



2006

VCE

Further Mathematics

Trial Examination 1



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PURPOSE OF THIS TRIAL EXAMINATION

This Further Mathematics Trial Examination is designed to assess

- knowledge of mathematical concepts
- skills in carrying out mathematical algorithms
- ability to apply concepts and skills in standards ways

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VICTORIAN CERTIFICATE OF EDUCATION 2006

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
A	13	13		
B	54	27	6	3

Directions to students

Materials

Question book of 37 pages.

Answer sheet for multiple-choice questions.

There is a detachable sheet of miscellaneous formula supplied.

Working space is provided throughout the book.

You may bring to the examination one bound reference that may be annotated. The reference may be typed or handwritten. The reference may be a textbook.

One approved graphics calculator or CAS and, if desired, one scientific calculator may be used.

You should have at least one pencil and an eraser.

The task

Detach the formula sheet from the book during reading time.

Please ensure 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.

Answer **all** questions from Section A

You should select three modules from Section B and answer **all** questions within the modules selected.

Indicate the modules selected on the answer sheet for multiple-choice questions by shading the corresponding boxes.

There is a total of 13 marks available for Section A and 9 marks for each module in Section B

There is a total of 40 marks available for this examination.

All questions should be answered on the answer sheet for multiple-choice questions provided.

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

You may retain this question book.

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

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VCE FURTHER MATHEMATICS 2006

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
---	---	---	---	---

Section A

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

Please turn over . . .



Section B

(Shade the boxes of the three modules selected. There are a total of six from which to choose)

	Module 1 Number patterns	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
	Module 2 Geometry and trigonometry	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
	Module 3 Graphs and relations	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

Please turn over . . .



Section B

(Shade the boxes of the three modules selected. There are a total of six from which to choose)

☐	Module 4 Business-related mathematics	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
☐	Module 5 Networks and decision mathematics	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
☐	Module 6 Matrices	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

Please DO NOT fold, bend or staple this form



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.

**Further Mathematics Formulas****Core: Data analysis**

standardised score:

$$z = \frac{x - \bar{x}}{s_x}$$

least squares line:

$$y = a + bx \text{ where } b = r \frac{s_y}{s_x} \text{ and } a = \bar{y} - b\bar{x}$$

residual value:

$$\text{residual value} = \text{actual value} - \text{predicted value}$$

seasonal index:

$$\text{seasonal index} = \frac{\text{actual figure}}{\text{deseasonalised figure}}$$

Module 1: Number patterns

arithmetic series:

$$a + (a + d) + \dots + (a + (n - 1)d) = \frac{n}{2}[2a + (n - 1)d] = \frac{n}{2}(a + l)$$

geometric series:

$$a + ar + ar^2 + \dots + ar^{n-1} = \frac{a(1 - r^n)}{1 - r}, r \neq 1$$

infinite geometric series:

$$a + ar + ar^2 + ar^3 + \dots = \frac{a}{1 - r}, |r| < 1$$

Module 2: Geometry and trigonometry

area of a triangle:

$$\frac{1}{2}bc \sin A$$

Heron's formula:

$$A = \sqrt{s(s - a)(s - b)(s - c)} \text{ where } s = \frac{1}{2}(a + b + c)$$

circumference of a circle:

$$2\pi r$$

area of a circle:

$$\pi r^2$$

volume of a sphere:

$$\frac{4}{3}\pi r^3$$

surface area of a sphere:

$$4\pi r^2$$

volume of a cone:

$$\frac{1}{3}\pi r^2 h$$

volume of a cylinder:

$$\pi r^2 h$$

volume of a prism:

$$\text{area of base} \times \text{height}$$

volume of a pyramid:

$$\frac{1}{3} \text{area of base} \times \text{height}$$



Pythagoras' theorem: $c^2 = a^2 + b^2$

sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

cosine rule: $c^2 = a^2 + b^2 - 2ab \cos C$

Module 3: Graphs and relations

Straight line graphs

gradient (slope): $m = \frac{y_2 - y_1}{x_2 - x_1}$

equation: $y = mx + c$

Module 4: Business-related mathematics

simple interest: $I = \frac{PrT}{100}$

compound interest: $A = PR^n$ where $R = 1 + \frac{r}{100}$

hire purchase: effective rate of interest $\approx \frac{2n}{n+1} \times \text{flat rate}$

annuities: $A = PR^n - \frac{Q(R^n - 1)}{R - 1}$, where $R = 1 + \frac{r}{100}$

Module 5: Networks and decision mathematics

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

Module 6: 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: $A^{-1} = \frac{1}{\det A} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ where $\det A \neq 0$

END OF FORMULA SHEET



Specific Instructions for Section A

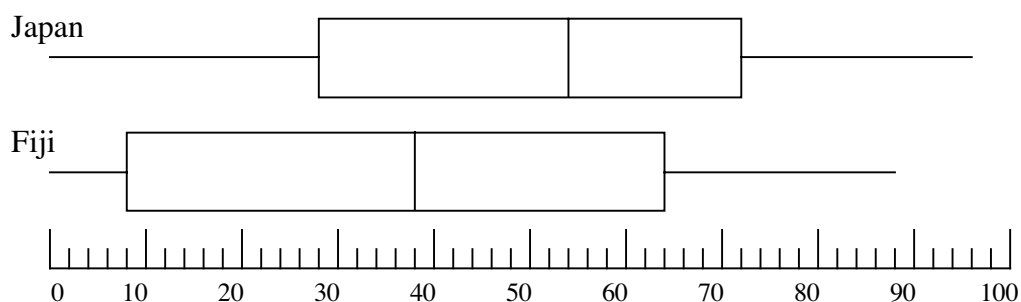
Section A consists of 13 questions

Answer **all** questions in this section.

A correct answer scores 1 mark, an incorrect answer scores 0. No mark will be given for a question if two or more letters are shaded for that question. Marks will not be deducted for incorrect answers and you should attempt every question.

The following box and whisker plot is to be used in Questions 1 and 2.

It shows the ages in years of people living in Fiji and Japan.



Question 1

The median age of people living in Fiji is

- A. 9 years.
- B. 38 years.
- C. 39 years.
- D. 53 years.
- E. 62 years.

Question 2

The percentage of Japanese people who are older than 28 is

- A. 5 %.
- B. 10 %.
- C. 25 %.
- D. 75 %.
- E. 90 %.



Question 3

The table below shows the number of males and females who work full time and part time for a particular company.

	Male	Female
Full Time	43	27
Part Time	37	45

The percentage of part time workers who are women is closest to

- A. 30 %
- B. 55 %
- C. 60 %
- D. 63 %
- E. 82 %

Question 4

The following is a stem and leaf plot for test scores.

4		3	6		
5		2	7	9	
6		3	3	4	8
7		1	2	5	6
8		2	8	9	
9		4			

The interquartile range for this stem and leaf plot is

- A. 19
- B. 20
- C. 21
- D. 22
- E. 51



Question 5

Jack looks at data for the number of hours spent studying maths during one week for 120 students and their results on a maths test at the end of the week. He calculates the coefficient of determination for these data and finds that $r^2 = 1$.

Which one of the following statements is correct?

- A. Jack made a mistake in find r^2 because it can never equal 1.
- B. When the coefficient of determination equals 1, then Pearson's product-moment correlation coefficient must equal 1.
- C. Jack cannot make reliable predictions regarding hours spent hours spent studying maths and the results on a maths test.
- D. Jack's results show that the more a student studies maths, the higher the results obtained on maths tests.
- E. 100% of the variation in each variable is likely to be due to the relationship between the two variables.

Question 6

A survey is conducted to find the relationship between the number of sweets eaten and the percentage of tooth decay per year. The equation of least squares is found to be:

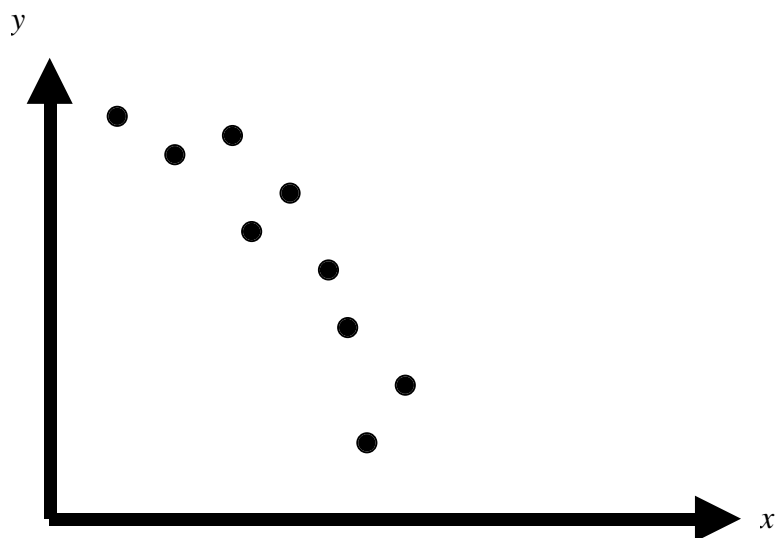
$$\text{Percentage tooth decay} = 0.22 \times \text{number of sweets eaten} + 1.4$$

If the percentage tooth decay is 35 % for a particular person , then the number of sweets eaten that year is closest to

- A. 5
- B. 10
- C. 15
- D. 150
- E. 200



Question 7



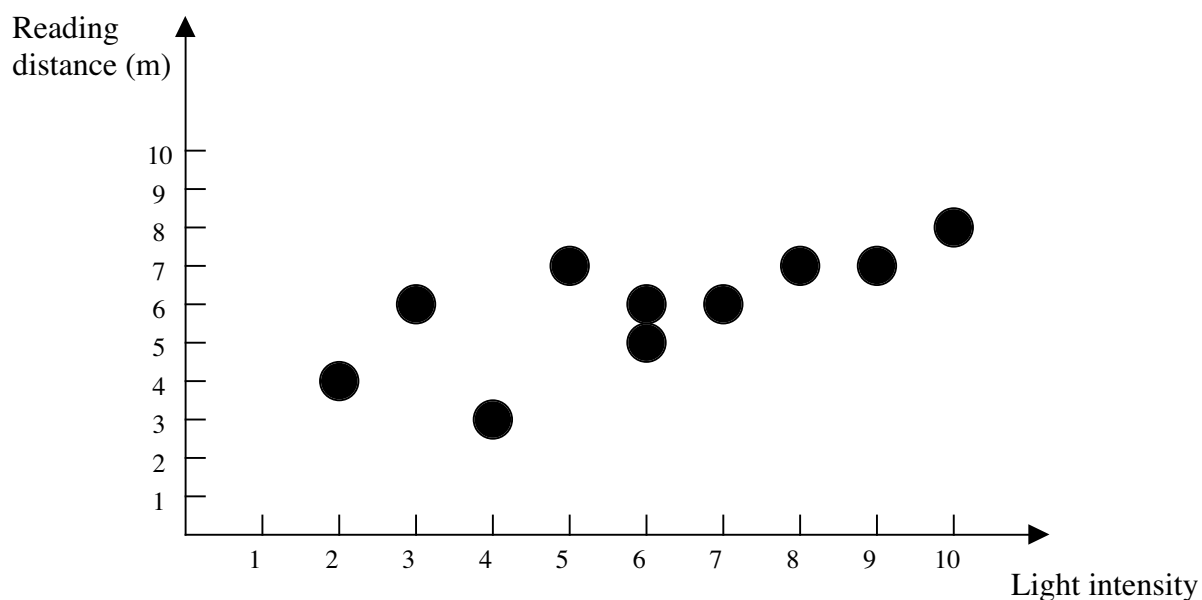
The scatter plot above shows the relationship between x and y . Which one of the following transformations would you use to try to linearise the relationship?

- A. a $\log y$ transformation
- B. a $\frac{1}{x}$ transformation
- C. a $\log x$ transformation
- D. a $\frac{1}{y}$ transformation
- E. an x^2 transformation



Question 8

An advertising company investigates how consumers would read their packaging under different light intensities. The following scatter graph was then drawn up.



The gradient of the 3 median line for these data is closest to

- A. 0.45
- B. 0.5
- C. 0.55
- D. 0.6
- E. 0.65



Question 9

The rainfall and temperature for a particular city are recorded over a period of time and the following statistics for the data are calculated.

$\bar{x} = 194.58 \text{ mm}$	$S_x = 78.26 \text{ mm}$	
$\bar{y} = 20.25 \text{ }^{\circ}\text{C}$	$S_y = 5.03 \text{ }^{\circ}\text{C}$	$r = -0.92$

The equation of the least squares regression line that will enable temperature to be determined from rainfall for this city, is closest to

- A. temperature = $32 - 0.06 \times \text{rainfall}$
- B. rainfall = $32 - 0.06 \times \text{temperature}$
- C. temperature = $15.6 \times \text{rainfall} - 3015$
- D. temperature = $121 - 15.6 \times \text{rainfall}$
- E. temperature = $193 - 0.06 \times \text{rainfall}$

Question 10

The seasonal indices for the price of fruit for each day of a week except Wednesday are listed below.

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Seasonal Index	0.5	0.6		1.0	1.4	1.5	1.6

The seasonal index for Wednesday is

- A. 0.3
- B. 0.4
- C. 0.7
- D. 0.9
- E. 1.1



Question 11

Mercury readings for each month of a year for a certain point off the coast of Australia are set out in the Table below.

Month	Mercury Reading	Month	Mercury Reading
January	0.9	July	0.3
February	0.6	August	0.5
March	0.7	September	0.7
April	0.5	October	0.8
May	0.4	November	0.6
June	0.4	December	0.8

The four point moving average for August is

- A. 0.4
- B. 0.438
- C. 0.475
- D. 0.525
- E. 0.575

Question 12

1000 eggs are weighed and found to have a normal distribution with a mean of 56 g and a standard deviation of 6 g. The number of eggs you would expect to have a weight greater than 68 g would be

- A. 15
- B. 25
- C. 30
- D. 50
- E. 667



Question 13

Which one of the following statements is true?

To compare the *History* and *Further Mathematics* marks of students in the VCE, we would need to

- A.** See which mark is more than 3 standard deviations above the mean.
- B.** Draw a normal curve for each subject and compare the means.
- C.** Convert the marks in each subject into standard scores so that each subject mark now has a mean of zero and a standard deviation of one.
- D.** Divide the difference between the marks obtained in each subject by the standard deviation.
- E.** Compare the percentages that lie within one standard deviation of the mean for each subject.

END OF SECTION A

**Specific Instructions for Section B**

Section B consists of 6 modules

You should select 3 modules and answer **all** questions within the modules on the answer sheet for multiple-choice questions provided. Indicate the modules selected on the answer sheet for multiple-choice questions by shading the corresponding boxes.

A correct answer scores 1 mark, an incorrect answer scores 0. No mark will be given for a question if two or more letters are shaded for that question. Marks will not be deducted for incorrect answers and you should attempt every question within the modules selected.

Module	Page
Module 1: Number patterns	10
Module 2: Geometry and trigonometry	14
Module 3: Graphs and relations	19
Module 4: Business-related mathematics	24
Module 5: Networks and decision mathematics	28
Module 6: Matrices	33



Before answering these questions you **must** shade the Number patterns and applications box on the answer sheet for multiple-choice questions

Question 1

The sum of the infinite series $8 + 4 + 2 + \dots$ is

- A. 14
- B. 15
- C. 16
- D. 24
- E. 28

Question 2

In an arithmetic sequence $t_1 = -9$ and $t_4 = 3$. Which one of the following gives the second and third terms respectively?

- A. -6 , -3
- B. -3 , 1
- C. -6 , 0
- D. -6 , -1
- E. -5 , -1

Question 3

The difference equation $t_{n+1} = 2t_n + 3$ with $t_1 = -3$ generates the sequence

- A. -3 , 3 , 9 , 21
- B. -3 , 3 , 6 , 9
- C. -3 , 0 , 3 , 6
- D. -3 , -3 , -3 , -3
- E. -3 , -6 , -9 , -12



Question 4

$$t_{n+1} = t_n + t_{n-1}, n > 1$$

If $t_{11} = 89$ and $t_{12} = 144$, then t_9 equals

- A. 21
- B. 34
- C. 44
- D. 55
- E. 233

Question 5

The number of terms required for the sum of the sequence 3 , 7 , 11 , 15 . . . to first exceed 320 is

- A. 10
- B. 11
- C. 12
- D. 13
- E. 14

Question 6

The value of a new car bought on 1st of January 2000 is \$50,000. Each year, the value decreases by 15% of the value of the car on the first of January that year.

The value of the car on 1st of January 2007, will be closest to

- A. \$5,006
- B. \$13,625
- C. \$16,029
- D. \$18,857
- E. \$21,523



Question 7

If $t_{n+1} = t_n + 2$ and $t_1 = 9$, then t_{20} equals

- A. 11
- B. 37
- C. 39
- D. 47
- E. 49

Question 8

The sum of n terms of a sequence satisfies the formula $S_n = 7(2^n - 1)$. The third term of this sequence is

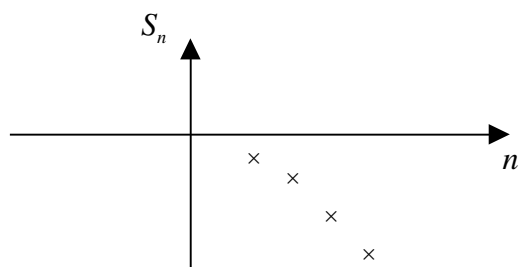
- A. 8
- B. 13
- C. 28
- D. 49
- E. 55



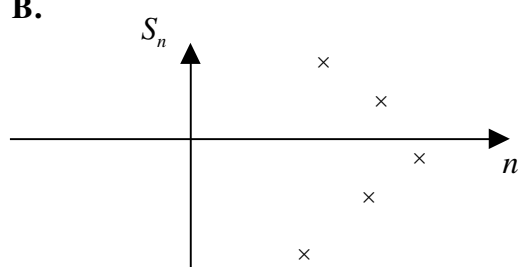
Question 9

Which one of the following could be the graph of a geometric sequence where $a < 0$ and $0 < r < 1$?

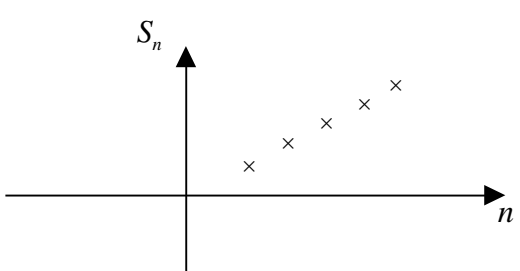
A.



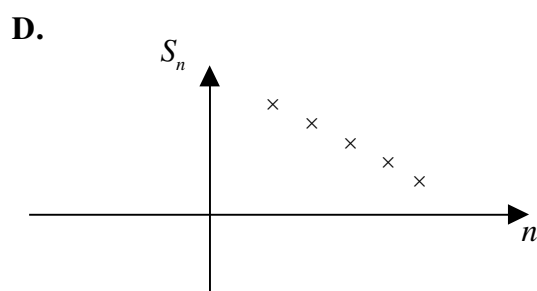
B.



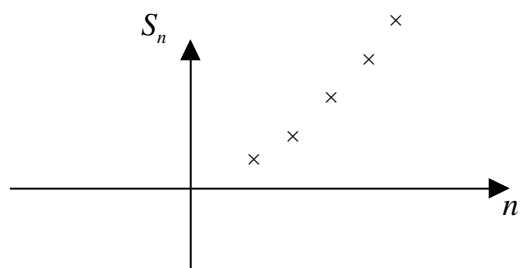
C.



D.



E.

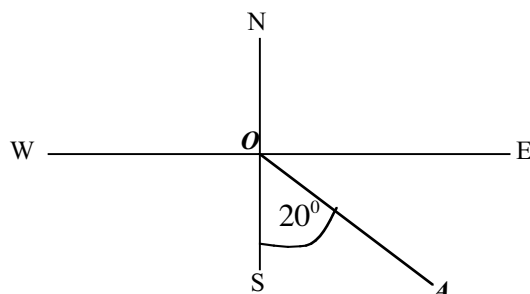


End of Module 1



Before answering these questions you **must** shade the Geometry and trigonometry box on the answer sheet for multiple-choice questions

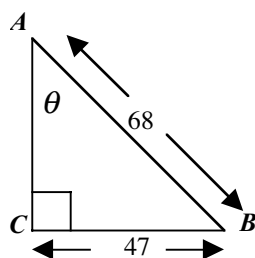
Question 1



The bearing of A from O is best described as

- A. N 20° E
- B. S 70° E
- C. 110° T
- D. 160° T
- E. 200° T

Question 2

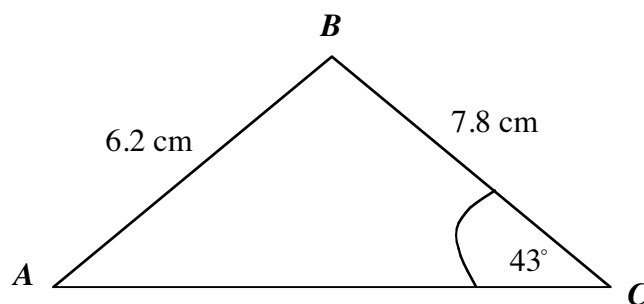


If $\angle CAB = \theta$, $CB = 47$ and $AB = 68$, then θ equals

- A. $34^\circ 39'$
- B. $43^\circ 43'$
- C. $43^\circ 44'$
- D. $46^\circ 16'$
- E. $46^\circ 17'$



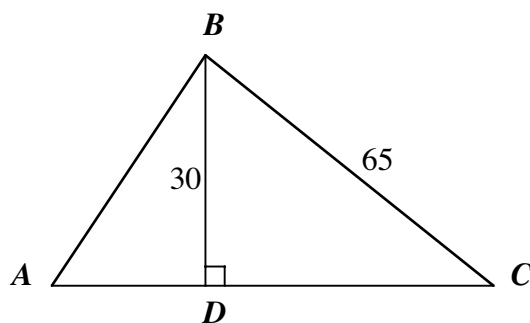
Question 3



In triangle ABC , $BC = 7.8$ cm, $AB = 6.2$ cm and $\angle ACB = 43^\circ$. $\sin \angle BAC$ is closest to

- A. 59.09
- B. 0.59
- C. 0.79
- D. 0.85
- E. 0.86

Question 4

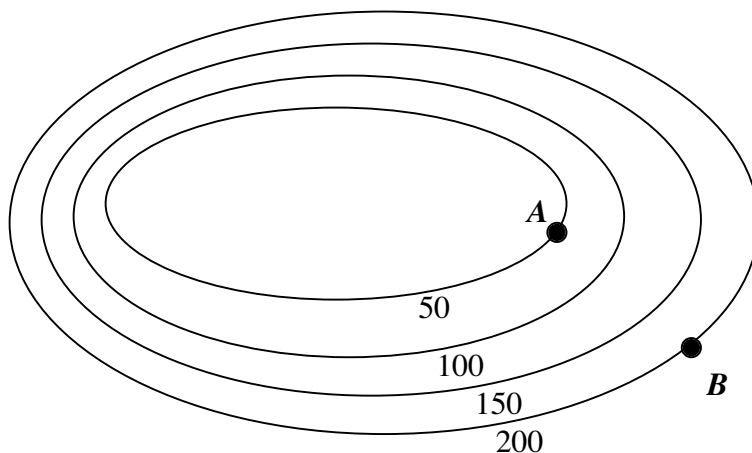


In the above diagram, $DC = 2AD$, $BD = 30$, $BC = 65$.
 AC is closest to

- A. 57.66
- B. 86.49
- C. 107.38
- D. 115.32
- E. 172.98



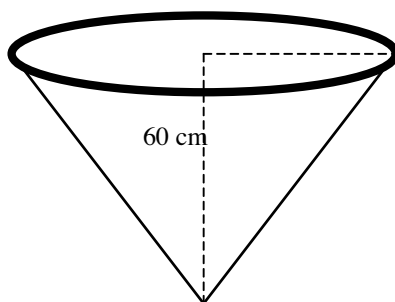
Question 5



The contour map above shows two towns A and B. If the horizontal distance from A to B is 200 m, then the angle of elevation of B from A is

- A. $36^\circ 52'$
- B. $41^\circ 25'$
- C. $48^\circ 35'$
- D. $53^\circ 7'$
- E. $53^\circ 8'$

Question 6

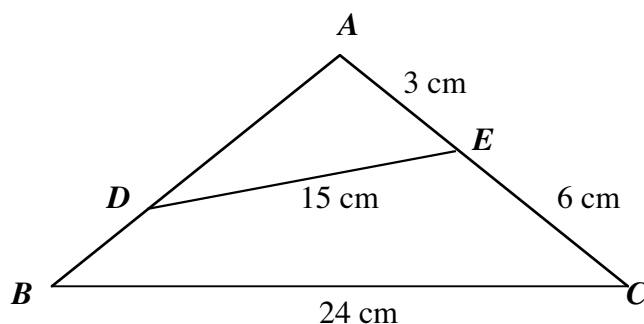


The volume of the above cone with a height of 60 cm is 9047.8 cm^3 .
The diameter of the circular base of this cone is closest to

- A. 12 cm.
- B. 13 cm.
- C. 24 cm.
- D. 25 cm.
- E. 26 cm.



Question 7

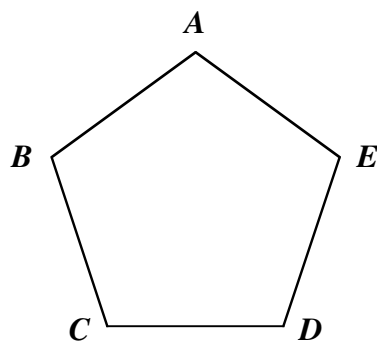


$\angle ADE = \angle ACB$ and $BC = 24$ cm , $DE = 15$ cm , $AE = 3$ cm , $CE = 6$ cm.

AB equals

- A. 4.8 cm.
- B. 8 cm.
- C. 9 cm.
- D. 12 cm.
- E. 22.5 cm.

Question 8

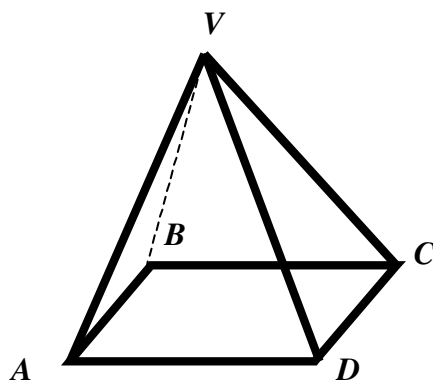


$ABCDE$ is a regular pentagon with sides equal to 5 cm. The area of this pentagon, in cm^2 , is closest to

- A. 21.06
- B. 43.01
- C. 50.56
- D. 59.44
- E. 87.52



Question 9



A right square pyramid is to be made from straws of various lengths. The square base is to have sides of 12 cm and the height of the pyramid is to be 8 cm. The total length of the straws used to make the pyramid is closest to

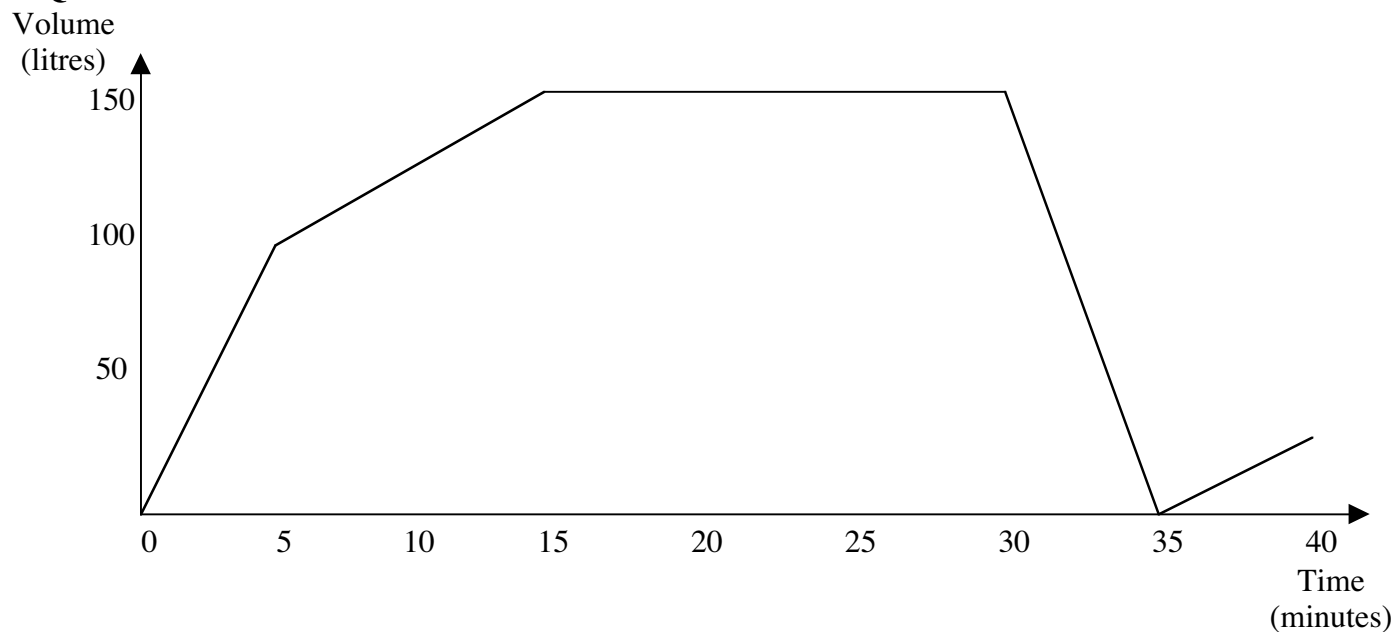
- A. 72 cm.
- B. 80 cm.
- C. 82 cm.
- D. 95 cm.
- E. 116 cm.

End of Module 2



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

Question 1

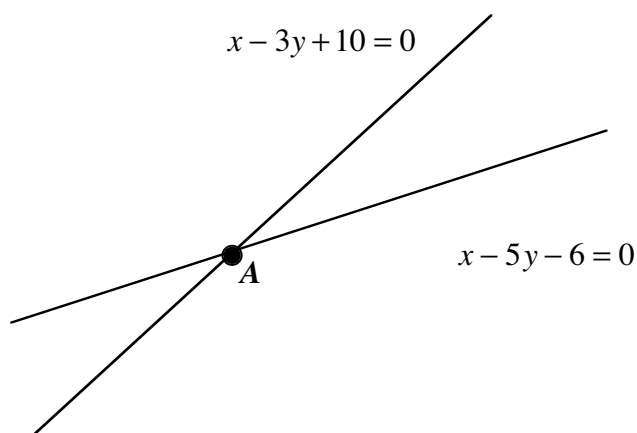


The above graph shows the volume of water in a tank. The time when water is flowing into the tank most rapidly is

- A. 0 – 5 mins.
- B. 5 – 15 mins.
- C. 15 – 30 mins.
- D. 30 – 35 mins.
- E. 35 – 40 mins.



Question 2



A is a point on the lines $x - 3y + 10 = 0$ and $x - 5y - 6 = 0$. If the coordinates of A are (x, y) , then x equals

- A. 4
- B. -4
- C. -8
- D. -11.5
- E. -34

Question 3

Which one of the following lines could be parallel to the line $2y - 4x + 7 = 0$?

- A. $y - 4x + 3 = 0$
- B. $2y - x + 7 = 0$
- C. $3y - 6x = 0$
- D. $y - 4x + 3.5 = 0$
- E. $4y - 2x + 7 = 0$



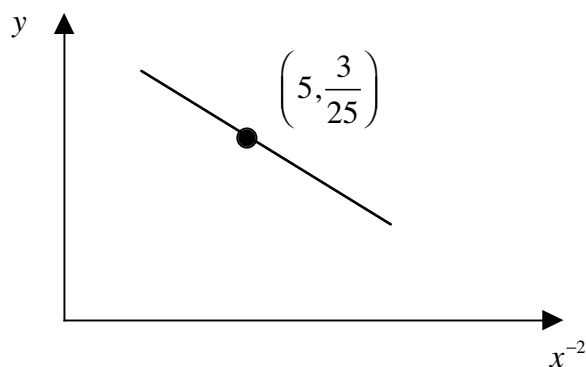
Question 4

Which one of the following points lies on the line $2y - x - 12 = 0$?

- A. (8 , 4)
- B. (12 , 2)
- C. (2 , 12)
- D. (11 , 10)
- E. (10 , 11)

Question 5

The straight line graph below is produced by plotting y against x^{-2} .



The rule giving y in terms of x is

- A. $y = 25x^{-2}$
- B. $y = \sqrt{3}x^{-2}$
- C. $y = 9x^{-2}$
- D. $y = \frac{5}{x^2}$
- E. $y = \frac{3}{x^2}$



Question 6

The cost of organising a concert is \$40,000. Tickets for the concert sell for \$80 each. If $2n$ people attend the concert, then the profit, P , equation, in dollars, is

A. $P = 160n - 40000$

B. $P = 40000 - 160n$

C. $P = \frac{20000}{n} - 160n$

D. $P = 160n - \frac{20000}{n}$

E. $P = n - 250$

Question 7

A hiring company charges a fixed amount of \$70 and \$40 per hour for the first 8 hours and then \$30 per hour for the next 16 hours. The equations that represent this situation are

$$c = \begin{cases} at + b & 0 < t \leq 8 \\ dt + f & 8 \leq t \leq 24 \end{cases}$$

The value of f is

A. 30

B. 40

C. 70

D. 110

E. 390



Question 8

The mass, m , of a solid sphere is given by the equation $m = kr^3$ where r is the radius of the sphere. A sphere of radius 1.5 cm has a mass of 36.45 g. the radius of a sphere of mass 72.9 g is closest to

- A. 1.8 cm.
- B. 1.9 cm.
- C. 2.9 cm.
- D. 3.0 cm.
- E. 6.75 cm.

Question 9

The owners of a new restaurant have budgeted \$50,000 for advertising over the next year. The following table shows the type of media and its cost as well as the family profile each media reaches.

Media	Cost of advertisement	Number of exposures to families with an annual income over \$60,000	Number of exposures to families with an annual income under \$60,000
Television	5,000	8,000	10,000
Radio	3,000	1,000	4,000

The following restrictions must be adhered to.

- There must be no more than 25 television advertisements and no more than 20 radio advertisements.
- There must be at least 50,000 exposures to families with incomes over \$60,000 and at least 90,000 exposures to families with incomes under \$60,000.

Which one of the following could be a constraint inequation for this restaurant where x is the number of television advertisements and y is the number of radio advertisement?

- A. $5x + 8y \geq 10$
- B. $3x + y \leq 4$
- C. $5x + 2y \geq 45$
- D. $4x + 2y \geq 30$
- E. $5x + 3y \geq 60$

End of Module 3



Before answering these questions you **must** shade the Business-related mathematics box on the answer sheet for multiple-choice questions

Question 1

A car costs \$33,000. If it depreciates at 12% per annum flat rate, then its book value after 6 years is

- A. \$3,960
- B. \$7,800
- C. \$9,240
- D. \$13,200
- E. \$23,760

Question 2

The number of years required for \$9,000 to double in value when invested at 6.3% compound interest, where the interest is paid monthly, is closest to

- A. 8
- B. 9
- C. 10
- D. 11
- E. 12



Question 3

Date	Credit	Debit	Balance
1 Aug			\$3,420
13 Aug		\$685	
17 Aug	\$1,800		
21 Aug		\$1,300	
31 Aug			

The above is part of a bank statement for August. On 31st August, the bank has to enter the interest and calculate the balance in the account for the month. If interest at 5.8% per annum is paid on the minimum monthly balance, then the balance of the account on 31st August is

- A. \$2,893.63
- B. \$3,248.22
- C. \$3,250.64
- D. \$3,261.44
- E. \$3,436.53

Question 4

The inflation rate in the year 2008 was 4.2% per annum. A litre of milk cost \$5.40 at the end of 2008. Assuming that the price of milk increased at the rate of inflation, the price of the litre of milk at the beginning of 2008 would have been closest to

- A. \$5.16
- B. \$5.17
- C. \$5.18
- D. \$5.19
- E. \$5.20



Question 5

Jan buys a TV for \$3,000. She pays a deposit of \$400 and agrees to pay monthly instalments of \$100 for 3 years. The interest rate per annum is closest to

- A. 6%
- B. 7%
- C. 8%
- D. 12%
- E. 13%

Question 6

Tran buys a unit for \$220,000. He pays a deposit of \$100,000 and borrows the rest from the bank at 7.2% compound interest. He agrees to repay \$852 per month. The time taken to repay this loan completely is closest to

- A. 4 years.
- B. 15 years.
- C. 18 years.
- D. 20 years.
- E. 26 years.

Question 7

Meg wants \$8,700 in 3 years time to travel overseas. The amount of money she needs to invest today at 5.2% per annum simple interest to achieve this goal, is, to the nearest dollar

- A. \$3,828
- B. \$4,872
- C. \$7,343
- D. \$7,526
- E. \$8,248



Question 8

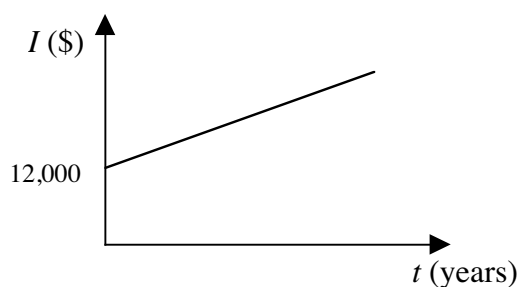
You have a loan of \$4,000 for 5 years, with monthly repayments. You pay a total of \$1,340 interest over the life of the loan. The effective interest rate on the loan is

- A. 11.17%.
- B. 13.18%
- C. 23.42%
- D. 27.83%
- E. 32.85%

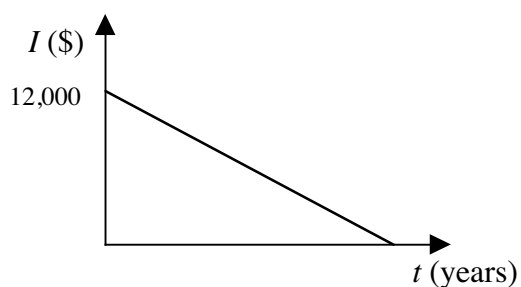
Question 9

A graph to show the number of years for an investment of \$12,000 at 5.4% per annum simple interest to earn various amounts of interest, would be

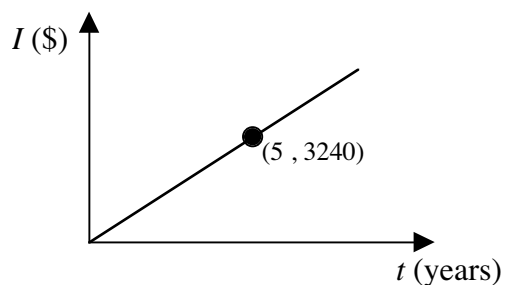
A.



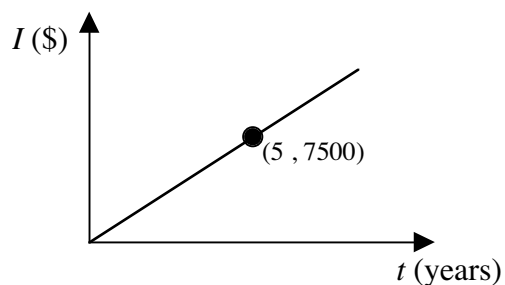
B.



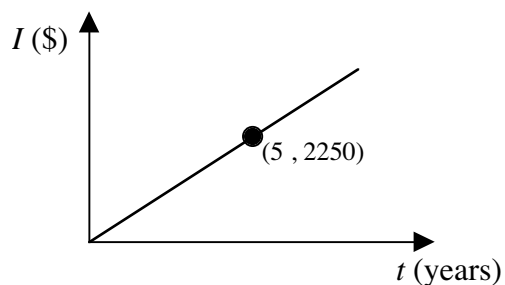
C.



D.



E.

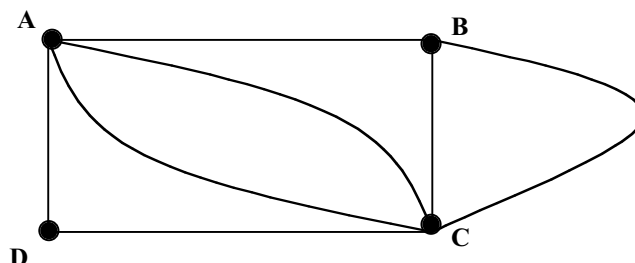


End of Module 4



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

Question 1



The adjacency matrix which best describes the above graph is

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

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

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

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

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

Question 2

Which one of the following is the best definition of a planar graph?

- A. A planar graph is a graph of a two dimensional shape.
- B. A planar graph is a graph that has the same number of edges and vertices.
- C. A planar graph cannot have more than six faces.
- D. A planar graph is a graph with at least three vertices.
- E. A planar graph is a graph whose edges intersect only at a vertex.



Question 3

The number of edges of a planar connected graph with five faces and nine vertices is

- A.** 2
- B.** 6
- C.** 12
- D.** 14
- E.** 16

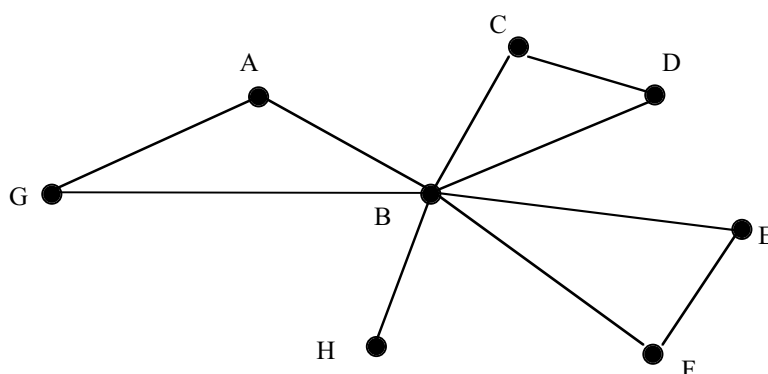
Question 4

The number of games played in a round robin, where each of the twelve teams plays every other team, is

- A.** 24
- B.** 66
- C.** 72
- D.** 144
- E.** 288



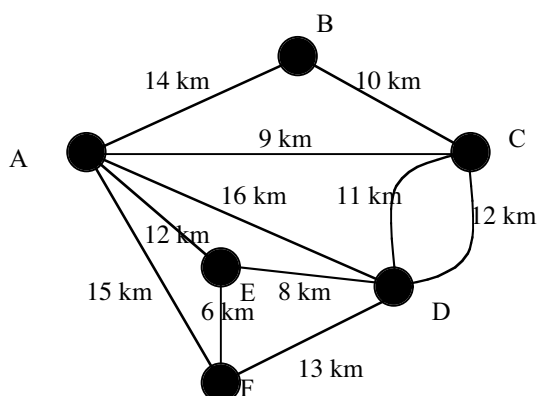
Question 5



The above graph has

- A. a hamiltonian circuit.
- B. a hamiltonian path.
- C. an eulerian circuit.
- D. an eulerian path.
- E. no hamiltonian path or circuit and no eulerian path or circuit.

Question 6

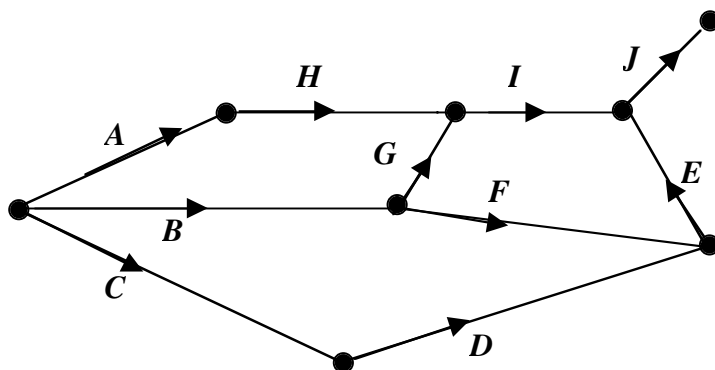


A salesman has to go from town A to each of the other towns B, C, D, E, F and finish his trip at his home town of B. The shortest distance he can travel is

- A. 41 km.
- B. 49 km.
- C. 50 km.
- D. 52 km.
- E. 53 km.



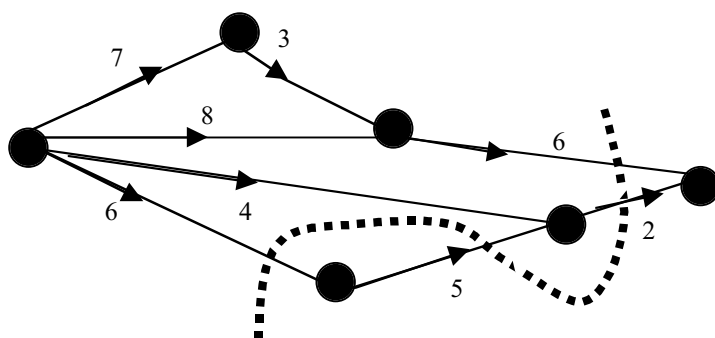
Question 7



In the above directed graph, the times taken for E , I and J to be completed are 7 days, 9 days and 8 days respectively. If the earliest time that J can begin is the morning of day 9, then the shortest time to complete the whole project is

- A. 13 days.
- B. 14 days.
- C. 16 days.
- D. 17 days.
- E. 24 days.

Question 8



The capacity of the cut in the above network is

- A. 8
- B. 11
- C. 14
- D. 17
- E. 19



Question 9

	Ann	Brian	Con	Danielle
Geometry	3	8	2	4
Trigonometry	3	8	5	4
Algebra	12	8	6	10
Calculus	5	8	7	5

The time taken for four students, Ann, Brian, Con and Danielle to complete complex mathematics problems in the areas of geometry, trigonometry, algebra and calculus is given in minutes in the above table. The four students are entering as a team in a maths competition in which they have to complete four problems in the minimum time to win. Each student will be assigned one problem. To maximise the chance of this team winning, Brian and Danielle should do the

- A.** Algebra and Calculus problems respectively.
- B.** Geometry and Calculus problems respectively.
- C.** Calculus and Geometry problems respectively.
- D.** Calculus and Trigonometry problems respectively.
- E.** Calculus and Algebra problems respectively.

End of Module 5



Before answering these questions you **must** shade the Number patterns and applications box on the answer sheet for multiple-choice questions

Question 1

If $A = \begin{bmatrix} p & q \\ r & s \end{bmatrix}$ and $B = \begin{bmatrix} -p & q \\ r & -s \end{bmatrix}$ then $2A - B$ equals

A. $\begin{bmatrix} 3p & q \\ r & 3s \end{bmatrix}$

B. $\begin{bmatrix} p & 3q \\ 3r & s \end{bmatrix}$

C. $\begin{bmatrix} 0 & 2q \\ 2r & 0 \end{bmatrix}$

D. $\begin{bmatrix} 2p & 0 \\ 0 & 2s \end{bmatrix}$

E. $\begin{bmatrix} p & q \\ r & s \end{bmatrix}$

Question 2

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

A. $\begin{bmatrix} 2 & 9 \\ 2 & 4 \end{bmatrix}$

B. $\begin{bmatrix} 11 & 1 \\ -11 & 6 \end{bmatrix}$

C. $\begin{bmatrix} 8 & 3 \\ -7 & 7 \end{bmatrix}$

D. $\begin{bmatrix} -11 & 11 \\ 1 & -6 \end{bmatrix}$

E. $\begin{bmatrix} 4 & -9 \\ -2 & 2 \end{bmatrix}$



Question 3

When an $m \times n$ matrix is multiplied by an $n \times p$ matrix, the order of the resulting matrix is

- A. $n \times n$
- B. $p \times n$
- C. $p \times m$
- D. $m \times p$
- E. $n \times p$

Question 4

$$P = \begin{bmatrix} 5 & 0 & 1 \end{bmatrix}, \quad Q = \begin{bmatrix} 2 \\ 6 \\ 5 \end{bmatrix}, \quad R = \begin{bmatrix} 3 & 1 & 0 \\ 1 & 3 & 1 \\ 0 & 1 & 3 \end{bmatrix}, \quad T = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix}, \quad U = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

Which one of the following statements is true?

The column matrix/matrices above is/are

- A. P and T only.
- B. Q only.
- C. U only.
- D. Q and U only.
- E. R , Q and U only.



Question 5

To solve the simultaneous equations, $3x = 4 - 2y$ and $5x - 2y - 12 = 0$, which one of the following matrix equations could be used?

A. $\begin{bmatrix} 3 & 4 \\ 5 & -2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -2 \\ 12 \end{bmatrix}$

B. $\begin{bmatrix} 3 & 4 \\ 5 & -2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -2 \\ -12 \end{bmatrix}$

C. $\begin{bmatrix} 3 & -2 \\ 5 & -2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 12 \end{bmatrix}$

D. $\begin{bmatrix} 3 & 2 \\ 5 & -2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 12 \end{bmatrix}$

E. $\begin{bmatrix} 3 & -2 \\ 5 & -2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ -12 \end{bmatrix}$

Question 6

The determinant of the matrix $A = \begin{bmatrix} 2 & 3 & 1 \\ 0 & 4 & 2 \\ 0 & 0 & 1 \end{bmatrix}$ is

A. 0.08

B. 0.125

C. 1

D. 8

E. 12



Question 7

If $A = \begin{bmatrix} 1 & 3 \\ -1 & 2 \end{bmatrix}$, then a_{12} of A^{-1} equals

A. -3

B. $-\frac{3}{5}$

C. $-\frac{1}{5}$

D. $\frac{2}{5}$

E. 1

Question 8

$$\begin{array}{l} \text{Anton} \\ \text{Bianca} \\ \text{Carla} \\ \text{David} \end{array} \begin{bmatrix} 50 & 28 \\ 40 & 60 \\ 12 & 50 \\ 80 & 44 \end{bmatrix}$$

The above matrix shows the amount four students, Anton, Bianca, Carla and David earn at their part-time jobs in each of two weeks. If their earnings in week three are 20% less than their earnings in week two, then the matrix that represents their earnings for week three is

A. $\begin{bmatrix} 40 & 10 \\ 32 & 8 \\ 9.6 & 2.4 \\ 64 & 16 \end{bmatrix}$

B. $\begin{bmatrix} 10 \\ 8 \\ 2.4 \\ 16 \end{bmatrix}$

C. $\begin{bmatrix} 40 \\ 32 \\ 9.6 \\ 64 \end{bmatrix}$

D. $\begin{bmatrix} 5.6 \\ 12 \\ 10 \\ 8.8 \end{bmatrix}$

E. $\begin{bmatrix} 22.4 \\ 48 \\ 40 \\ 35.2 \end{bmatrix}$



Question 9

If the transition matrix is $\begin{bmatrix} 0.6 & 0.3 \\ 0.4 & 0.7 \end{bmatrix}$ and the initial state matrix $S_0 = \begin{bmatrix} 520 \\ 380 \end{bmatrix}$, then S_2 , with elements to the nearest whole number, is

A. $S_2 = \begin{bmatrix} 426 \\ 474 \end{bmatrix}$

B. $S_2 = \begin{bmatrix} 389 \\ 511 \end{bmatrix}$

C. $S_2 = \begin{bmatrix} 398 \\ 502 \end{bmatrix}$

D. $S_2 = \begin{bmatrix} 386 \\ 514 \end{bmatrix}$

E. $S_2 = \begin{bmatrix} 387 \\ 513 \end{bmatrix}$

End of Module 6

End of 2006 Further Mathematics Trial Examination 1
Multiple Choice Question Book

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