Year 2007

VCE

Further Mathematics

Trial Examination 1

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VICTORIAN CERTIFICATE OF EDUCATION
2007

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	13	13			13
B	54	27	6	3	27
					Total 40

- Students are permitted to bring into the exam room: pens, pencils, highlighters, erasers, sharpeners, rulers, one bound reference, one approved graphics calculator or approved CAS calculator or CAS software and, if desired, one scientific calculator. Calculator memory DOES NOT need to be cleared.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.

Materials supplied

- Question book of 43 pages.
- Answer sheet for multiple-choice questions.
- There is a sheet of miscellaneous formula supplied.
- Working space is provided throughout the book.

Instructions

- Detach the formula sheet from the book during reading time.
- 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.

VCE FURTHER MATHEMATICS 2007
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 2007
Trial Written Examination 1
ANSWER SHEET

NAME: _____

STUDENT NUMBER _____

SIGNATURE _____

Instructions

- Write your name in the space provided above.
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  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 . . .

VCE FURTHER MATHEMATICS 2007
Trial Written Examination 1
ANSWER SHEET

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

VCE FURTHER MATHEMATICS 2007
Trial Written Examination 1
ANSWER SHEET

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: $z = \frac{x - \overline{x}}{s_x}$

least squares line: $y = a + bx$ where $b = r\frac{s_y}{s_x}$ and $a = \overline{y} - b\overline{x}$

residual value: residual value = actual value – predicted value

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

Module 1: Number patterns

arithmetic series: $a + (a+d) + \ldots + (a+(n-1)d) = \frac{n}{2}[2a + (n-1)d] = \frac{n}{2}(a+l)$

geometric series: $a + ar + ar^2 + \ldots + ar^{n-1} = \frac{a(1-r^n)}{1-r}, r \neq 1$

infinite geometric series: $a + ar + ar^2 + ar^3 + \ldots = \frac{a}{1-r}, |r| < 1$

Module 2: Geometry and trigonometry

area of a triangle: $\frac{1}{2}bc\sin A$

Heron's formula: $A = \sqrt{s(s-a)(s-b)(s-c)}$ where $s = \frac{1}{2}(a+b+c)$

circumference of a circle: $2\pi r$

area of a circle: πr^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: area of base × height

volume of a pyramid: $\frac{1}{3}$ area of base × 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: $I = \frac{\Pr T}{100}$

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

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

Core

The following information relates to Questions 1 and 2

A number of households was asked about having a water tank on their premises. Their responses are summarised in the table below.

Water Tank	Number of households
Have one on order	73
Have one already installed	61
Do not have one and do not have one on order	146

Question 1

The percentage of households interviewed who already have a water tank installed is closest to

A. 22%

B. 26%

C. 42%

D. 50%

E. 52%

Question 2

Which **one** of the following graphs would be best to display the data given in the table?

A. A scatter plot

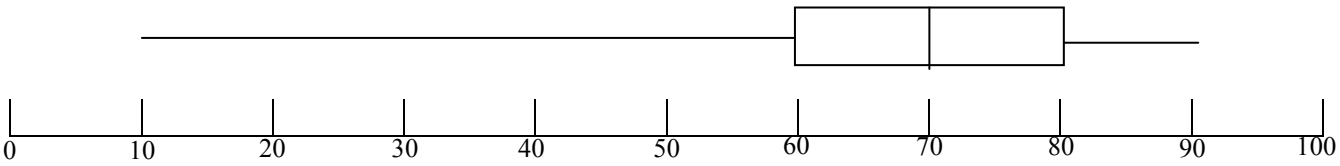
B. A stem and leaf

C. A box plot

D. A bar chart

E. A histogram

Question 3



The above box plot is

A. negatively skewed with an interquartile range of 80

B. positively skewed with an interquartile range of 80

C. negatively skewed with an interquartile range of 20

D. positively skewed with an interquartile range of 20

E. positively skewed with a median of 40

Question 4

In a large group of maths students, the final test scores are approximately normal with a mean of 43 and a standard deviation of 15. The top 0.15% of students receive an A grade. The lowest mark required to achieve an A grade is

A. 64

B. 73

C. 88

D. 90

E. 92

Question 5

The mean weight of ten bags of apples is 450g. and the standard deviation is 5g. If an extra 2g. of apples is added to each bag, then which one of the following statements about the bags of apples is true?

A. The mean weight is 452g and the standard deviation is 5g.

B. The mean weight is 452g and the standard deviation is 7g.

C. The mean weight is 450g and the standard deviation is 5g.

D. The mean weight is 450g and the standard deviation is 7g.

E. The mean weight is 455g and the standard deviation is 2g

Question 6

If the least squares regression line for two variables x and y is $y = 3125 - 0.73x$ and the coefficient of determination is 0.1296, then Pearson's correlation coefficient is closest to

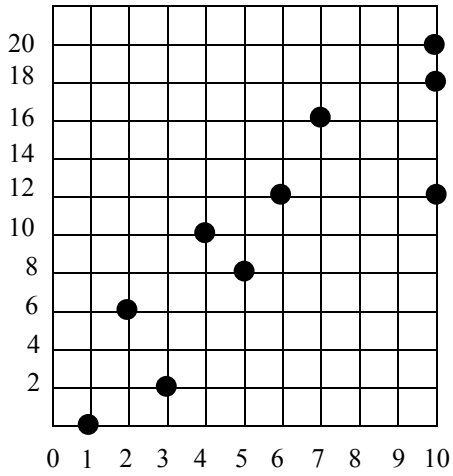
A. 0.36

B. –0.36

C. 0.017

D. –0.017

E. –0.73



Question 7

The gradient of the three median regression line for the above scatter plot is

A. 1

B. 2

C. -2

D. 1.5

E. -1.5

Question 8

A study of the effect of tram ticket prices, in dollars, upon the number of passengers per tram, gave the regression line equation

$$\textit{number of passengers} = 48.3 - 27.6 \times \textit{cost of ticket}$$

where the cost of the ticket is in dollars.
From this equation, the results of the study indicate that the number of passengers using the tram

A. decreased by approximately 48 for each dollar increase in fares

B. increased by approximately 48 for each dollar increase in fares

C. decreased by approximately 21 for each dollar increase in fares

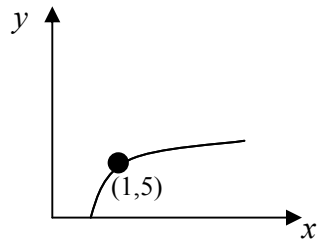
D. increased by approximately 28 for each dollar increase in fares

E. decreased by approximately 28 for each dollar increase in fares

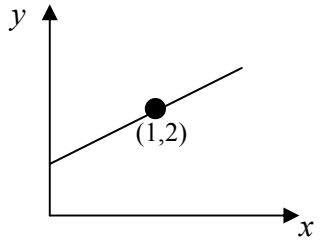
Question 9

The graph below that best describes the relationship $y = 3\log_{10} x + 2$ is

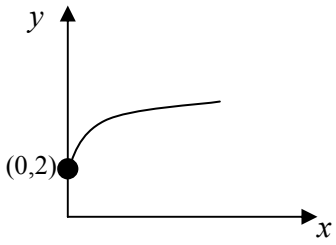
A.



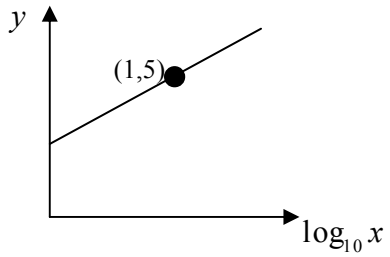
B.



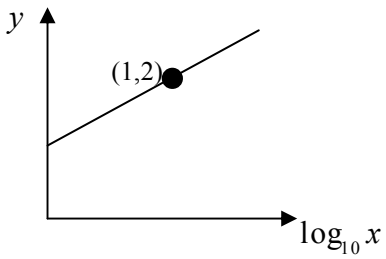
C.



D.



E.



Question 10

The following table shows the number of years of full-time education, x, and the annual salary, y, in thousands of dollars for ten people

x	13	20	18	12	17	18	14	16	13	15
y	42	105	82	35	64	45	40	150	38	50

The coefficient of determination for this data correct to three decimal places is

A. 0.131

B. 0.305

C. 0.323

D. 0.390

E. 0.552

Question 11

Which one of the following statements is true about seasonal indices?

Seasonal indices can be used to remove most or all of the seasonal variation where

A. there are seasonal variations only

B. there are seasonal and cyclical variations

C. there are seasonal or cyclical variations

D. there are seasonal variations as well as a secular trend

E. the seasonal index is obtained from data collected for four seasons

Question 12

A language centre has noted that there is a seasonal component to the number of enrolments each term. The term enrolment figures at this language centre for the year 2006 are given in the table below.

Term	I	II	III	IV
Number of Enrolments	240	226	210	120

The seasonal index for the third quarter to three decimal places is

A. 0.264

B. 0.533

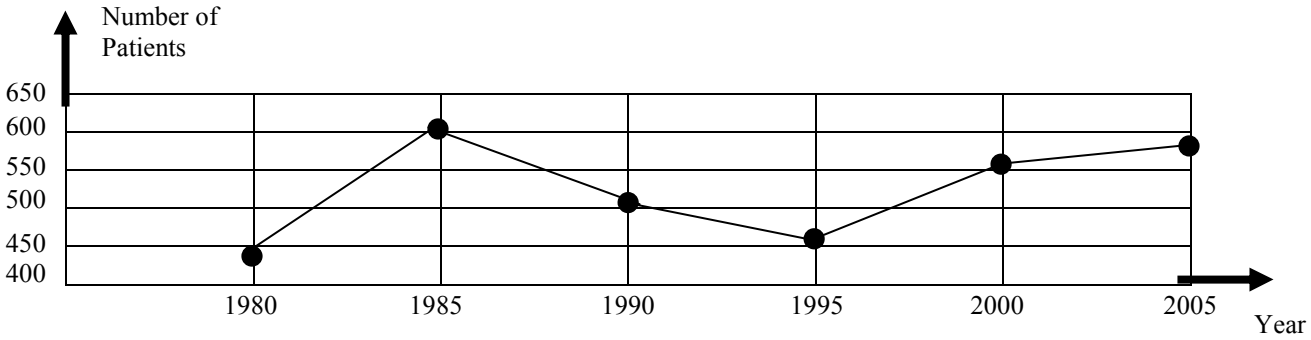
C. 0.603

D. 1.055

E. 1.075

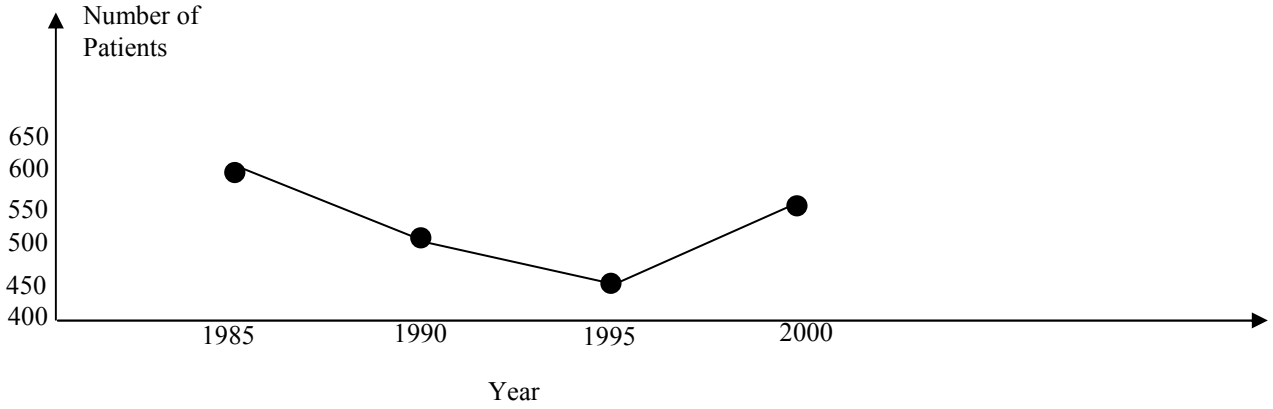
Question 13

The time series plot below shows the number of thousands of patients presenting at the emergency room of a hospital each year.

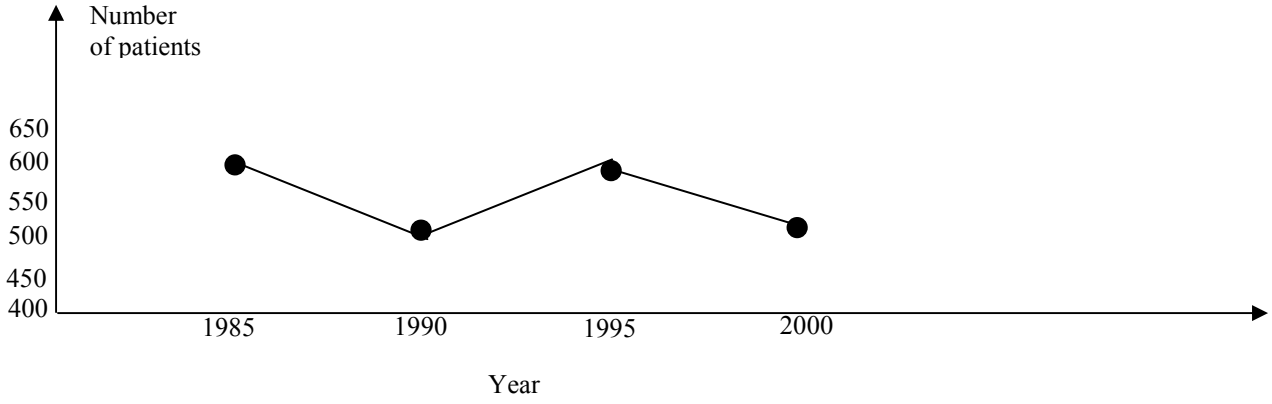


When smoothed using a 3-point median smoothing, the time series would look like

A.

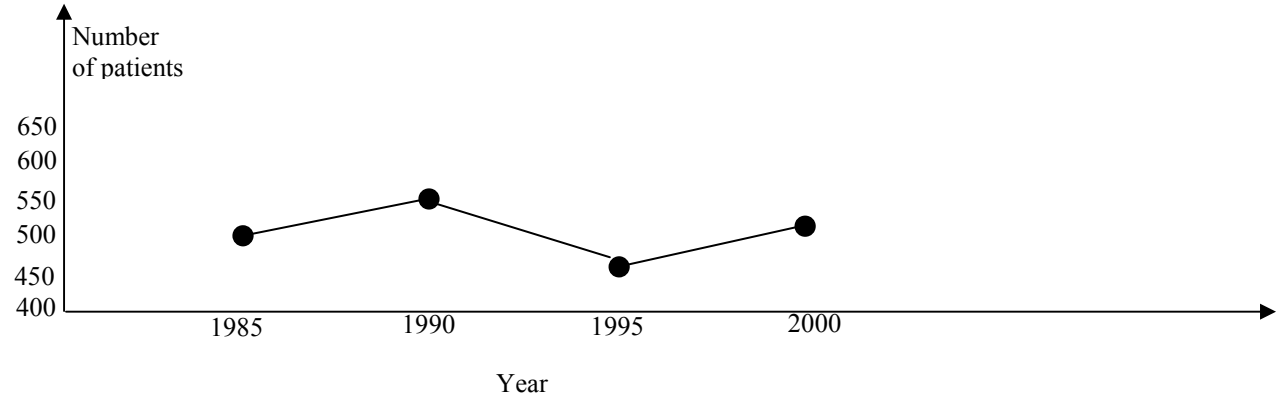


B.

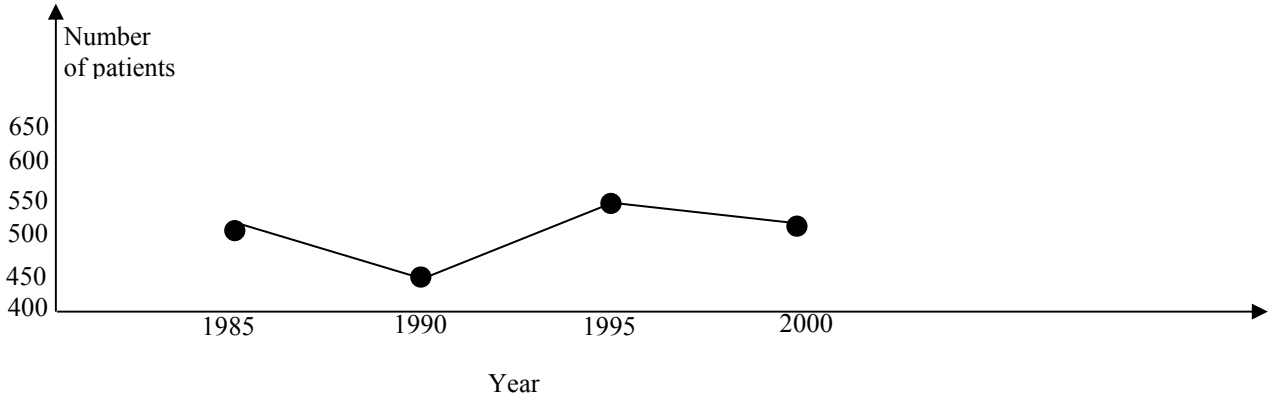


Question 13 (continued)

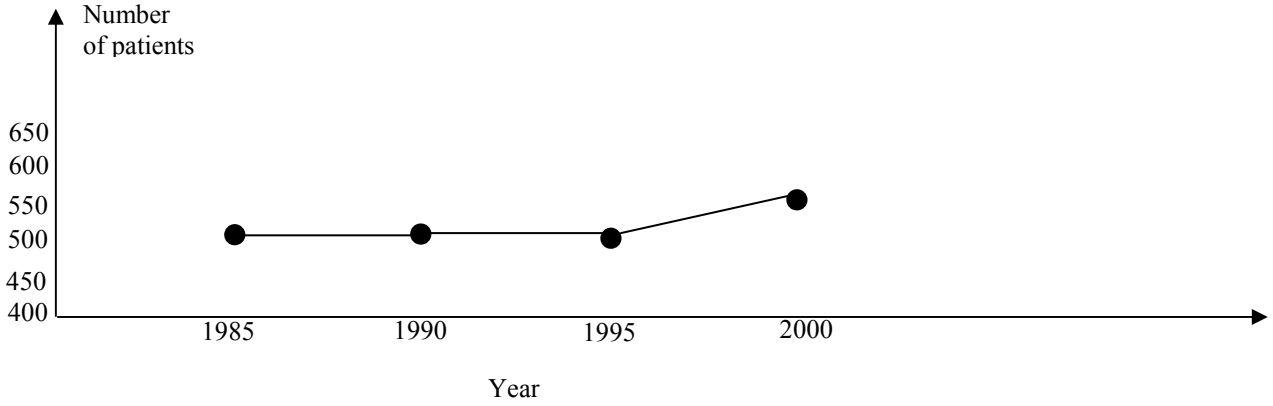
C.



D.



E.



END OF SECTION A

Instructions for Section B

Select **three** 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.
Choose the response that is **correct** for the question.
A correct answer scores 1 mark, 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.

Module 1: Number patterns and applications

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

Question 1
The sequence 3, 9, 15, 21,….. is

A. a geometric sequence with a common ratio of 3

B. a geometric sequence with a common ratio of $\frac{5}{3}$

C. an arithmetic sequence with a common difference of 3

D. an arithmetic sequence with a common difference of 6

E. an arithmetic sequence with a common difference of $\frac{5}{3}$

Question 2

In the sequence 8, –4, 2, –1, …. the twelfth term is

A. $-\frac{1}{128}$

B. $-\frac{1}{256}$

C. $\frac{1}{256}$

D. $-\frac{1}{512}$

E. $\frac{1}{512}$

Module 1

Question 3

If $t_n = 3t_{n-1} + 4$ and $t_7 = 8017$ then t_5 equals

A. $885\frac{4}{9}$

B. $886\frac{1}{3}$

C. 889

D. 2671

E. $2668\frac{1}{3}$

Question 4

The fifth term generated by the difference equation $t_{n+3} = t_{n+2} + t_{n+1} + t_n$ where $n \geq 1$ and $t_1 = t_2 = t_3 = 1$ is

A. 3

B. 4

C. 5

D. 6

E. 8

Question 5

A car is accelerating from rest. In the first second it moves 4m. In the next second it moves 6 m. In the third second it moves 8 m. In the fourth second it moves 10m. If this pattern continues for ten seconds, then the total distance travelled in the first ten seconds will be

A. 22m

B. 44m

C. 130m

D. 170m

E. 260m

Question 6

Each year the value of a car decreases by 15% of its value at the beginning of the year. If the value of the car was $32,000 when bought on January 1st 2007 then the value of the car on December 31st 2010 will be closest to

A. $8,000

B. $12,800

C. $14,199

D. $16,200

E. $16,704

Question 7

The number of terms in the sequence 85, 78, 71, …… –48 is

A. 4

B. 12

C. 16

D. 20

E. 24

Question 8

In the geometric sequence 8, x, 72, the value of the common ratio is

A. ±3

B. 3

C. ±4

D. 4

E. 24

Question 9

The number of terms, *n*, of the geometric series $2+\frac{4}{5}+\frac{8}{25}+....$ that must be taken before the sum of *n* terms differs from the sum to infinity by less than 0.01 is

A. 4

B. 5

C. 6

D. 7

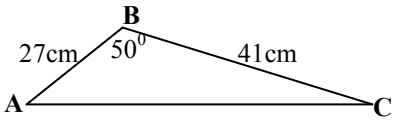
E. 8

End of Module 1

Module 2: Geometry and trigonometry

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

Question 1



In triangle $ABC, \angle ABC = 50^0, AB = 27cm$ and $BC = 41cm$. The length of AC in cm. is closest to

A. 11

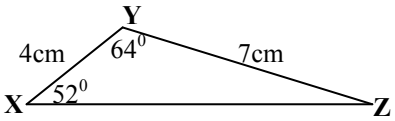
B. 19

C. 21

D. 27

E. 31

Question 2



Triangle XYZ has sides XY and YZ equal to 4 cm and 7 cm respectively. $\angle XYZ = 64^0$ and $\angle ZXY = 52^0$. The area of this triangle in cm^2 is closest to

A. 7.98

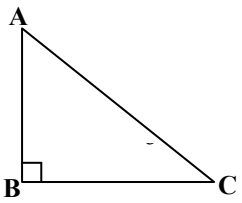
B. 9.92

C. 11.03

D. 12.58

E. 13.58

Question 3



In the right angled isosceles triangle ABC, which one of the following statements is true?

A. $\sin\theta = \dfrac{AB}{BC}$

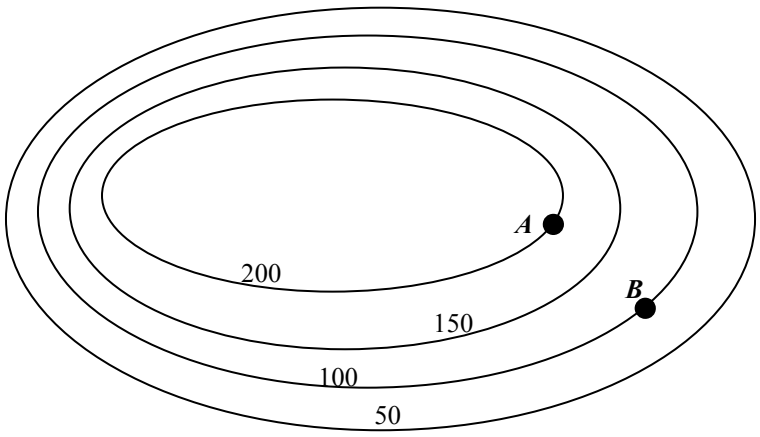
B. $\cos\theta = \dfrac{AC}{BC}$

C. $\tan\theta = \dfrac{BC}{AB}$

D. $\tan\theta = \dfrac{AB}{AC}$

E. $\sin\theta = \cos\theta$

Question 4



The contour map above shows two towns, A and B. If the horizontal distance from A to B is 3 km., then the slope of the straight road from A to B is closest to

A. 0.03

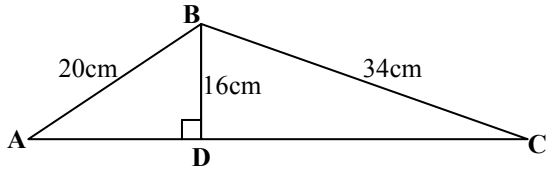
B. 0.33

C. 0.67

D. 30

E. 66

Question 5



In the above triangle, ABC, $AB = 20$cm. and $BC = 34$cm.
BD is perpendicular to AC and is 16cm. The length of AC is closest to

A. 28 cm.

B. 40 cm.

C. 42 cm.

D. 70 cm.

E. 144 cm.

Question 6

If the length of each side of a cube is increased by a factor of 4, then the volume of the cube is increased by a factor of

A. 2

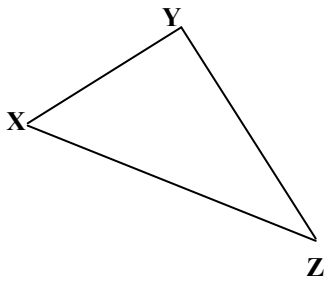
B. 4

C. 8

D. 16

E. 64

Question 7



In the above diagram, the bearing of Z from X is 142^0 and the bearing of Y from Z is 340^0.
The size of $\angle XZY$ is

A. 18^0

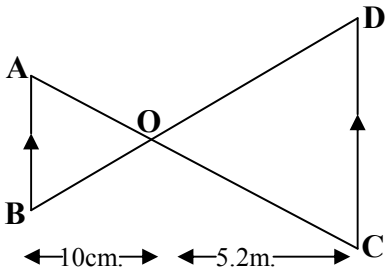
B. 19^0

C. 20^0

D. 30^0

E. 35^0

Question 8



A photographic slide, AB, has a length of 2.5 cm. If the distance from the slide to the lens, O, is 10cm. and the distance from the lens to the screen CD is 5.2m, then the length of the screen CD is closest to

A. 13cm

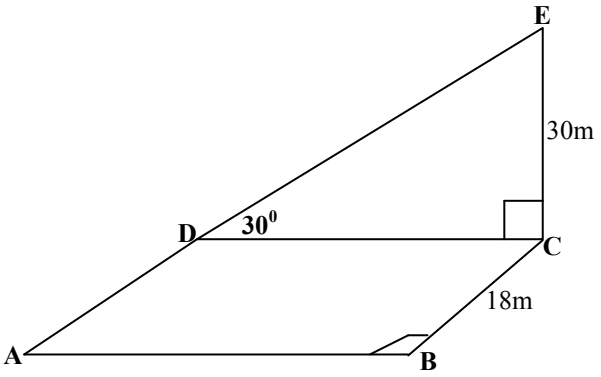
B. 20cm

C. 130cm

D. 150cm

E. 200cm

Question 9



The above diagram shows a vertical building, *EC*, which stands on the corner of a horizontal rectangular plot of ground, *ABCD*.
The building is 30m high. $\angle EDC = 30^0$ and $BC = 18$m.
The angle of elevation of the top of the building from *A* is closest to

A. 29^0

B. 31^0

C. 37^0

D. 53^0

E. 59^0

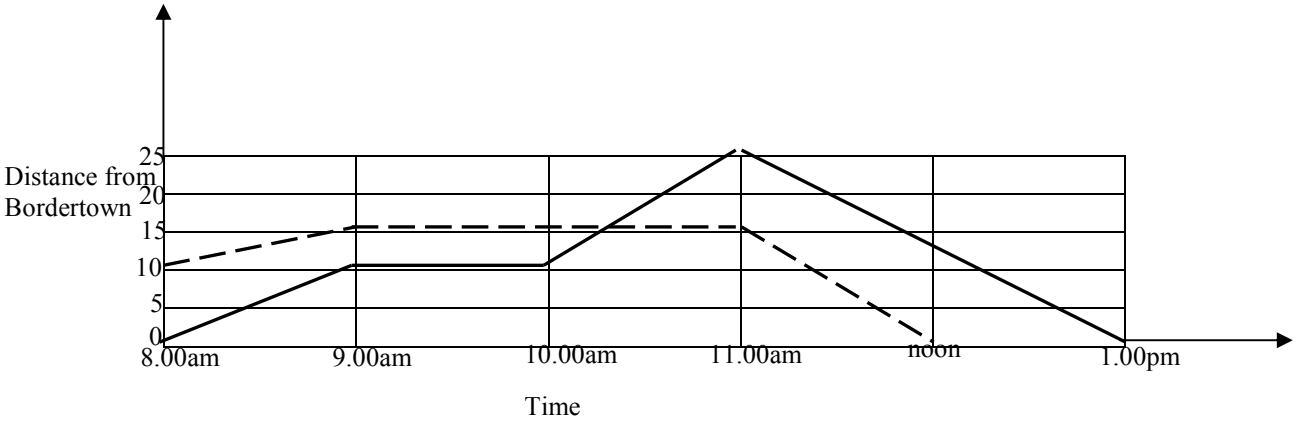
End of Module 2

Module 3: Graphs and relations

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

Question 1

The following information relates to Questions 1 and 2



The graph above shows the journey of two cyclists. Jake's path is given by the solid line and Jenny's path is given by the dotted line.

Question 1

The distance from Bordertown when Jake and Jenny meet is

A. 0 km

B. 10 km

C. 15 km

D. 20 km

E. 25 km

Question 2

Which **one** of the following statements is **true**?

A. Jenny travelled further than Jake between 9.00am and 11.00am

B. Jake's speed is greatest between 8.00am and 9.00am

C. Jenny travels a total distance of 15 km.

D. Jake travels a total distance of 25 km.

E. Jake travels 30 km further than Jenny.

Question 3

x	2	4	6
y	28	224	756

The data in the table above satisfies the equation $y = ax^3$. The value of a is closest to

A. 1.5

B. 1.6

C. 2.4

D. 3.4

E. 3.5

Question 4

If the straight line $2y - 5x + b = 0$ passes through the point (2,3),then the value of b is

A. –11

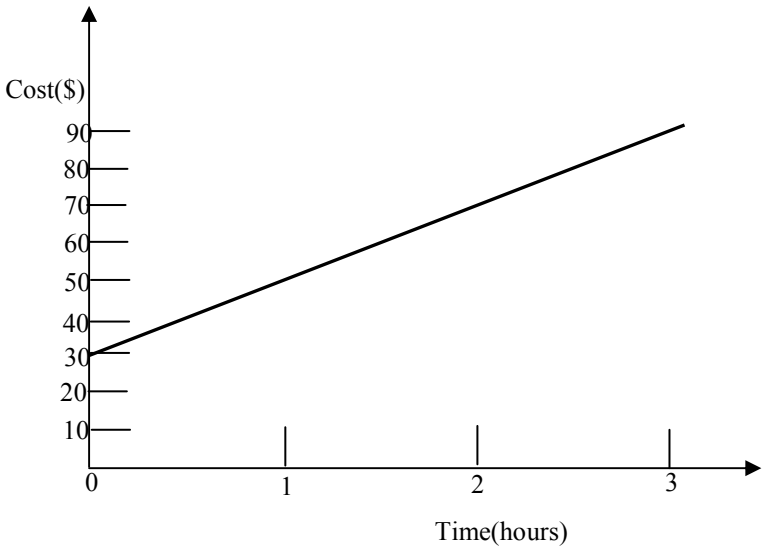
B. –5

C. –4

D. 4

E. 11

Question 5



The cost, $C, charged by a piano tuner is shown in the graph above. The charge per hour and the fixed cost, respectively, are

A. $30, $20

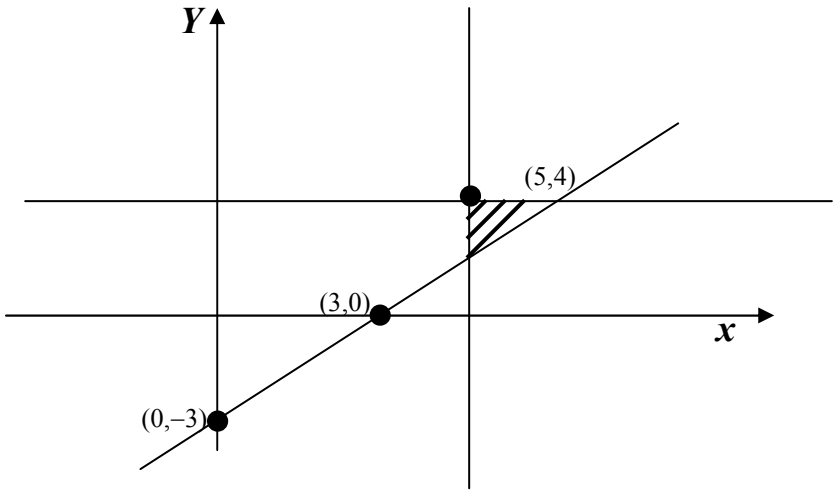
B. $20, $30

C. $30, $10

D. $10, $30

E. $30, $30

Question 6



The inequalities that define the shaded region are

A. $y \geq x-3, \quad y \geq 0, \quad x \geq 0$

B. $y \geq x-3, \quad y \geq 5, \quad x \geq 4$

C. $y \leq x-3, \quad y \geq 4, \quad x \geq 5$

D. $y \geq x-3, \quad y \leq 4, \quad x \geq 5$

E. $y \leq x-3, \quad y \geq 5, \quad x \leq 4$

Question 7

The equation of the straight line parallel to the line $3y+6x-2=0$ and passing through the point (4,10) is

A. $y+2x+2=0$

B. $y+2x-18=0$

C. $3y-2x+22=0$

D. $y-6x-14=0$

E. $y+6x-14=0$

Question 8

To solve the simultaneous equations

$$2a - 3b = 8 \quad (1)$$
$$a - 2b = 6 \quad (2)$$

you could

A. multiply equation (2) by 2 and add this new equation to equation (1)

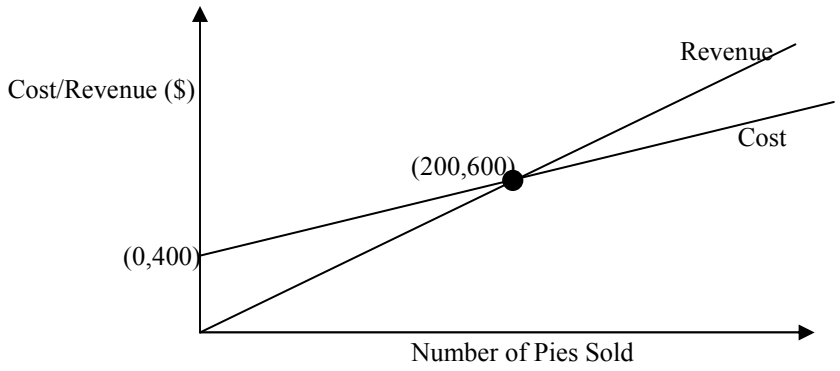
B. multiply equation (1) by 3 and equation (2) by 2 and add these two equations

C. multiply equation (1) by 3 and equation (2) by 2 and subtract these two equations

D. multiply equation (1) by 2 and equation (2) by 3 and add these two equations

E. multiply equation (1) by 2 and equation (2) by 3 and subtract these two equations

Question 9



Freddy's pie shop sells a variety of pies each day. The above graph shows the revenue and the cost involved in producing the pies, and the number of pies sold. If the shop sold 150 pies on one particular day, then which **one** of the following statements is **true**?

A. The pie shop would make a loss of $100

B. The pie shop would make a profit of $100

C. The pie shop would make a profit of $450

D. The pie shop would make a loss of $450

E. The pie shop would make a profit of $600

End of Module 3

Module 4: Business-related mathematics

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

Question 1

If the simple interest on a deposit of $4,800 for 3 years is $945 then the annual interest rate is closest to

A. 2.0%

B. 5.9%

C. 6.6%

D. 15.1%

E. 16.0%

Question 2

Kai buys a car for $36,000. He agrees to pay a deposit of $7,000, then monthly repayments of $1,330 for 2 years. The amount of interest paid is

A. $1208

B. $2040

C. $2400

D. $2920

E. $4080

Question 3

A $1,300 refrigerator is on sale at 15% discount. Jan is employed by the shop, which gives its employees a 12% deduction on the sale price of any item. The cost of the refrigerator for Jan is

A. $949

B. $972.40

C. $1053

D. $1105

E. $1261

Question 4

Nikita invests $3,000 with interest compounding quarterly at 10% per annum. The interest on this investment after 12 years is closest to

A. $4035

B. $6415

C. $6814

D. $9415

E. $28,805

The following information relates to Questions 5 and 6

The following is part of a Bank Statement for the period 13/12/2006 to 13/03/2007. Interest is paid at 12% per annum on the minimum monthly balance.

Date		Withdrawals ($)	Deposits ($)	Balance ($)
1 Dec	Opening Balance			9427
15 Dec		184		9243
2 Jan		1595		7648
9 Jan			2004	
29 Jan		x		7632
7 Feb		100		
14 Feb			2004	
21 Feb		1800		
6 March		1750		
10 March			2004	
14 March	Interest for Dec, Jan and Feb		y	

Question 5

The value of x is

A. $225

B. $1988

C. $2020

D. $2036

E. $5644

Question 6

The interest paid into the account, ***y***, on 14 March. 2007, is

A. $61.18

B. $244.07

C. $508.45

D. $722.21

E. $903.84

Question 7

A computer is purchased for $2,000. If it depreciates at 8% per annum of the previous book value each year, then the number of years it takes for the value of the computer to reach $800 is closest to

A. 7

B. 8

C. 9

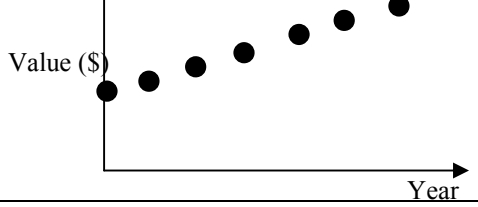
D. 10

E. 11

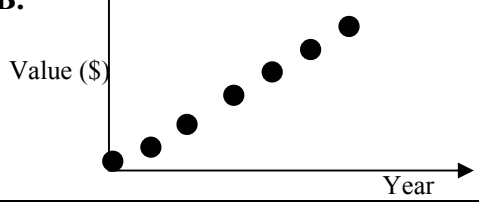
Question 8

Joanne invests $30,000 at a fixed interest rate, compounding quarterly for six years. Which graph best shows the accrued value of the investment at the end of each year?

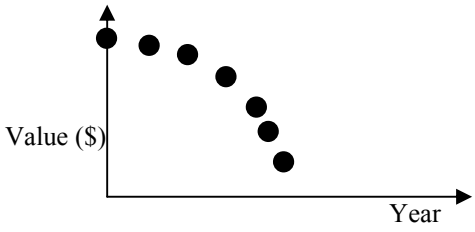
A.



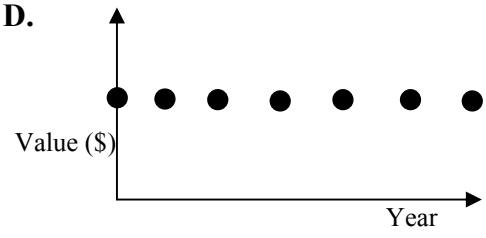
B.



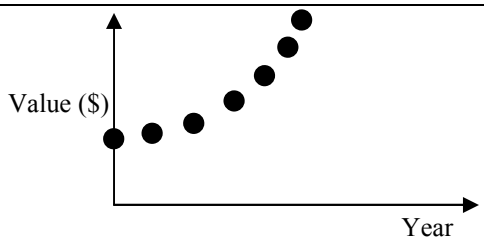
C.



D.



E.



Question 9

Gabrielle borrowed $20,000 to buy a car at 9.2% per annum, compounding monthly. She agreed to repay $300 per month, which she did for four years. At the end of this time, her grandmother gave her $2,000, which she paid off her car as a lump sum. She then paid $400 per month until the loan was completely paid off. The extra time she would need to pay off the loan would be closest to

A. 6 months

B. 1 year

C. 2 years.

D. 6 years

E. 13 years

End of Module 4

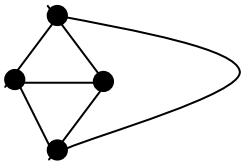
Module 5: Networks and decision mathematics

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

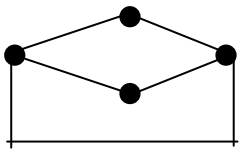
Question 1

Which one of the following is a complete graph?

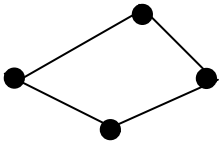
A.



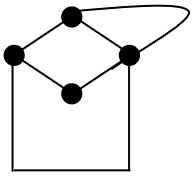
B.



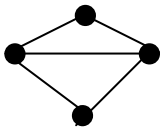
C.



D.



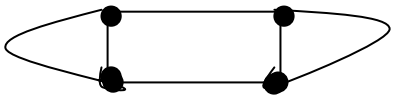
E.



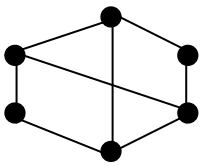
Question 2

Which one of the following graphs has an Euler circuit?

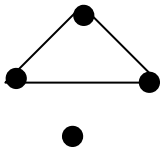
A.



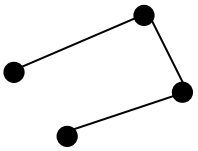
B.



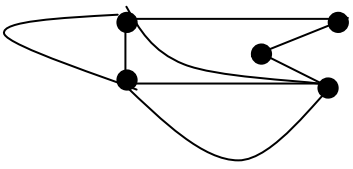
C.



D.

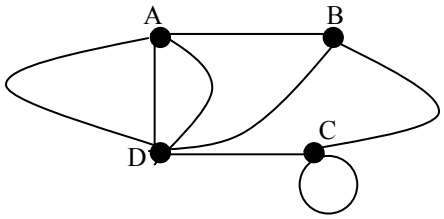


E.



Module 5: Networks and decision mathematics

Question 3



Which one of the following matrices could represent the above graph?

A.

	A	B	C	D
A	3	1	0	3
B	1	0	1	1
C	0	1	0	1
D	3	1	1	0

B.

	A	B	C	D
A	3	1	0	3
B	1	0	1	1
C	0	1	1	1
D	3	1	1	0

C.

	A	B	C	D
A	0	1	0	3
B	1	0	1	1
C	0	1	0	1
D	3	1	1	0

D.

	A	B	C	D
A	0	1	0	3
B	1	0	1	1
C	0	1	0	1
D	3	1	1	0

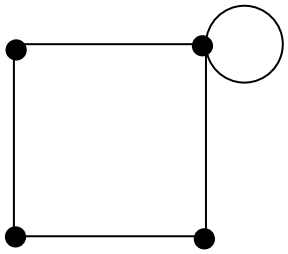
E.

	A	B	C	D
A	0	1	0	3
B	1	0	1	1
C	0	1	1	1
D	3	1	1	0

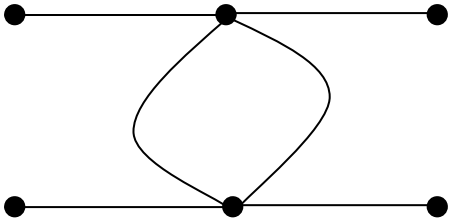
Question 4

Which one of the following is **not** a tree?

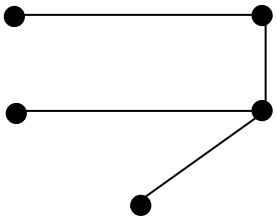
A.



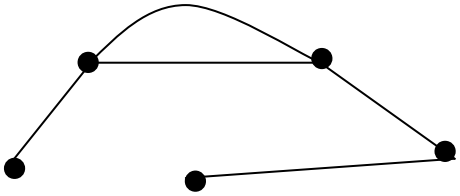
B.



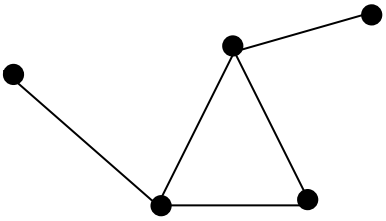
C.



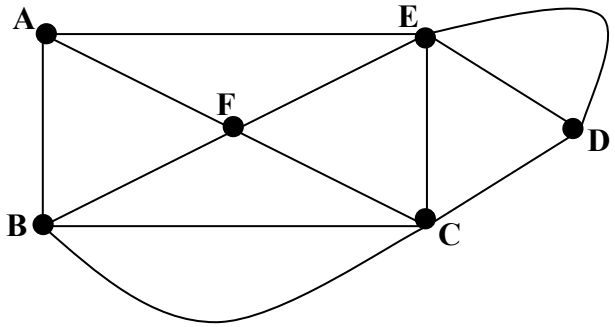
D.



E.



Question 5



In the above graph an Euler path can be formed by adding an edge from

A. A to B

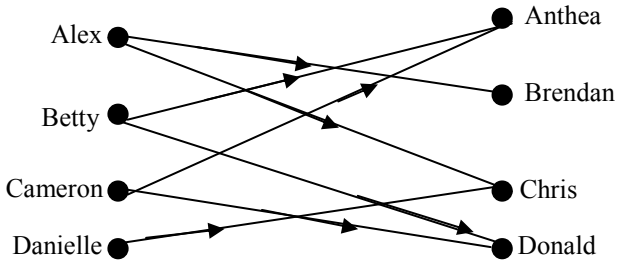
B. E to F

C. B to F

D. C to B

E. C to D

Question 6



Which one of the following statements is **not** implied by the above graph, where the arrows show "is the parent of"?

A. Alex and Danielle are the parents of Chris

B. Betty is the parent of Donald

C. Alex is the parent of Brendan and Chris

D. Cameron is the parent of Chris

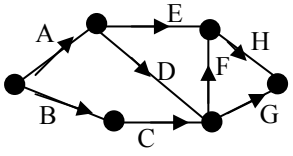
E. Anthea is Cameron's daughter

Question 7

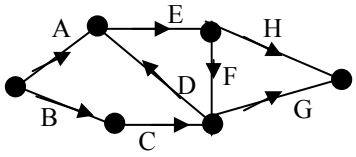
Activity	Prerequisites
A	**–**
B	**–**
C	**B**
D	**C,F**
E	**A,D**
F	**E**
G	**C,F**
H	**E**

Which one of the following could be the graph for the above table?

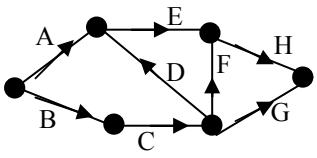
A.



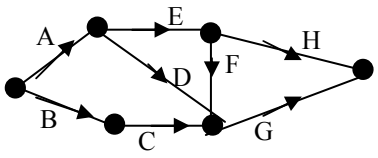
B.



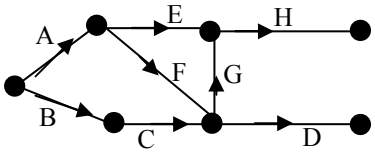
C.



D.

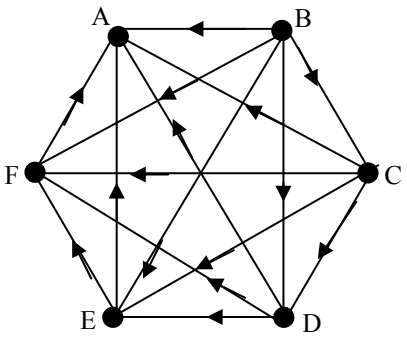


E.



Question 8

Annie, Ben Carrie, David, Ellie and Frank all play a game of tennis against every other person. The results are shown in the directed graph below, where **X** ⟶ **Y** indicates X beat Y.



The person who has a two step dominance over David, D, is

A. Annie

B. Ben

C. Carrie

D. Ellie

E. Frank

Question 9

Activity	Duration (days)	Earliest Start Time (day)	Latest Start Time (day)	Crash Time (days)
A	**2**	**0**	**1**	**1**
B	**3**	**0**	**0**	**0**
C	**4**	**3**	**3**	**2**
D	**2**	**7**	**7**	**0**
E	**1**	**3**	**5**	**2**
F	**3**	**4**	**6**	**1**
G	**2**	**9**	**9**	**1**
H	**4**	**4**	**7**	**1**

Given the data in the table above, which one of the following statements is true?

A. A and B lie on the critical path.

B. A crash time of 2 hours for E will not reduce the overall time for the project.

C. The overall reduction in time for the project is 8 days if all the crash times are implemented.

D. If only two activities can be crashed, they should be C and E

E. The total time for the project is 21 days.

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

Question 1

The determinant of the matrix, $\begin{bmatrix} 4 & -2 \\ -1 & -3 \end{bmatrix}$

A. -14

B. -11

C. -5

D. 10

E. 14

Question 2

If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ $\mathrm{B} = \begin{bmatrix} e & f \\ g & -h \end{bmatrix}$ then $2A - B$ equals

A. $2\begin{bmatrix} a-e & b-f \\ c-g & d+h \end{bmatrix}$

B. $2\begin{bmatrix} a-e & b-f \\ c-g & d-h \end{bmatrix}$

C. $\begin{bmatrix} 2a-e & 2b-f \\ 2g-c & 2d+h \end{bmatrix}$

D. $\begin{bmatrix} 2a-e & 2b-f \\ 2c-g & 2d+h \end{bmatrix}$

E. $\begin{bmatrix} 2a+e & 2b+f \\ 2c+g & 2d-h \end{bmatrix}$

Question 3

If A is a 2×3 matrix and B is a 4×2 matrix, then which one of the following statements is true?

A. AB is a 4×3 matrix

B. BA is a 4×3 matrix

C. AB is a 2×2 matrix

D. BA is a 2×2 matrix

E. BA is a 3×4 matrix

Question 4

Which one of the following sets of simultaneous equations has **no** unique solution?

A.
$$2x + 6y = 9$$
$$x + 3y = 1$$

B.
$$y = 4$$
$$y = x + 2$$

C.
$$2x + 3y = 9$$
$$4x + 6y = 18$$

D.
$$x + y = 7$$
$$2x + 3y = 10$$

E.
$$3x + 6y = 5$$
$$2x - 4y = 9$$

Question 5

If $A=\begin{bmatrix}4 & 1\\ 2 & 3\end{bmatrix}, B=\begin{bmatrix}2 & 0\\ 0 & 1\end{bmatrix}$ and C=$\begin{bmatrix}1 & 2\\ 3 & 1\end{bmatrix}$ then $(A-B)C^2$ equals

A. $\begin{bmatrix}20 & 15\\ 26 & 22\end{bmatrix}$

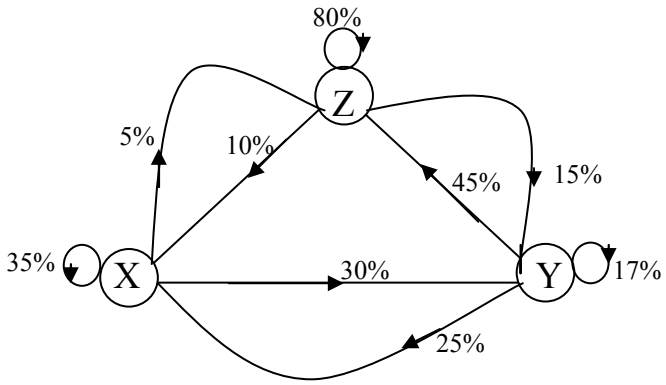
B. $\begin{bmatrix}22 & 15\\ 26 & 20\end{bmatrix}$

C. $\begin{bmatrix}11 & 9\\ 20 & 10\end{bmatrix}$

D. $\begin{bmatrix}10 & 9\\ 20 & 11\end{bmatrix}$

E. $\begin{bmatrix}20 & 15\\ 11 & 10\end{bmatrix}$

Question 6



The corresponding transition matrix for the above diagram is

A.

	From x	From y	From z
To x	0.35	0.25	0.10
To y	0.30	0.17	0.15
To z	0.50	0.45	0.80

B.

	From x	From y	From z
To x	0.35	0.30	0.50
To y	0.25	0.17	0.45
To z	0.10	0.15	0.80

C.

	From x	From y	From z
To x	0.35	0.30	0.05
To y	0.25	0.17	0.45
To z	0.10	0.15	0.80

D.

	From x	From y	From z
To x	0.35	0.30	0.17
To y	0.15	0.25	0.05
To z	0.80	0.45	0.10

E.

	From x	From y	From z
To x	0.35	0.25	0.10
To y	0.30	0.17	0.15
To z	0.05	0.45	0.80

The following information relates to Questions 7 and 8

At a particular shop there are two choices of chocolate, dark and milk. Weekly records show that 72% of the people choose milk chocolate if they chose milk chocolate the previous week. The records also show that 65% of the customers will choose dark chocolate if they chose dark chocolate the previous week. 2180 customers chose milk chocolate last week and 1260 customers chose dark chocolate. Assume people shop once a week.

Question 7

The initial state matrix, S_0, could be

A. $\begin{bmatrix} 2180 \\ 1260 \end{bmatrix}$

B. $\begin{bmatrix} 0.65 \\ 0.35 \end{bmatrix}$

C. $\begin{bmatrix} 0.72 & 0.65 \\ 0.28 & 0.35 \end{bmatrix}$

D. $\begin{bmatrix} 0.72 & 0.28 \\ 0.65 & 0.35 \end{bmatrix}$

E. $\begin{bmatrix} 0.72 & 0.65 \\ 0.63 & 0.37 \end{bmatrix}$

Question 8

An estimation of the number of people who will choose dark chocolate in 5 weeks time would be

A. 1429

B. 1527

C. 1533

D. 1907

E. 1913

Module 6: Matrices

Question 9

A company produces three types of shampoo. One for dry hair, D, one for normal hair, N and one for coloured hair, C. The number of bottles of each type of shampoo produced each day in each of its three factories, X,Y and Z are given in the matrix, A below

$$A = \begin{array}{c} \\ X \\ Y \\ Z \end{array} \begin{array}{c} \begin{array}{ccc} D & N & C \end{array} \\ \begin{bmatrix} 50 & 60 & 200 \\ 20 & 100 & 30 \\ 80 & 40 & 70 \end{bmatrix} \end{array}$$

The cost of making shampoo for dry hair is \$2.00 a bottle, for normal hair it is \$1.00 a bottle and for shampoo for coloured hair it is \$3.00 a bottle. The cost of producing all shampoos made each day at each factory can be given by the matrix

A. $\begin{array}{c} X \\ Y \\ Z \end{array} \begin{bmatrix} 300 \\ 340 \\ 900 \end{bmatrix}$

B. $\begin{array}{c} X \\ Y \\ Z \end{array} \begin{bmatrix} 330 \\ 380 \\ 470 \end{bmatrix}$

C. $\begin{array}{c} X \\ Y \\ Z \end{array} \begin{bmatrix} 770 \\ 310 \\ 410 \end{bmatrix}$

D. $\begin{array}{c} X \\ Y \\ Z \end{array} \begin{bmatrix} 760 \\ 230 \\ 410 \end{bmatrix}$

E. $\begin{array}{c} X \\ Y \\ Z \end{array} \begin{bmatrix} 360 \\ 340 \\ 640 \end{bmatrix}$

End of Module 6

End of 2007 Further Mathematics Trial Examination 1
Multiple Choice Question Book

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