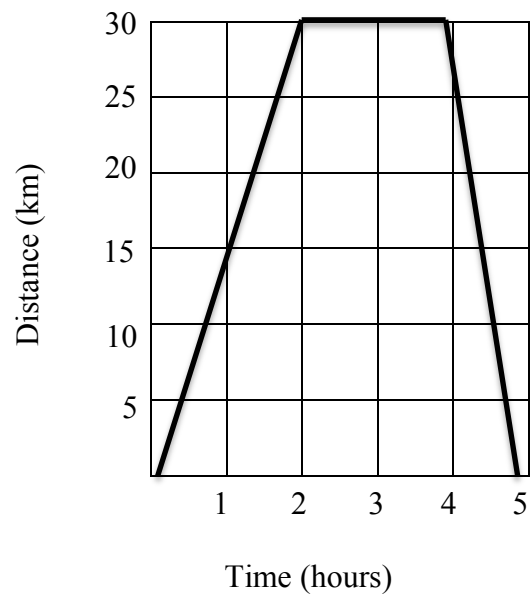
The above graph shows how Josh rode his bike from his home to the beach and back home again. What was his speed when he was going to the beach?

A.   10 km/hr.

B.   15 km/hr.

C.   20 km/hr.

D.   30 km/hr.

E.   150 km/hr.

Question 4
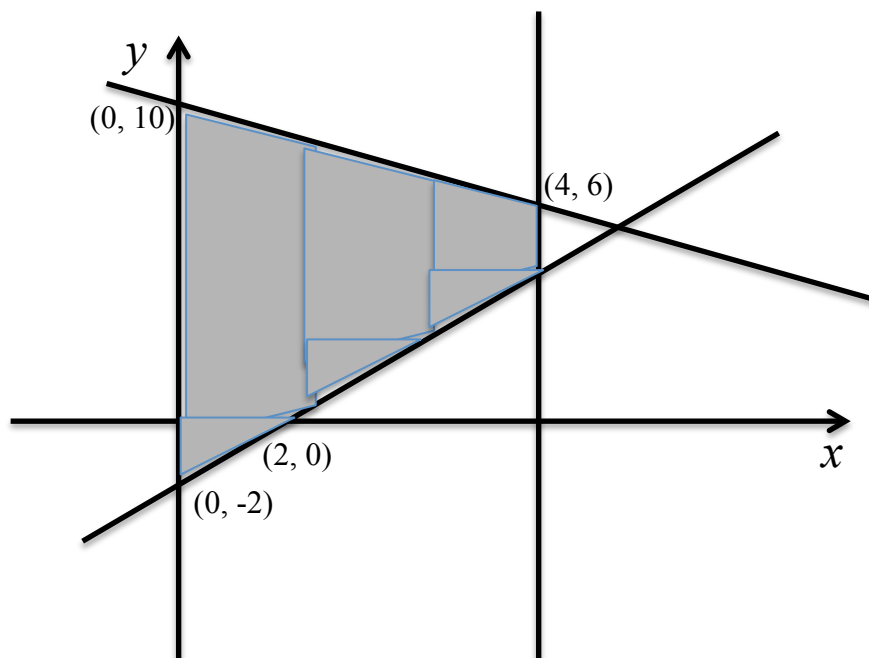
Which one of the following sets of equations could satisfy the shaded region in the above graph?

A.

$y \le x - 2$

$y \le 10 - x$

$x \ge 4$

B.

$y \ge x - 2$

$y \ge 10 - x$

$0 \le x \le 4$

C.

$y \le x - 2$

$y \le 10 - x$

$0 \le x \le 4$

D.

$y \ge x - 2$

$y \le 10 - x$

$x \ge 4$

E.

$y \ge x - 2$

$y \le 10 - x$

$0 \le x \le 4$

Question 5

It costs a company $7,500 plus $20 for each gadget that it makes. Each gadget is sold for $35.
How many gadgets would the company have to sell in order to make a profit of $6000?

A.   500

B.   550

C.   600

D.   650

E.   900

Question 6

Which one of the following could be the graph of $y = 3x^n$, where $n = -1$?

A.
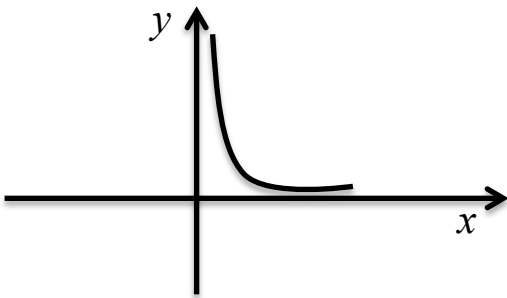
B.
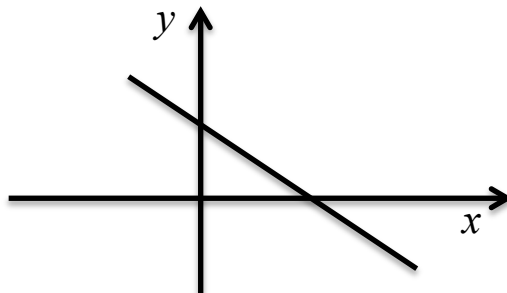
C.
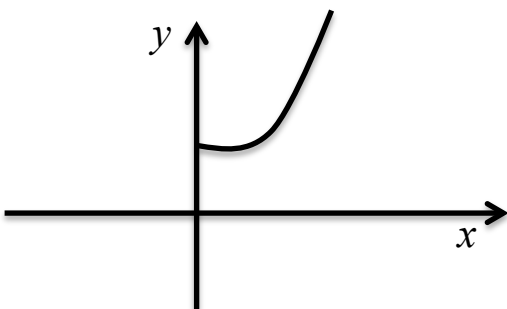
D.
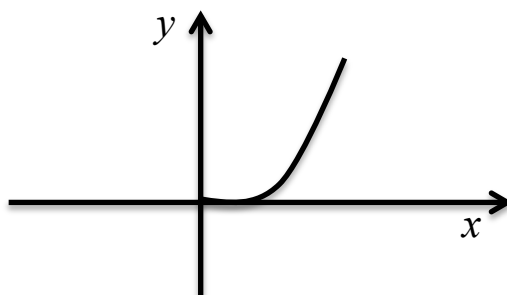
E.
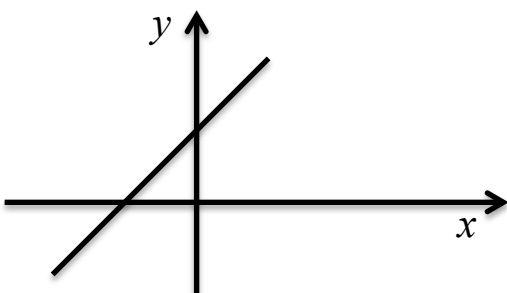
Question 7
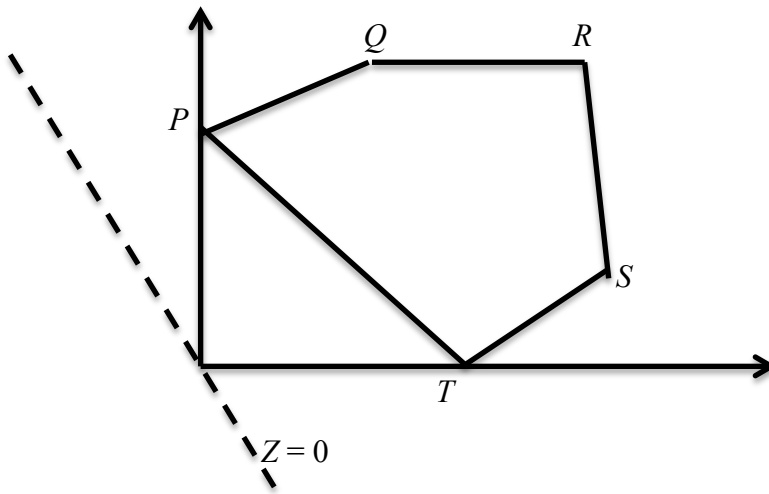
In the above graph, the required set of points lie on and within the boundary *PQRST*.
The line $Z = 0$ is shown. If $Z = x + 2y$, the maximum value of Z occurs at

A.   *P*

B.   *Q*

C.   *R*

D.   *S*

E.   Any point on the line *PT*.

Question 8

(-1, 0)   (0, 0)
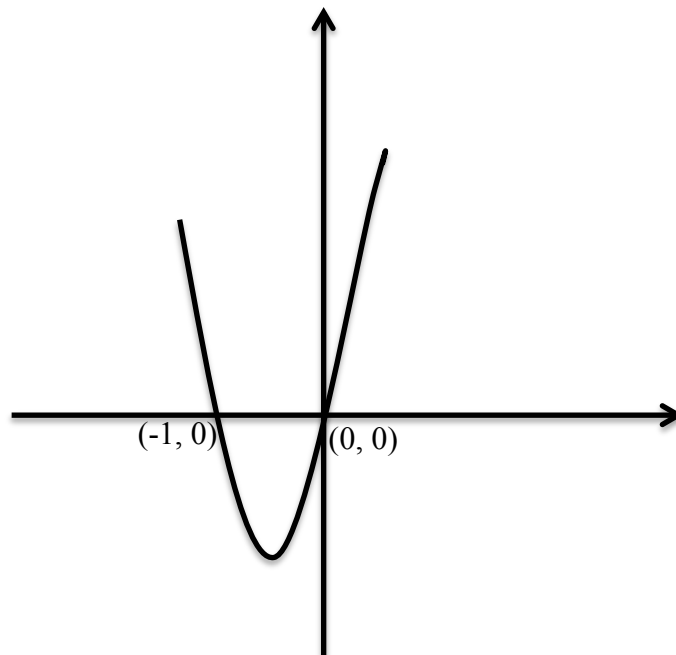
The above is the graph of $y = x^2 + x$. What is the equation of the line that you would have to draw on the given axis to find the graphical solution to the equation $x^2 + 2x = 3$?

A. $y = x + 3$

B. $y = -x + 3$

C. $y = 2x + 3$

D. $y = -2x + 3$

E. $y = -2x - 3$

End of Module 4

End of 2016 Further Mathematics Trial Examination 1
Multiple Choice Question Book

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Kew Vic 3101	kilbaha@gmail.com
Australia	http://kilbaha.com.au

FURTHER MATHEMATICS

Written examinations 1 and 2

FORMULA SHEET

Directions to students

Detach this formula sheet during reading time.

This formula sheet is provided for your reference.

$$2$$

Further Mathematics Formulas

Core: Data analysis

standardised score:	$z = \dfrac{x - \bar{x}}{s_x}$
lower and upper fence in a boxplot	lower $Q_1 - 1.5 \times IQR$ $\qquad$ upper $Q_3 + 1.5 \times IQR$
least squares line:	$y = a + bx$ where $b = r\dfrac{s_y}{s_x}$ and $a = \bar{y} - b\bar{x}$
residual value:	residual value = actual value – predicted value
seasonal index:	seasonal index $= \dfrac{\text{actual figure}}{\text{deseasonalised figure}}$

Core: Recursion and financial modelling

first-order linear recurrence relation	$u_0 = a, \qquad u_{n+1} = bu_n + c$
effective rate of interest for a compound interest loan or investment	$r_{effective} = \left[\left(1 + \dfrac{r}{100n} \right)^n - 1 \right] \times 100\%$

Module 1: Matrices

determinant of a 2×2 matrix:	$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$; $\det A = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$
inverse of a 2×2 matrix:	$A^{-1} = \dfrac{1}{\det A} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ where $\det A \neq 0$
recurrence relation:	$S_0 =$ initial state, $\qquad S_{n+1} = TS_n + B$

Module 2: Networks and decision mathematics

Euler's formula:	$v + f = e + 2$

Module 3: Geometry and measurement

area of a triangle:	$A = \dfrac{1}{2}bc\sin(\theta^0)$
Heron's formula:	$A = \sqrt{s(s-a)(s-b)(s-c)}$ where $s = \dfrac{1}{2}(a+b+c)$
sine rule:	$\dfrac{a}{\sin(A)} = \dfrac{b}{\sin(B)} = \dfrac{c}{\sin(C)}$
cosine rule:	$a^2 = b^2 + c^2 - 2bc\cos(A)$
circumference of a circle:	$2\pi r$
length of an arc:	$r \times \dfrac{\pi}{180} \times \theta^0$
area of a circle:	πr^2
area of sector	$\pi r^2 \times \dfrac{\theta^0}{360}$
volume of a sphere:	$\dfrac{4}{3}\pi r^3$
surface area of a sphere:	$4\pi r^2$
volume of a cone:	$\dfrac{1}{3}\pi r^2 h$
volume of a prism:	area of base $\times$ height
volume of a pyramid:	$\dfrac{1}{3} \times$ area of base $\times$ height

Module 4: Graphs and relations

gradient (slope) of a straight line:	$m = \dfrac{y_2 - y_1}{x_2 - x_1}$
equation of a straight line:	$y = mx + c$

END OF FORMULA SHEET

VCE FURTHER MATHEMATICS 2016
Trial Written Examination 1
ANSWER SHEET

NAME: _____

STUDENT _____
NUMBER

SIGNATURE_____

Instructions

- Write your name in the space provided above.

- Write your student number in the space provided above. Sign your name.

- Use a **PENCIL** for **ALL** entries.
  If you make a mistake, **ERASE** it - **DO NOT** cross it out.

- Marks will **NOT** be deducted for incorrect answers.

- **NO MARK** will be given if more than **ONE** answer is completed for any question.

- All answers must be completed like **THIS** example.

A	B	C	D	E

VCE FURTHER MATHEMATICS 2016
Trial Written Examination 1
ANSWER SHEET

NAME: _____

STUDENT
NUMBER _____

SIGNATURE_____

Instructions

- Write your name in the space provided above.

- Write your student number in the space provided above. Sign your name.

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- **NO MARK** will be given if more than **ONE** answer is completed for any question.

- All answers must be completed like **THIS** example.

A	B	C	D	E

Section A

1	A	B	C	D	E	**13**	A	B	C	D	E
2	A	B	C	D	E	**14**	A	B	C	D	E
3	A	B	C	D	E	**15**	A	B	C	D	E
4	A	B	C	D	E	**16**	A	B	C	D	E
5	A	B	C	D	E	**17**	A	B	C	D	E
6	A	B	C	D	E	**18**	A	B	C	D	E
7	A	B	C	D	E	**19**	A	B	C	D	E
8	A	B	C	D	E	**20**	A	B	C	D	E
9	A	B	C	D	E	**21**	A	B	C	D	E
10	A	B	C	D	E	**22**	A	B	C	D	E
11	A	B	C	D	E	**23**	A	B	C	D	E
12	A	B	C	D	E	**24**	A	B	C	D	E

Please turn over . . .

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VCE FURTHER MATHEMATICS 2016
Trial Written Examination 1
ANSWER SHEET

Section B

(Shade the boxes of the two modules selected **and** write the name of the modules you have selected. There are a total of four from which to choose)

	Matrices	**Module 1**	**1**	A	B	C	D	E
		_____	**2**	A	B	C	D	E
		_____	**3**	A	B	C	D	E
			4	A	B	C	D	E
		_____	**5**	A	B	C	D	E
			6	A	B	C	D	E
			7	A	B	C	D	E
			8	A	B	C	D	E
	Networks and decision mathematics	**Module 2**	**1**	A	B	C	D	E
		_____	**2**	A	B	C	D	E
		_____	**3**	A	B	C	D	E
		_____	**4**	A	B	C	D	E
			5	A	B	C	D	E
			6	A	B	C	D	E
			7	A	B	C	D	E
			8	A	B	C	D	E
	Geometry and measurement	**Module 3**	**1**	A	B	C	D	E
		_____	**2**	A	B	C	D	E
		_____	**3**	A	B	C	D	E
		_____	**4**	A	B	C	D	E
			5	A	B	C	D	E
			6	A	B	C	D	E
			7	A	B	C	D	E
			8	A	B	C	D	E
	Graphs and relations	**Module 4**	**1**	A	B	C	D	E
		_____	**2**	A	B	C	D	E
		_____	**3**	A	B	C	D	E
		_____	**4**	A	B	C	D	E
			5	A	B	C	D	E
			6	A	B	C	D	E
			7	A	B	C	D	E
			8	A	B	C	D	E

Please DO NOT fold, bend or staple this form