

## **FURTHER MATHEMATICS**

### **TRIAL EXAMINATION 1**

#### **(FACTS, SKILLS AND APPLICATIONS TASK)**

**2000**

Reading Time: 15 minutes

Writing Time: 90 minutes

#### **Instructions to Students**

This exam consists of Section A and Section B.

Section A consists of 13 multiple-choice questions which should be answered on the detachable answer sheet on page 37 of this exam. This section of the exam is worth 13 marks. Every question in Section A should be answered.

Section B consists of 5 modules, each containing 9 multiple-choice questions. Choose only 3 modules and answer all questions in those modules on the detachable answer sheet on page 37 of this exam. This section of the exam is worth 27 marks. Section B begins on page 10 of this exam. The exam in total is worth 40 marks.

Students may bring up to two A4 pages of pre-written notes into the exam.

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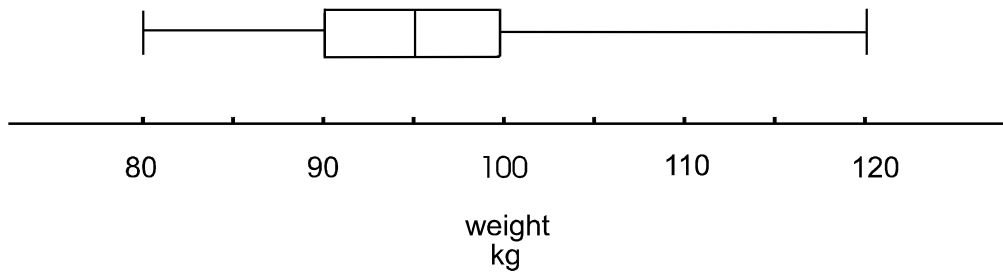
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## Section A

Section A consists of 13 questions. Answer **all** questions in Section A.

### Question 1

The box plot below shows the distribution of weights (in kg) of a squad of basketball players.



The median weight is

- A. 80 kg
- B. 90 kg
- C. 95 kg
- D. 100 kg
- E. 120 kg

### Question 2

The distribution of the length of licorice straps produced at a local factory is 'bell shaped' with a mean of 35 cm and a standard deviation of 0.5 cm.

The proportion of licorice straps produced which are between 35 and 36 cm long is

- A. 9%
- B. 18%
- C. 22.25%
- D. 45%
- E. 47.5%

**Question 3**

An investigation was undertaken into the relationship between membership status of an A.F.L. football club (member/non member) and mode of transport to and from matches (car/public transport).

The results are shown in the segmented percentage bar-chart below.



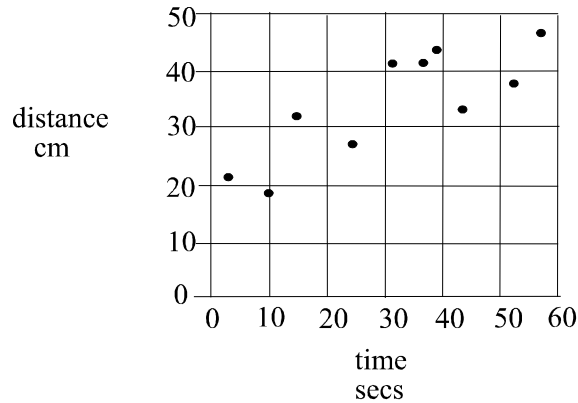
In this investigation, the percentage of non members who take public transport to and from football matches is

- A. 25%
- B. 35%
- C. 65%
- D. 75%
- E. 100%

The information below relates to questions 4, 5 and 6.

Ten primary school children race their pet tortoises in order to raise money for social service. As soon as the tortoises begin moving, the time and the distance they cover is recorded. As soon as they stop, they are considered to have finished the race.

The distance, in cm, that each of the tortoises covers, and the time that each takes to cover that distance, is shown on the scatterplot below.



#### Question 4

Which one of the following describe respectively the direction, form and strength of the association between the time the tortoises take and the distance they cover?

- A. positive, linear, moderate
- B. negative, linear, strong
- C. positive, non linear, strong
- D. negative, non linear, weak
- E. negative, linear, weak

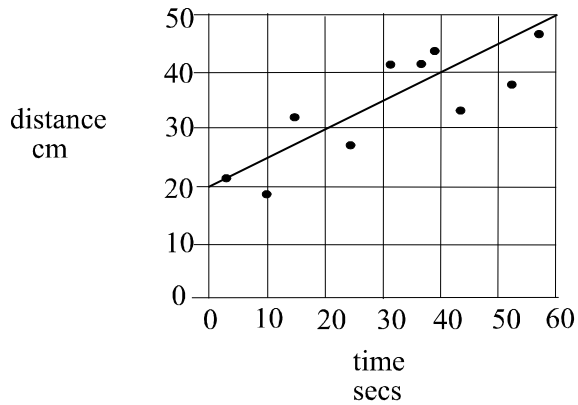
#### Question 5

The variable "time" could be described as

- A. categorical
- B. dependent
- C. skewed
- D. independent
- E. linear

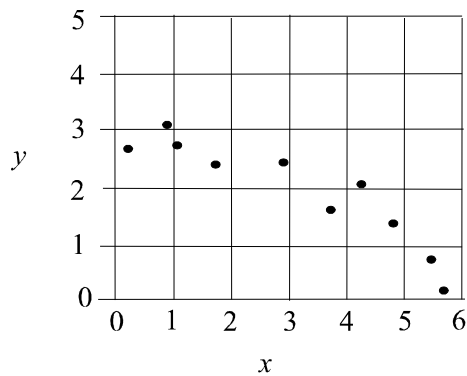
**Question 6**

A line is fitted by eye to the data on the scatterplot and is shown below.



The equation of this line is closest to

- A.  $\text{time} = 20 + 0.5 \times \text{distance}$
- B.  $\text{distance} = 20 + 2 \times \text{time}$
- C.  $\text{time} = 0.5 + 2 \times \text{distance}$
- D.  $\text{distance} = 20 + 0.5 \times \text{time}$
- E.  $\text{distance} = 0.5 + 2 \times \text{time}$

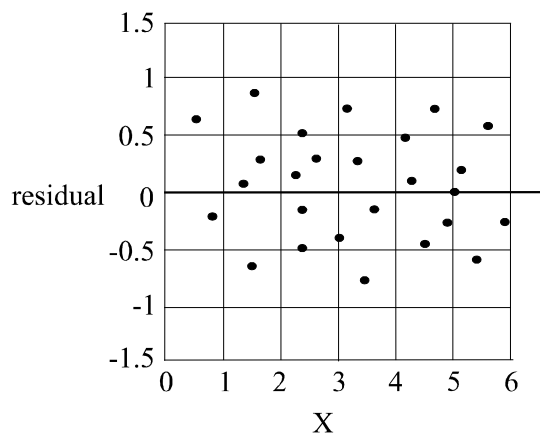
**Question 7**

The scatterplot above shows the relationship between two variables  $x$  and  $y$ . The transformation most likely to transform this data to linearity would be

- A. a square transformation on the  $x$  axis
- B. a log transformation on the  $y$  axis
- C. a reciprocal transformation on the  $x$  axis
- D. a reciprocal transformation on the  $y$  axis
- E. a square transformation on the  $y$  axis

**Question 8**

A regression line is fitted by eye to a set of bivariate data on a scatterplot. A residual plot is made and is shown below.



The residual plot suggests that the association between the two variables is probably

- A. linear
- B. given by the coefficient of determination
- C. non linear
- D. showing a goodness of fit
- E. random

**Question 9**

The relationship between the amount of sunlight, in hours, received in a week by a crop and the amount of growth, in cm, in a week is investigated.

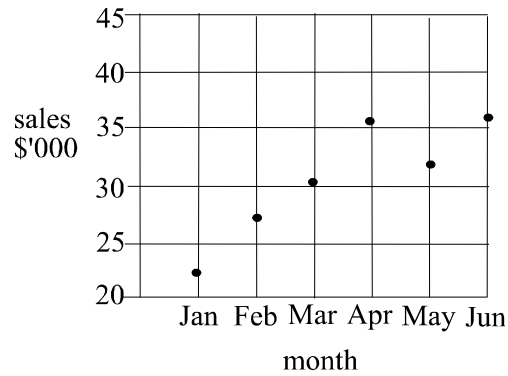
A Pearson correlation coefficient was calculated for the data collected and found to be 0.7

The proportion of the variation in growth that can be explained by the variation in the amount of sunlight received is

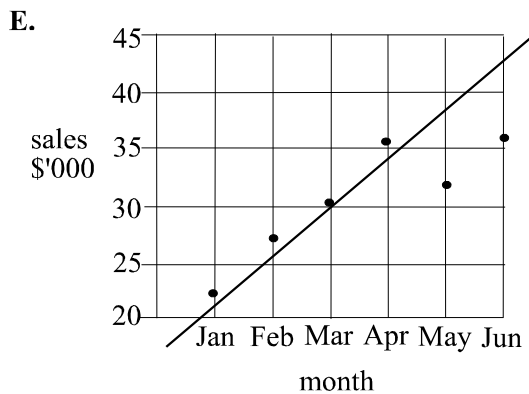
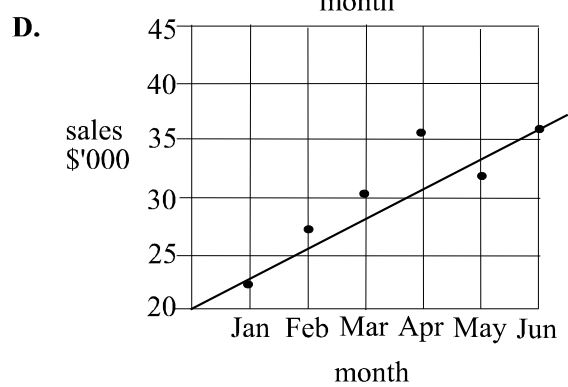
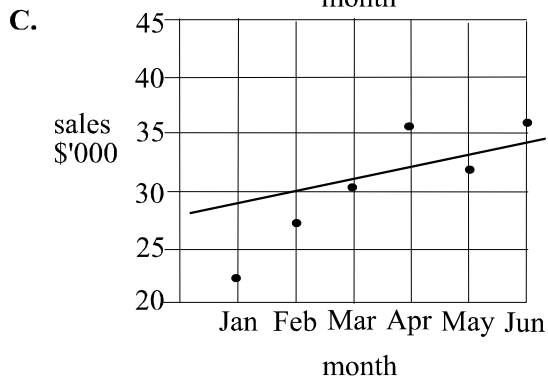
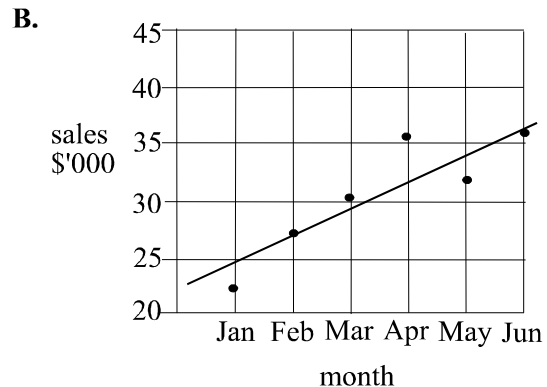
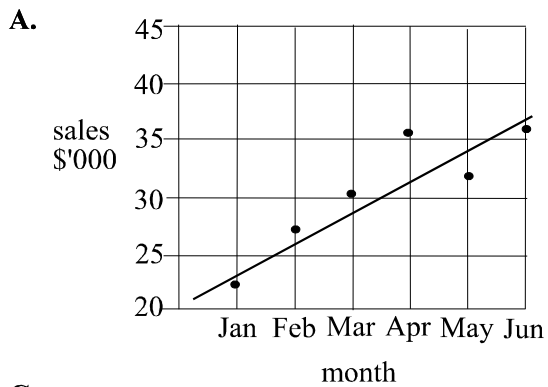
- A. 0.49%
- B. 0.7%
- C. 7%
- D. 49%
- E. 70%

**Question 10**

A time series plot for the sales of a new dairy product over a six month period is shown below.



A trend line has been fitted to this data using a three median fit. That trend line could be given by



**Question 11**

The following table gives the number of cars sold at a car yard over an eight month period.

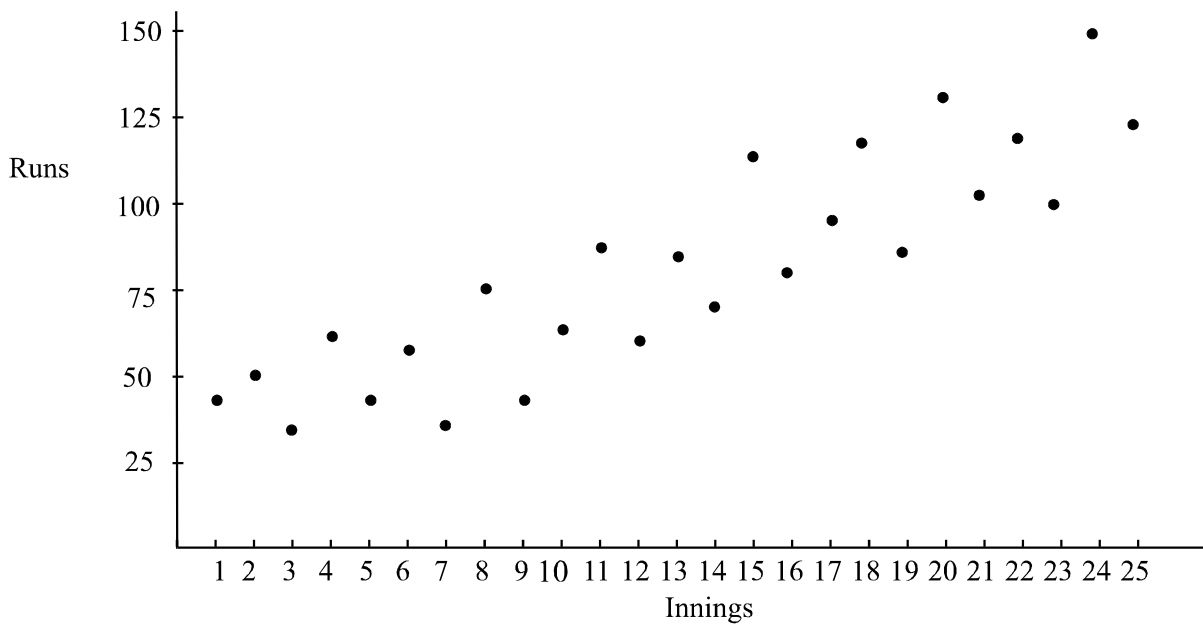
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Number of cars sold	12	17	12	21	17	12	21	19

Using the five term moving average method, the smoothed value of the number of cars sold at the car yard in April is closest to

- A. 14
- B. 16
- C. 17
- D. 19
- E. 21

**Question 12**

The time series plot below shows the scores made by a cricketer in successive innings over a summer.



The variation in the number of runs made by the cricketer followed a pattern best described as

- A. cyclic
- B. seasonal
- C. trending upwards
- D. random
- E. trending downwards



**Question 13**

The attendances at a neighbourhood market day are deseasonalised using seasonal indices. The indices for summer and autumn are given below and the indices for winter and spring are referred to as  $x$  and  $y$  respectively.

Summer	Autumn	Winter	Spring
0.85	1.23	$x$	$y$

It is true to say that

- A.  $x = y$
- B.  $x + y = 0.85$
- C.  $x + y = 1.23$
- D.  $x + y = 1.92$
- E.  $x + y = 2.08$

## Section B

Section B consists of 5 modules and each module contains 9 questions.

You should select **3** modules only and answer **all** questions in each of those 3 modules.

### Module 1: Number patterns and applications

If you choose this module, **all** questions must be answered.

#### Question 1

The sum of the first 28 terms of the arithmetic sequence

11, 15, 19, 23, 27,... is

- A. 41
- B. 1742
- C. 1820
- D. 1876
- E. 3640

#### Question 2

A patient is prescribed 5 mg of a drug which is to be given by injection. The stock solution contains 0.25 mg of the drug per 1 ml of stock solution.

How much of the stock solution, in ml, should the patient be injected with?

- A. 0.5
- B. 1.25
- C. 2
- D. 4
- E. 20

**Question 3**

A council allocates a sum of money for new fences at the five local kindergartens. The money is to be divided between kindergartens A, B, C, D and E in the ratio 2 : 3 : 3 : 4 : 6 respectively.

If kindergarten C receives \$10 500, what is the total sum of money allocated by council to the five kindergartens?

- A. \$3500
- B. \$7000
- C. \$10 500
- D. \$21 000
- E. \$63 000

**Question 4**

The sum to infinity of the series  $4 - 2 + 1 - \frac{1}{2} + \dots$  is

- A.  $\frac{1}{6}$
- B.  $\frac{8}{3}$
- C. 4
- D. 6
- E. 8

**Question 5**

The production of wine at a winery increases by 2.5% each year. At the end of the first year of production, the output was 40 000 litres of wine.

If  $P_{n+1}$  represents the production of wine in litres in the  $(n + 1)$ th year, which of the following difference equations represent the production of wine at this winery?

- A.  $P_{n+1} = 0.025P$  where  $P_1 = 40\,000$
- B.  $P_{n+1} = 0.25P$  where  $P_1 = 40\,000$
- C.  $P_{n+1} = 1.025P$  where  $P_1 = 40\,000$
- D.  $P_{n+1} = 1.25P$  where  $P_1 = 40\,000$
- E.  $P_{n+1} = 2.5P$  where  $P_1 = 40\,000$

**Question 6**

A teacher asked students to comment on the sequence generated by the difference equation

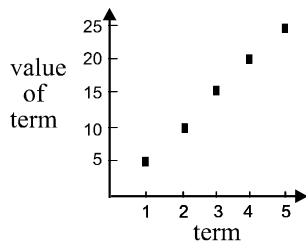
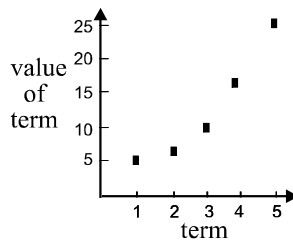
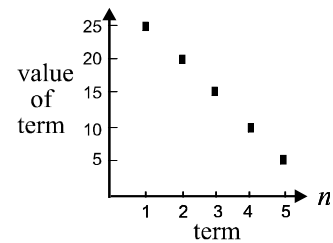
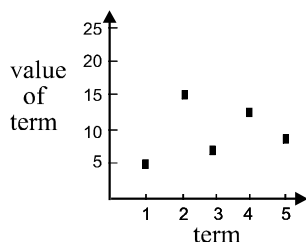
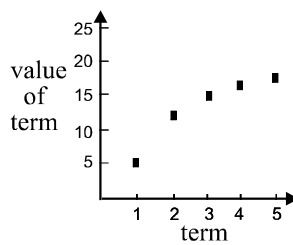
$$f_{n+1} = 3f_n - 1 \quad \text{where} \quad f_1 = 2$$

Which one of the following comments she received was correct?

- A. The sequence is decreasing.
- B. The sequence is arithmetic.
- C. The sequence cannot be solved.
- D. The sequence is geometric.
- E. The sequence is neither arithmetic or geometric.

**Question 7**

Which one of the following graphs represents an increasing arithmetic sequence?

**A.****B.****C.****D.****E.**

**Question 8**

The solution of the difference equation

$$t_{n+1} = 3t_n \quad n = 1, 2, 3$$

where  $t_1 = 7$  is

- A.  $\frac{3}{7}$
- B. 21
- C.  $t_{n+1} = 3t_1 + 7$
- D.  $t_{n+1} = 7(3)^{n-1}$
- E.  $t_{n+1} = 3n + 7$

**Question 9**

A geometric sequence has fourth term 162 and fifth term 54.

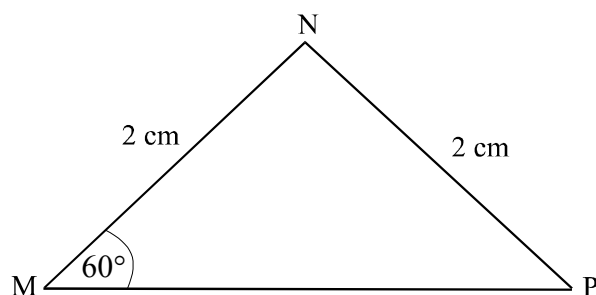
The sum of the first 10 terms of this sequence is

- A.  $10\frac{2}{9}$
- B. 487
- C.  $6560\frac{8}{9}$
- D. 59 048
- E. 129 137 976

## Module 2 : Geometry and trigonometry

If you choose this module, **all** questions must be answered.

### Question 1

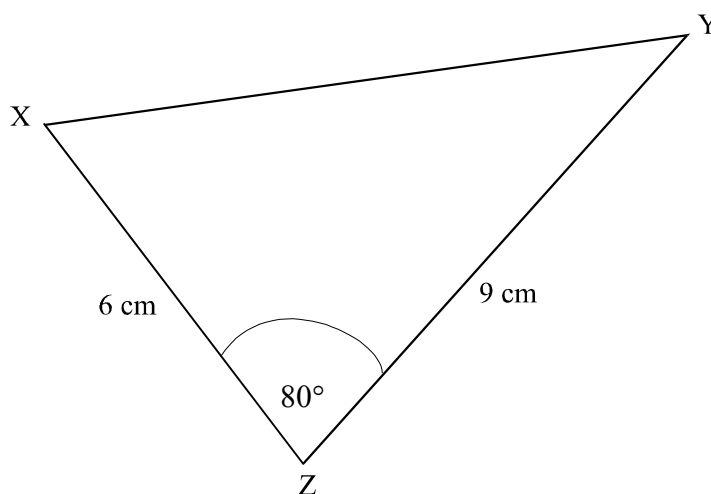


In triangle  $MNP$ ,  $MN = 2$  cm,  $NP = 2$  cm and angle  $NMP = 60^\circ$ .

The length of  $MP$  in centimetres is

- A. 2
- B. 2.2
- C. 3
- D. 3.5
- E. 4

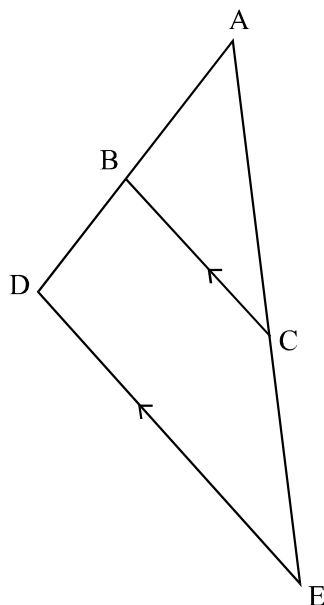
### Question 2



In triangle  $XYZ$ ,  $XZ = 6$  cm,  $YZ = 9$  cm and angle  $XZY = 80^\circ$ .

The area of triangle  $XYZ$ , in square centimetres, and correct to 1 decimal place, is

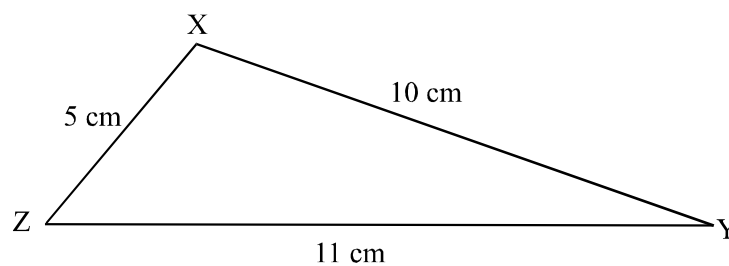
- A. 3.8
- B. 4.7
- C. 26.6
- D. 27
- E. 53

**Question 3**

The area of triangle  $ABC$  is  $4 \text{ cm}^2$ .

If  $AB = BD$ , then the area of triangle  $ADE$  in  $\text{cm}^2$  is

- A. 6
- B. 8
- C. 12
- D. 16
- E. 18

**Question 4**

In triangle  $XYZ$ ,  $XZ = 5 \text{ cm}$ ,  $ZY = 11 \text{ cm}$  and  $XY = 10 \text{ cm}$ .

Angle  $XZY$ , to the nearest minute is

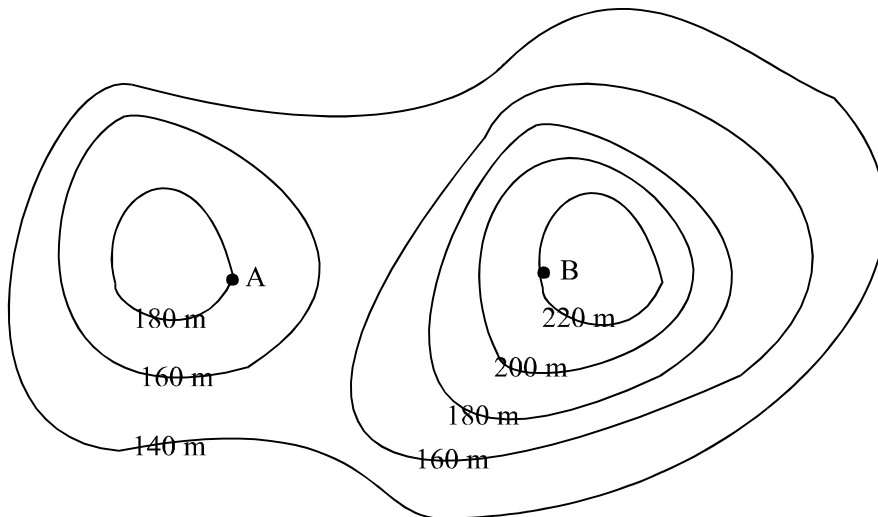
- A.  $33^\circ 15'$
- B.  $65^\circ 3'$
- C.  $65^\circ 17'$
- D.  $71^\circ 8'$
- E.  $82^\circ 12'$

**Question 5**

On a scale map, a building is represented by a rectangle of length 15 mm and width 10 mm. The scale of the map is 1 : 2000.

How many square metres does the actual building cover?

- A. 15
- B. 60
- C. 150
- D. 300
- E. 600

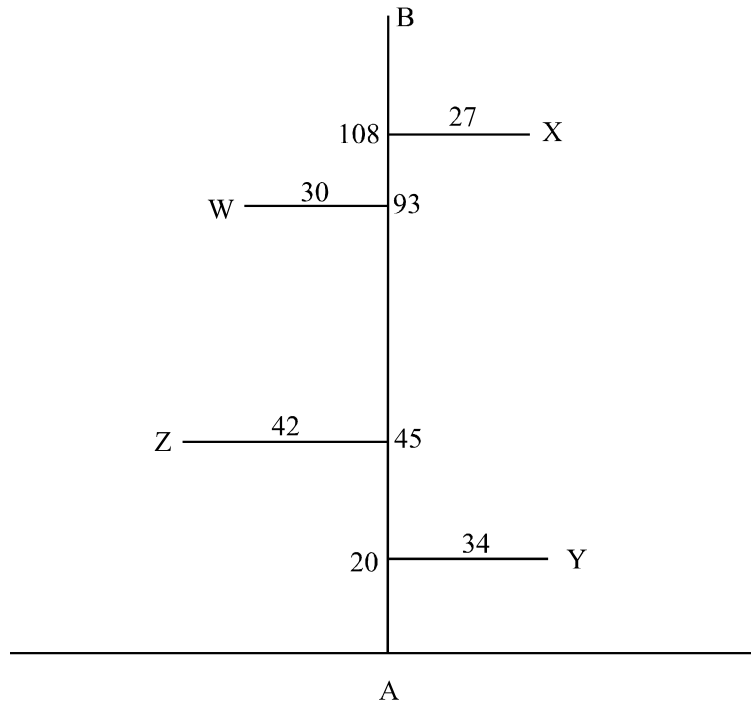
**Question 6**

Two hills are shown on the contour map above. The horizontal distance between point A and point B is 70 metres. A bird flies in a straight line from point A to point B.

The distance flown by the bird, to the nearest metre is

- A. 57
- B. 58
- C. 73
- D. 80
- E. 81

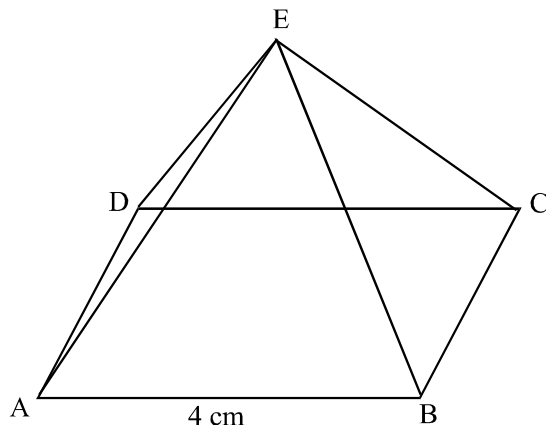


**Question 7**

A field sketch of a traverse survey is shown in the diagram above. The vertical base line AB has 4 horizontal lines branching off it and these lead to points of interest which are represented by W, X, Y and Z. The distance, in metres, from each of these points of interest, horizontally back to the base line is indicated in the diagram as is the distance from A to each point where one of the horizontal lines branches off.

The actual distance from W to Z, to the nearest metre is

- A. 36
- B. 44
- C. 46
- D. 49
- E. 56

**Question 8**

The right pyramid shown in the diagram above has a square base with side length 4 cm and diagonal edges EA, EB, EC and ED each 6 cm.

Find, to the nearest minute, the angle that the triangular side BCE makes with the square base ABCD.

- A.  $19^\circ 28'$
- B.  $41^\circ 49'$
- C.  $45^\circ$
- D.  $55^\circ$
- E.  $69^\circ 18'$

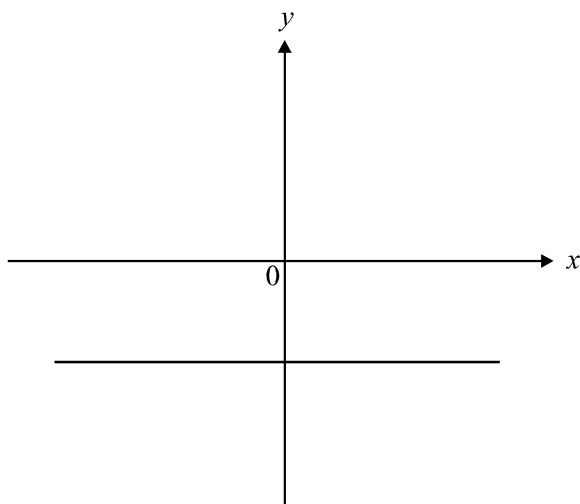
**Question 9**

A group of Year 9 students on school camp hike from their campsite to a water tank along a straight fire track for a distance of 3 km on a bearing of  $080^\circ$ . They then walk along another straight fire track for a distance of 4 km on a bearing of  $220^\circ$ . They stop for lunch at this spot. The bearing of the lunch spot from the original campsite is closest to

- A.  $79^\circ$
- B.  $89^\circ$
- C.  $100^\circ$
- D.  $159^\circ$
- E.  $169^\circ$

**Module 3 : Graphs and relations**

If you choose this module, **all** questions must be answered.

**Question 1**

The equation of the horizontal line shown above could be

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

**Question 2**

For the linear relation  $x + 2y = -1$ , it is true to say that

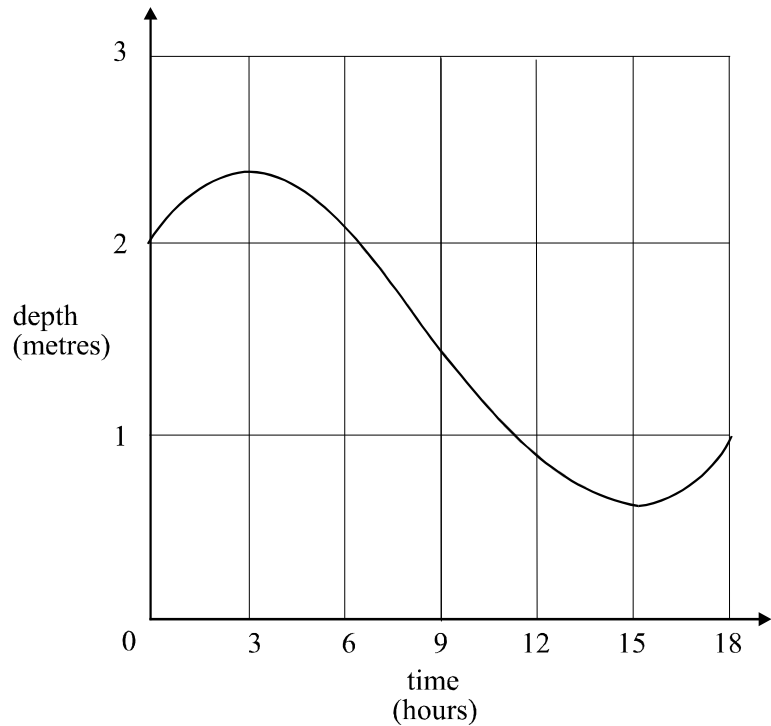
- A. the graph passes through the origin
- B. as  $x$  increases,  $y$  increases
- C. the  $y$ -intercept of the graph is greater than zero
- D. the gradient of the graph is  $-\frac{1}{2}$
- E. the  $x$ -intercept of the graph is greater than zero

**Question 3**

The depth of a tidal river measured at Jackson's Bridge over an 18 hour period is shown on the graph below.

The depth of the river decreased most rapidly between

- A. 0 and 3 hours
- B. 2 and 4 hours
- C. 8 and 10 hours
- D. 14 and 16 hours
- E. 15 and 18 hours

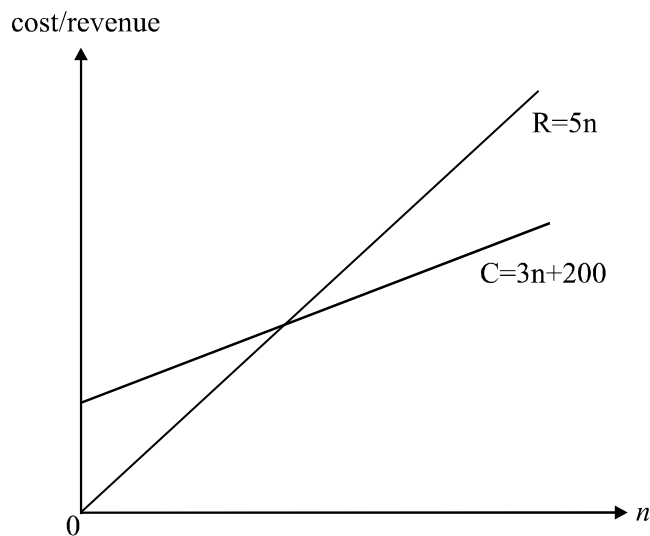
**Question 4**

The number of counter lunches ordered at a pub in a week is given by  $n$ .

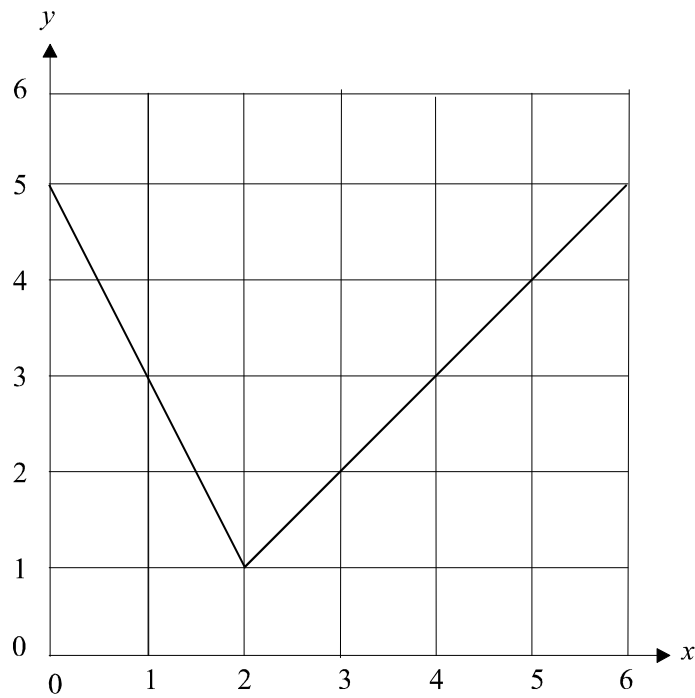
The graph below shows the costs  $C$ , and the revenue,  $R$ , in dollars, as a result of producing  $n$  counter lunches at this pub.

The owner of the pub will break even when the number of counter lunches ordered in a week is

- A. 25
- B. 100
- C. 150
- D. 200
- E. 225



## Question 5

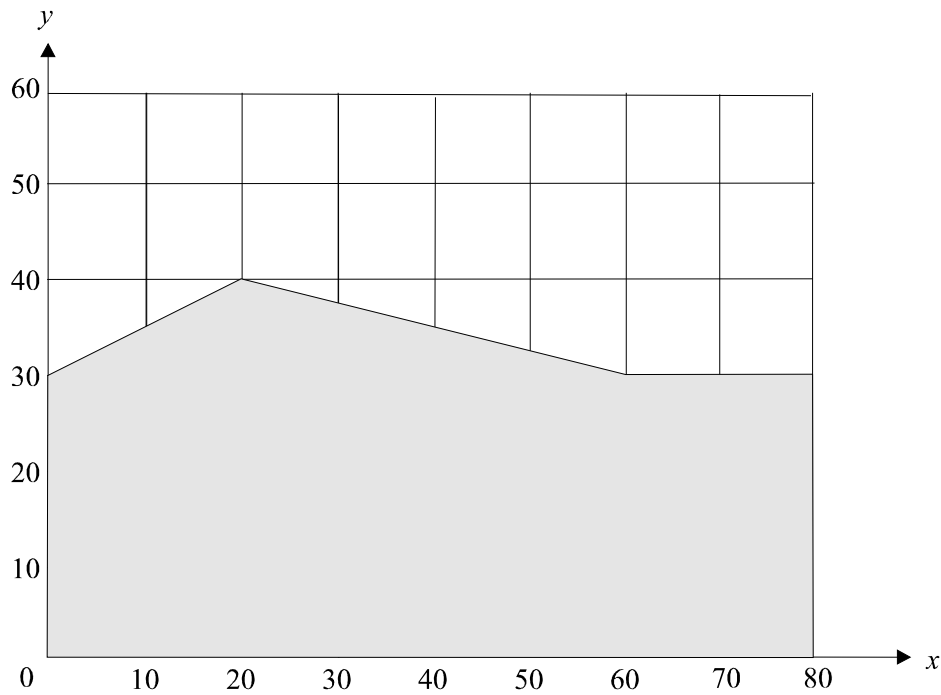


The graph shown represents the function with the rule

- A.  $y = \begin{cases} 2x + 5 & 0 \leq x \leq 2 \\ x + 2 & 2 < x \leq 6 \end{cases}$
- B.  $y = \begin{cases} -\frac{x}{2} + 5 & 0 \leq x \leq 2 \\ -x - 1 & 2 < x \leq 6 \end{cases}$
- C.  $y = \begin{cases} -2x + 5 & 0 \leq x \leq 2 \\ x - 1 & 2 < x \leq 6 \end{cases}$
- D.  $y = \begin{cases} -\frac{x}{2} + 5 & 0 \leq x \leq 2 \\ x + 2 & 2 < x \leq 6 \end{cases}$
- E.  $y = \begin{cases} -2x + 5 & 0 \leq x \leq 2 \\ x + 1 & 2 < x \leq 6 \end{cases}$

**Question 6**

The graph below shows a shaded area with boundary included which is the feasible region in a linear programming problem.



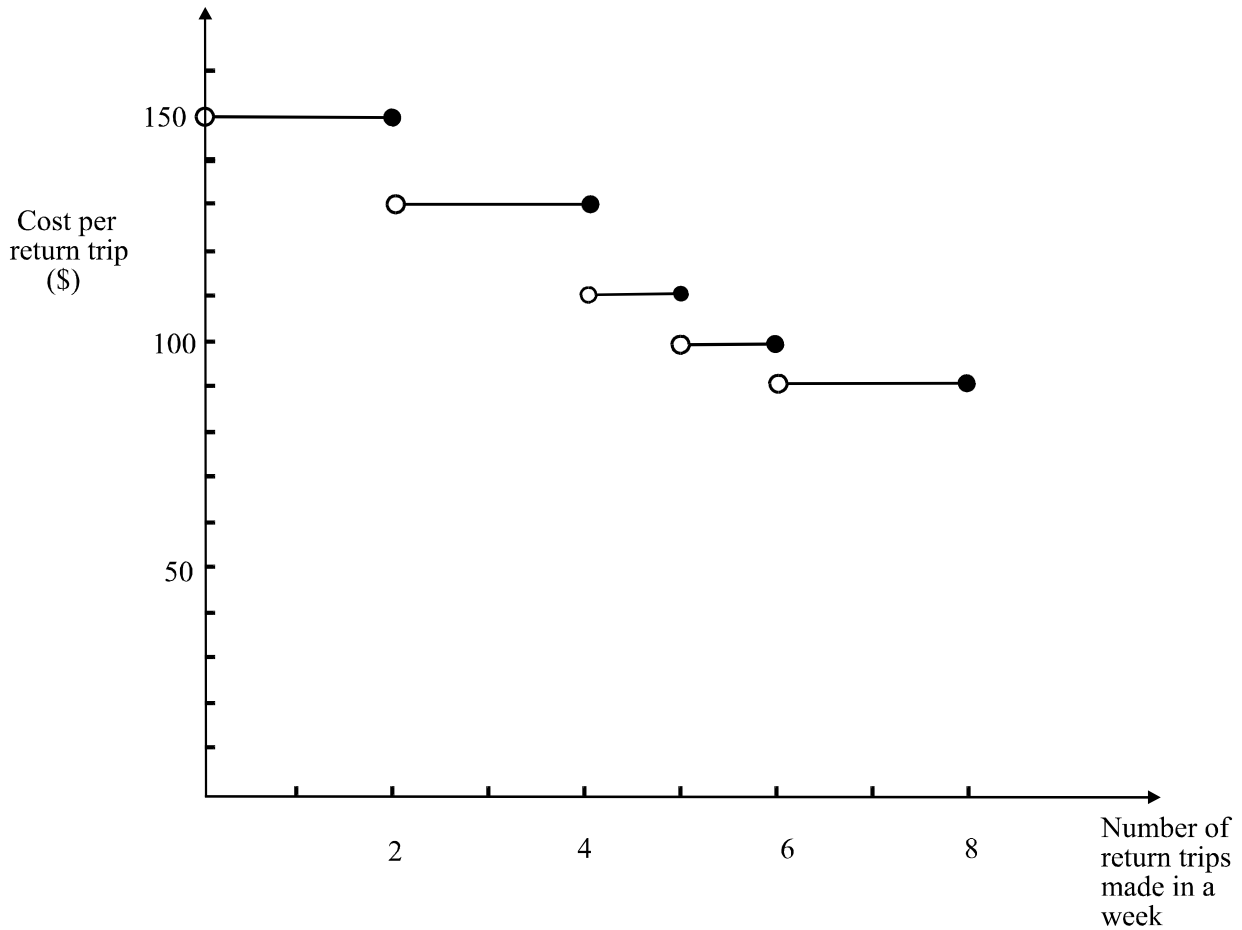
The maximum value of  $2x + 3y$  for this feasible region would be

- A. 0
- B. 90
- C. 160
- D. 210
- E. 250

**Question 7**

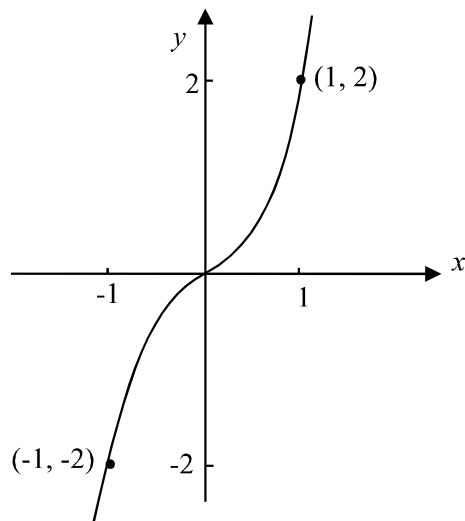
An airline gives discounted rates to a company which has employees travelling between Melbourne and Sydney. The extent of the discount is determined by how many such return trips are made in a week.

The cost per return trip against the number of return trips made in a week is shown on the graph below.



If 3 return trips are made one week and 5 the next, what is the total cost to the company for these 8 trips?

- A. \$90
- B. \$240
- C. \$720
- D. \$890
- E. \$940

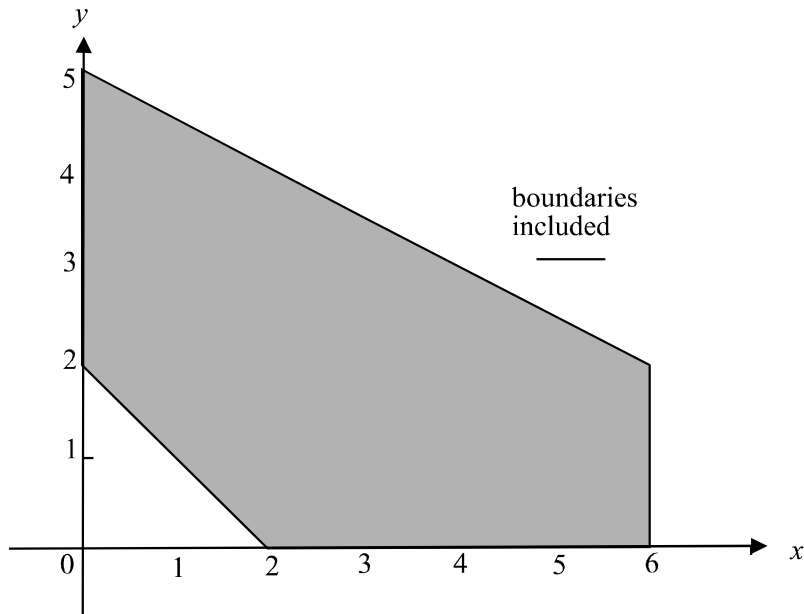
**Question 8**

A possible equation for the graph shown above is

- A.  $y = \frac{2}{x^2}$
- B.  $y = \frac{2}{x}$
- C.  $y = 2x$
- D.  $y = 2x^2$
- E.  $y = 2x^3$



## Question 9



Which set of inequations describes the shaded region shown above which has boundaries included ?

- A.  $0 \leq x \leq 6$ ,  $y \geq 0$ ,  $x + y \geq 2$ ,  $x + 2y \leq 10$
- B.  $0 \leq x \leq 6$ ,  $y \geq 0$ ,  $x - y \geq 2$ ,  $\frac{x}{2} + y \leq 6$
- C.  $x \geq 0$ ,  $y \leq 6$ ,  $x + y \geq 2$ ,  $\frac{x}{2} + y \leq 6$
- D.  $x \geq 0$ ,  $y \geq 0$ ,  $y \leq 6$ ,  $x - y \geq 2$ ,  $2x + y \leq 6$
- E.  $x \geq 0$ ,  $y \leq 6$ ,  $2x + 2y \geq 1$ ,  $x + 2y \leq 10$

**Module 4 : Business related mathematics**

If you choose this module, **all** questions must be answered.

**Question 1**

An office phone system was purchased for \$25 000 and decreases in value by 13% each year. After 6 years its value is closest to

- A. \$0
- B. \$9431.36
- C. \$10 840
- D. \$12 460
- E. \$21 100

**Question 2**

Interest on a savings account is calculated at 0.3% per month based on the minimum monthly balance. The last five transactions on the account are shown below.

<b>date</b>	<b>transaction detail</b>	<b>debit</b>	<b>credit</b>	<b>balance</b>
01 Apr 00	balance brought forward			790.53
07 May 00	deposit		2395.00	3185.53
09 Jun 00	withdrawal	238.00		2947.53
13 Jun 00	withdrawal	137.00		2810.53
26 Jun 00	deposit		153.00	2963.53

The interest, in dollars, for the month of May is calculated by evaluating

- A.  $790.53 \times 0.003$
- B.  $790.53 \times 0.3$
- C.  $3185.53 \times 0.003$
- D.  $3185.53 \times 0.3$
- E.  $2947.53 \times 0.003$

**Question 3**

A store offers a deal on television sets whereby a customer pays a deposit and then 52 weekly instalments. The flat rate of interest on such a deal is 15%. The effective rate of interest is closest to

- A. 7.8%
- B. 14.7%
- C. 26%
- D. 29.4%
- E. 34.6%

**Question 4**

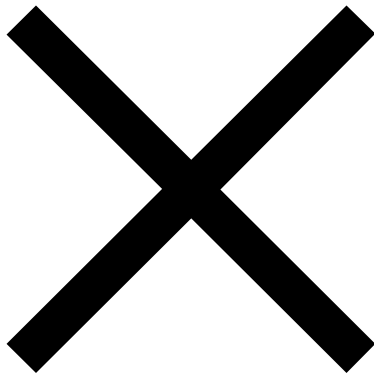
Matthew places an inheritance of \$20 000 into an account which earns compound interest of 6% per annum compounding monthly. The amount of money in this account, to the nearest cent, after nine months is

- A. \$20 918.21
- B. \$21 104.59
- C. \$21 106.29
- D. \$28 466.24
- E. \$31 026.56

**Question 5**

Sam and Jack each invested \$5000. Sam invested his in an account earning compound interest of 4% compounding annually. Jack invested his in an account earning simple interest. After 3 years Sam and Jack had earned the same amount of interest on their investments. What annual simple interest rate, correct to 2 decimal places, did Jack earn on his investment?

- A. 3.87%
- B. 4.16%
- C. 4.18%
- D. 25.62%
- E. 37.50%

**Question 6**

An amount of \$1000 is placed in an account which earns interest that compounds annually. The amount of money in the account at the end of each year is shown on the graph above.

The annual rate of interest earned could be

- A. 0.015%
- B. 0.05%
- C. 1.5%
- D. 5%
- E. 10%

The information below relates to questions 7 and 8.

John considers taking out a reducing balance loan of \$30 000 with an annual interest rate of 10% compounding each 6 months. He would make repayments of \$5000 each 6 months.

### Question 7

John begins to calculate step-by-step the interest charged and the amount still owing on the first few repayments of this loan.

<b>date</b>	<b>amount repaid</b>	<b>interest charged</b>	<b>amount owing</b>
01 Jul 00	0	0	30 000
15 Dec 00	5000	0	25 000
01 Jan 01	0	1250	26 250
15 Jun 01	5000	0	21 250
01 Jul 01	0	_____	

The interest charged on the 1<sup>st</sup> July 2001 would be

- A. \$212.50
- B. \$876.25
- C. \$1062.50
- D. \$1250.00
- E. \$1500.00

### Question 8

The amount owing on such a loan after 3 years can be found by evaluating

- A.  $30\,000 \times (1.01)^3 - \frac{5000(1.01^3 - 1)}{0.01}$
- B.  $30\,000 \times (1.1)^3 - \frac{5000(1.1^3 - 1)}{0.1}$
- C.  $30\,000 \times (1.1)^6 - \frac{5000(1.1^6 - 1)}{0.1}$
- D.  $30\,000 \times (1.05)^3 - \frac{5000(1.05^3 - 1)}{0.05}$
- E.  $30\,000 \times (1.05)^6 - \frac{5000(1.05^6 - 1)}{0.05}$

**Question 9**

Joy takes out a reducing balance loan of \$10 000. The interest rate on this loan is 10% per annum compounding six monthly. Joy makes repayments of \$1295.05 every six months in order to have the loan paid off after 5 years.

If Joy's repayments were calculated so that she made yearly repayments rather than six monthly repayments, whilst still repaying the loan in 5 years, how much more would she pay in interest over the 5 years?

- A. \$24.90
- B. \$239.37
- C. \$302.00
- D. \$277.10
- E. \$1206.00

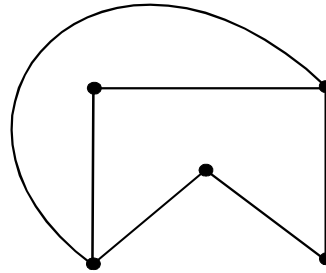
## Module 5 : Networks and decision mathematics

If you choose this module, **all** questions must be answered.

### Question 1

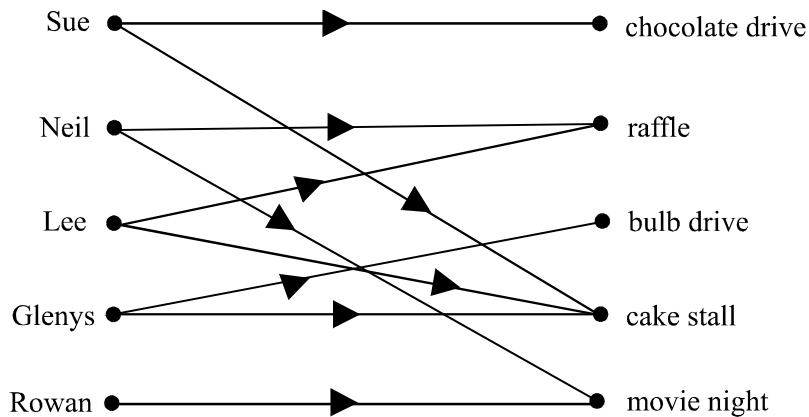
The sum of the degrees of the vertices of the graph shown is

- A. 5
- B. 6
- C. 7
- D. 11
- E. 12



### Question 2

A fundraising sub-committee has 5 members, each of whom chose various fundraising activities that they would like to see held. The information regarding their preferences is displayed in the following bipartite graph.



Which one of the following statements is true?

- A. The chocolate drive was the least popular of all the activities.
- B. Neil and Lee chose no activity the same.
- C. No one wanted the bulb drive to be held.
- D. The cake stall was the most popular activity.
- E. Glenys preferred less activities than anybody else.

**Question 3**

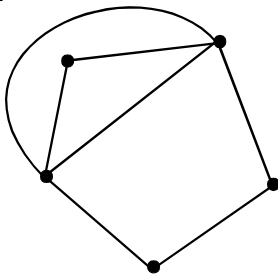
A connected planar graph has 10 vertices and divides the plane into 5 regions. The number of edges linking the vertices is

- A. 3
- B. 7
- C. 13
- D. 15
- E. 17

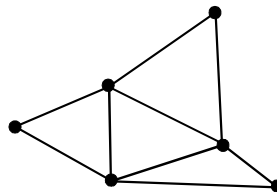
**Question 4**

Which one of the following graphs does **not** have an Euler circuit?

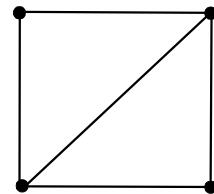
A.



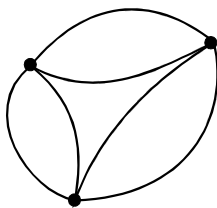
B.



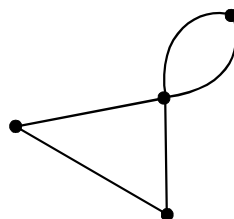
C.



D.

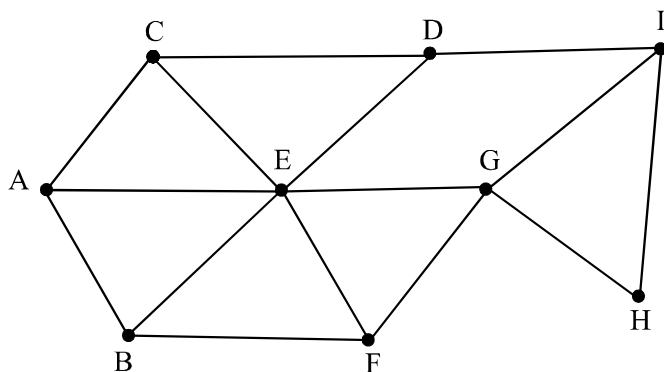


E.





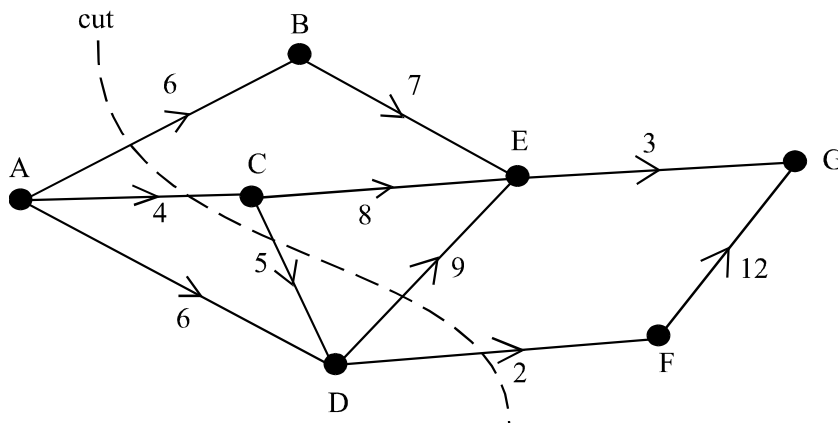
## Question 5



Which one of the following paths describes a Hamiltonian circuit for the graph below?

- A. AEDCEBFIH
- B. ACEDIHGFBA
- C. AEBFGIHGEDCA
- D. ABFGHIGEDCA
- E. ACDIHGFEA

## Question 6

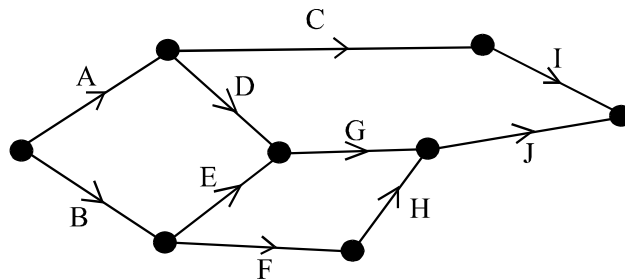


In the graph above, the capacity of the cut shown is

- A. 12
- B. 17
- C. 21
- D. 26
- E. 31

### Question 7

The directed graph below represents the process involved with the construction of a tunnel with the activities listed on the arcs of the graph.



Which one of the following tables shows the activities with their immediate predecessors for this graph?

A.

task	immediate predecessor
A	-
B	-
C	A
D	B
E	A
F	B
G	D, E
H	F
I	C
J	G, H

B.

task	immediate predecessor
A	-
B	-
C	A
D	A
E	-
F	B
G	D
H	F
I	C
J	H

C.

task	immediate predecessor
A	C, D
B	F
C	I
D	G
E	G
F	H
G	J
H	J
I	-
J	-

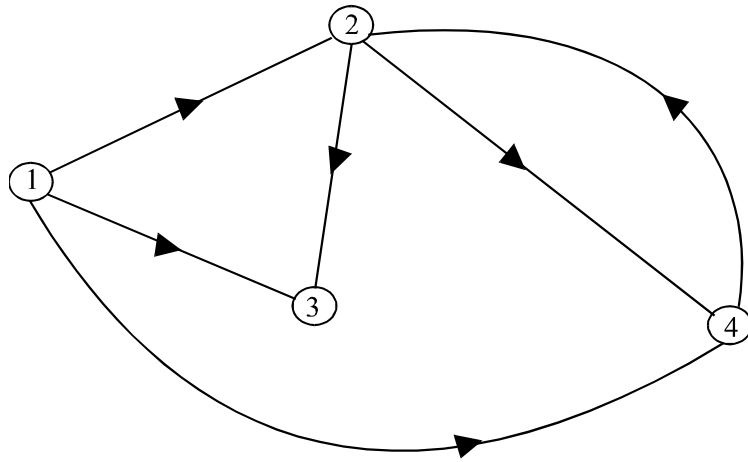
D.

task	immediate predecessor
A	-
B	-
C	A
D	A
E	B
F	B
G	D, E
H	F
I	C
J	G, H

E.

task	immediate predecessor
A	-
B	-
C	A
D	A
E	B
F	B
G	D, E
H	F
I	J
J	C

## Question 8



The adjacency matrix for the digraph shown above is given by

**A.**

$$\begin{array}{c} \text{vertex} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{ccccc} & 1 & 2 & 3 & 4 \\ \left[ \begin{array}{cccc} 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{array} \right] \end{array}$$

**B.**

$$\begin{array}{c} \text{vertex} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{ccccc} & 1 & 2 & 3 & 4 \\ \left[ \begin{array}{cccc} 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \end{array} \right] \end{array}$$

**C.**

$$\begin{array}{c} \text{vertex} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{ccccc} & 1 & 2 & 3 & 4 \\ \left[ \begin{array}{cccc} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \end{array} \right] \end{array}$$

**D.**

$$\begin{array}{c} \text{vertex} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{ccccc} & 1 & 2 & 3 & 4 \\ \left[ \begin{array}{cccc} 3 & 0 & 0 & 0 \\ 0 & 4 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 3 \end{array} \right] \end{array}$$

**E.**

$$\begin{array}{c} \text{vertex} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{ccccc} & 1 & 2 & 3 & 4 \\ \left[ \begin{array}{cccc} 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{array} \right] \end{array}$$

**Question 9**

A company looks at quotes from 4 couriers - A, B, C and D - to deliver documents to destinations W, X, Y and Z.

The company secretary has created a matrix using the quotes and has begun to apply the Hungarian algorithm to decide how to allocate the delivery of the documents.

The matrix he has now is

	W	X	Y	Z
A	0	5	10	8
B	0	0	11	6
C	9	0	4	0
D	0	0	0	7

By completing the Hungarian algorithm, the secretary will find that the allocation producing the minimum delivery cost is

- A.** courier A delivers to destination W  
courier B delivers to destination X  
courier C delivers to destination Y  
courier D delivers to destination Z
- B.** courier A delivers to destination W  
courier B delivers to destination X  
courier C delivers to destination Z  
courier D delivers to destination Y
- C.** courier A delivers to destination X  
courier B delivers to destination W  
courier C delivers to destination Y  
courier D delivers to destination Z
- D.** courier A delivers to destination X  
courier B delivers to destination W  
courier C delivers to destination Z  
courier D delivers to destination Y
- E.** courier A delivers to destination Z  
courier B delivers to destination X  
courier C delivers to destination W  
courier D delivers to destination Y

# FURTHER MATHEMATICS

## TRIAL EXAMINATION 1

### 2000

## MULTIPLE-CHOICE ANSWER SHEET

*STUDENT NAME:* .....

### INSTRUCTIONS

Fill-in the letter that corresponds to your choice. Example:  A  B  C  D  E  
The answer selected is B. Only one answer should be selected.

#### Section A - Core

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
9.  A  B  C  D  E
10.  A  B  C  D  E
11.  A  B  C  D  E
12.  A  B  C  D  E
13.  A  B  C  D  E

#### Section B - Modules

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>Module Number ____</li> <li>1. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>2. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>3. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>4. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>5. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>6. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>7. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>8. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>9. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>10. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>11. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>12. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>13. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> </ol> | <ol style="list-style-type: none"> <li>5. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>6. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>7. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>8. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>9. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>Module Number ____</li> <li>1. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>2. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>3. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>4. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>5. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>6. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>7. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>8. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> <li>9. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E</li> </ol> |
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