2008

VCE

Further Mathematics

Trial Examination 1

Kilbaha Multimedia Publishing **PO Box 2227** **Kew Vic 3101** **Australia**	**Tel: (03) 9817 5374** **Fax: (03) 9817 4334** **kilbaha@gmail.com** **http://kilbaha.googlepages.com**

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VICTORIAN CERTIFICATE OF EDUCATION 2008

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 42 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 2008
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 2008
Trial Written Examination 1
ANSWER SHEET

NAME: _____

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Instructions

- Write your name in the space provided above.
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- **NO MARK** will be given if more than **ONE** answer is completed for any question.
- All answers must be completed like **THIS** example.

A	B	C	D	E

Section A

1	A	B	C	D	E
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 2008
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

Please turn over . . .

VCE FURTHER MATHEMATICS 2008
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: $z = \frac{x - \bar{x}}{s_x}$

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

residual value: residual value = actual value – predicted value

seasonal index: 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

The stem and leaf plot below shows the ages of people applying for a passport in Victoria on a particular day.

	Age						
1	7	8	9	9	9		
2	0	1	2	2	4	7	
3	0	1	2	3	5	6	
4	2	5	8				
5	4	7					
6	2	3	5	7	8	9	9
7	1						

Question 1
The percentage of people under 25 applying for a passport on this day was closest to

A. 10%

B. 20%

C. 30%

D. 40%

E. 50%

Question 2
The interquartile range for the given data is

A. 34

B. 35

C. 40

D. 41

E. 42

Core

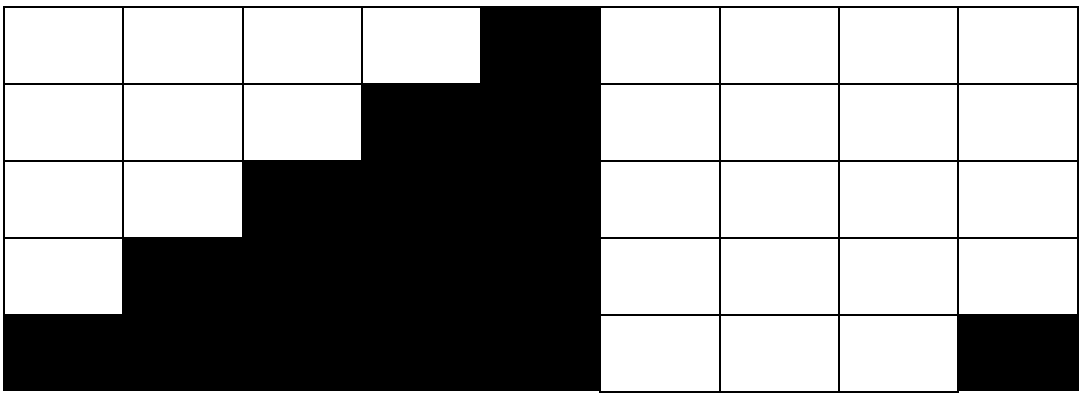
The following information relates to Questions 3 and 4

10

8

6

Number of



The graph above shows the time taken in minutes for various people to ski down a slope.

Question 3

The best description of the above histogram is

A. positively skewed with an outlier

B. negatively skewed with an outlier

C. approximately symmetric with an outlier

D. positively skewed with no outlier

E. negatively skewed with no outlier

Question 4

The number of people who take more than 30 minutes to ski down the slope is

A. 10

B. 12

C. 18

D. 20

E. 50

Core

Question 5

Data regarding the number of housing loans taken out over each of the last 20 years was collected. The best way to display this data would be

A. A bar graph

B. A stem plot

C. A box plot

D. Either a stem plot or a box plot

E. A scatter plot

Question 6

If the annual rainfall of a particular town is known to be normally distributed with a mean of 600 mm and a standard deviation of 80 mm, then which one of the following statements is true?

A. 68% of annual rainfall would be between 440 mm and 760 mm

B. 5% of annual rainfall would be greater than 520 mm

C. 5% of annual rainfall would be less than 440 mm

D. 0.15% of annual rainfall would be less than 360 mm

E. 0.15% of annual rainfall would be greater than 680 mm

Core

Question 7

A student's standard score on a test is -2, and his actual score is 60. If the standard deviation for the test is 5, then the mean mark for the test is

A. 50

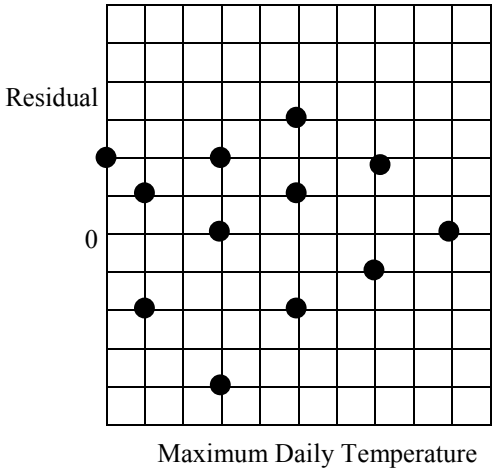
B. 70

C. 75

D. 80

E. 85

Question 8



The above graph is a residual plot of data collected on the number of skis hired and the maximum daily temperature. Which one of the following statements is **true**?

A. The residual plot implies that a linear relationship exists between the number of skis rented and the maximum daily temperature.

B. The residual plot implies that a random relationship exists between the number of skis rented and the maximum daily temperature.

C. The residual plot implies that a quadratic relationship exists between the number of skis rented and the maximum daily temperature.

D. The residual plot implies that a logarithmic relationship exists between the number of skis rented and the maximum daily temperature.

E. The residual plot implies that a cubic relationship exists between the number of skis rented and the maximum daily temperature.

Core

The following information relates to Questions 9 and 10

Students' marks on an English and Mathematics test were recorded and the least squares regression line was found to have the equation

$$English\ Mark = 7.25 - 0.18 \times Mathematics\ Mark$$

The coefficient of determination was 0.04

Question 9

The value of Pearson's product moment correlation coefficient would be closest to

A. 0.2

B. 0.16

C. -0.16

D. -0.18

E. -0.2

Question 10

Which of the following marks is closest to the Mathematics mark that a student who scored 7 on the English test would be expected to get?

A. 1

B. 3

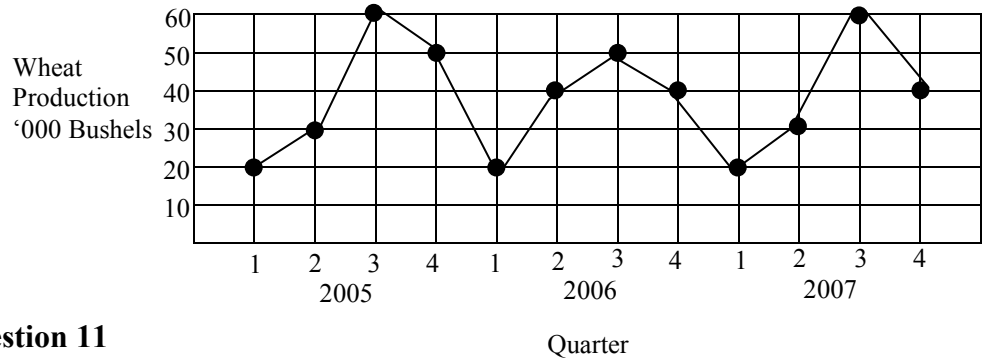
C. 5

D. 7

E. 9

Core

The following information relates to Questions 11 and 12



Question 11

The time series graph above shows

A. a positive linear trend only

B. a negative linear trend only

C. a seasonal pattern and a linear trend

D. a seasonal pattern and no linear trend

E. no linear trend and no seasonal pattern

Question 12

The three median trend line fitted to this data has a gradient in thousands of Bushels per quarter which is closest to

A. -0.625

B. -0.556

C. 0

D. 0.556

E. 0.625

Core

Question 13

Month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Hours spent playing sport per week	14	5	7	14	16	15	14	13	12	6	4	2

Using the data in the above table, the 4-mean smoothed number of hours playing sport per week centred at July would be

A. 11.25

B. 12.375

C. 13.5

D. 14

E. 14.5

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. $\frac{1}{512}$

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

Module 1: Number patterns and applications

Question 5

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

A. 22 m

B. 44 m

C. 130 m

D. 170 m

E. 260 m

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 1st2008, then the value of the car on January 1st 2012 will be closest to

A. $8,000

B. $12,800

C. $14,199

D. $16,200

E. $16,704

Module 1: Number patterns and applications

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

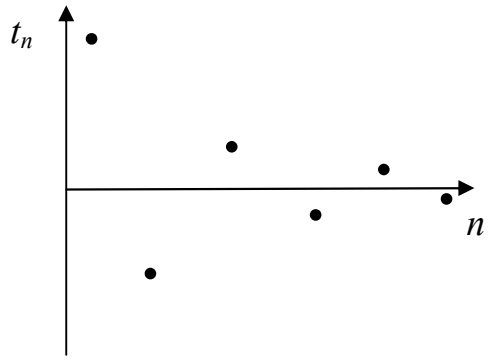
C. ±4

D. 4

E. 24

Module 1: Number patterns and applications

Question 9



The above graph **could** represent

A. an arithmetic sequence where the common difference is negative.

B. a geometric sequence where the common ratio is a positive integer.

C. a geometric sequence where the common ratio is a negative integer.

D. a geometric sequence where the common ratio is a positive fraction.

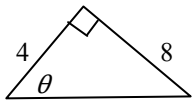
E. a geometric sequence where the common ratio is a negative fraction.

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 the above triangle, the value of θ is closest to

A. 27^0

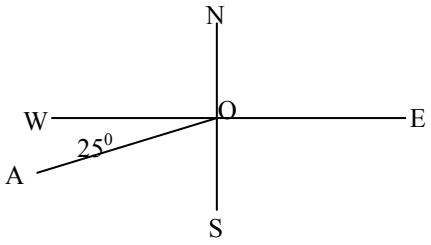
B. 30^0

C. 60^0

D. 63^0

E. 64^0

Question 2



The true bearing of OA is

A. 115^0T

B. 155^0T

C. 205^0T

D. 245^0T

E. 295^0T

Module 2: Geometry and trigonometry

Question 3

A metre ruler held perpendicular to the ground casts a shadow that is 3 metres long at the same time as a building casts a shadow that is 12 metres long. The height of the building is

A. 2m

B. 4m

C. 6m

D. 9m

E. 10m

Question 4

An isosceles right angled triangle has an hypotenuse of length 12 cm. The perimeter of the triangle is closest to

A. 15.5 cm

B. 20.5 cm

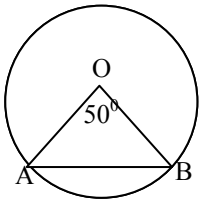
C. 25 cm

D. 29 cm

E. 36 cm

Module 2: Geometry and trigonometry

Question 5



In the above circle with O at the centre, the radius is 6 cm and $\angle AOB = 50^0$. The area of triangle AOB is closest to

A. 4.6 cm^2

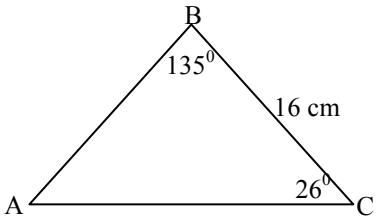
B. 11.6 cm^2

C. 13.8 cm^2

D. 23.1 cm^2

E. 27.6 cm^2

Question 6



In the triangle ABC where
$\angle ABC = 135^0, \angle ACB = 26^0$ and $BC = 16$ cm, the length of AC is closest to

A. 7.4 cm

B. 9.9 cm

C. 23.8 cm

D. 25.8 cm

E. 34.8 cm

Module 2: Geometry and trigonometry

Question 7

From the top of a cliff 100 metres high, the angle of depression of a boat is 23^0. The distance of the boat from the cliff is closest to

A. 39.1 m

B. 42.4 m

C. 108.6 m

D. 235.6 m

E. 255.9 m

Question 8

A square pyramid is to be constructed using wire. If the square base has a length of 15 cm and if the vertical height of the pyramid is to be 10 cm. then the length of wire required for the construction of the pyramid is closest to

A. 100 cm

B. 118 cm

C. 123 cm

D. 124 cm

E. 131 cm

Module 2: Geometry and trigonometry

Question 9

A rectangular prism has a length twice the height and a width three times the height. If the surface area of the prism is 7942cm^2, then the width of the prism is

A. 6.3 cm

B. 9.5 cm

C. 19 cm

D. 36 cm

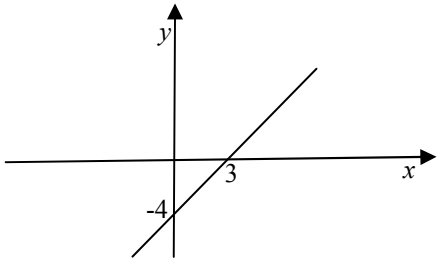
E. 57 cm

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 gradient of the line above is

A. 7

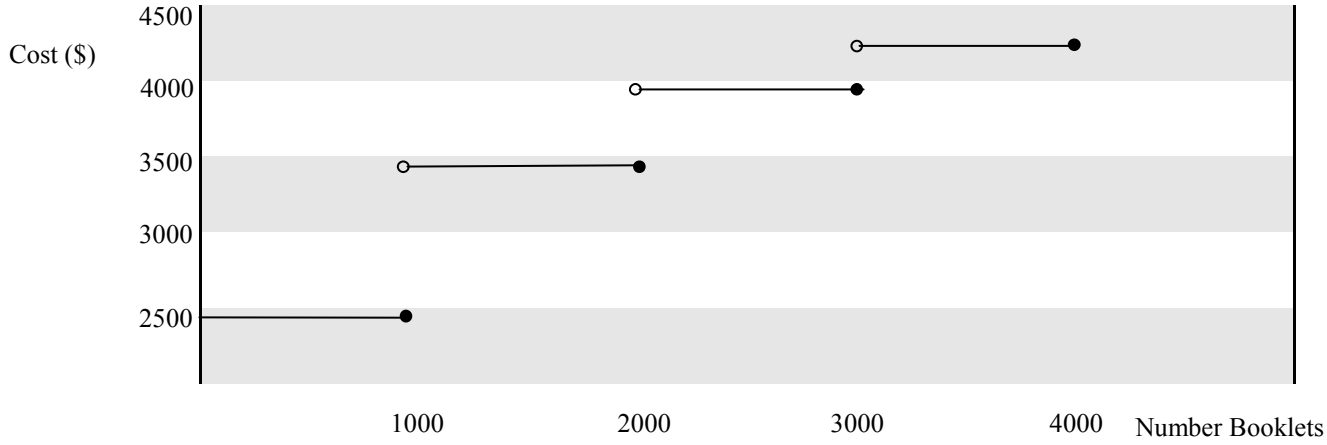
B. $\frac{4}{3}$

C. $\frac{3}{4}$

D. $-\frac{4}{3}$

E. $-\frac{3}{4}$

Question 2



The above graph shows the costs charged by a printer. The cost for printing 3,800 booklets is

A. $1000

B. $2500

C. $3000

D. $4000

E. $4250

Question 3

If a population of rabbits can be modeled by the equation, $P = 400t + 50$, where P is the size of the population and t is the time, then the original population of rabbits was

A. 8

B. 50

C. 350

D. 400

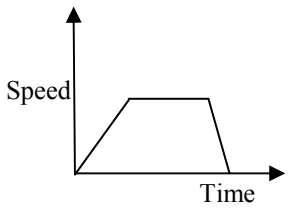
E. 450

Module 3: Graphs and relations

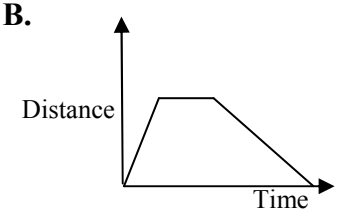
Question 4

Meg rides her bike at 10 km/hr for one hour. She then stops for lunch before riding home at 20 km/hr. Which one of the following graphs could represent Meg's journey?

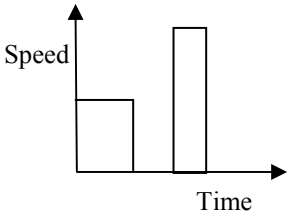
A.



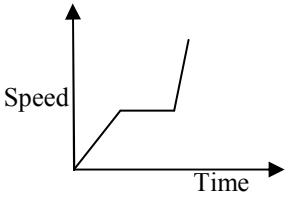
B.



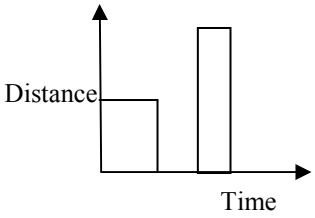
C.



D.

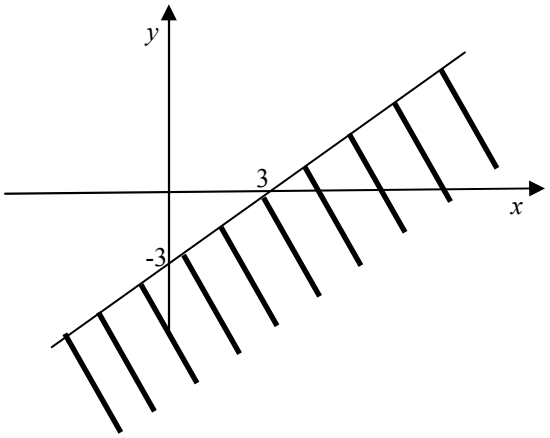


E.



Module 3: Graphs and relations

Question 5



Which one of the following inequations could be represented by the shaded region above?

A. $x - y \geq 3$

B. $y - x \geq 3$

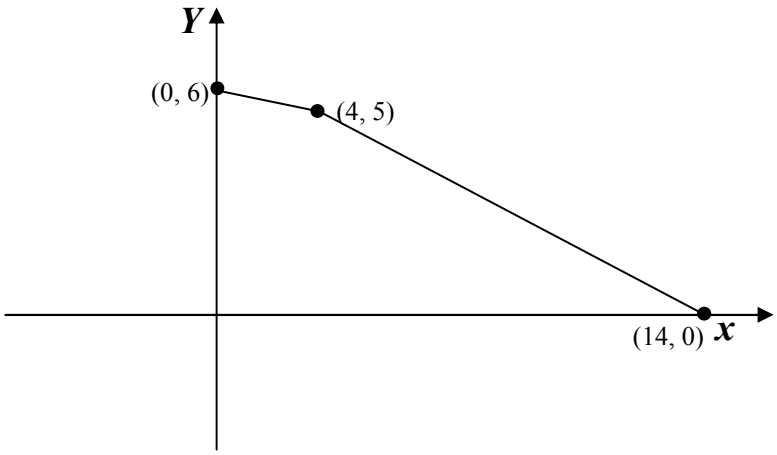
C. $x - y \leq -3$

D. $y - x \leq -3$

E. $x + y \leq -3$

Module 3: Graphs and relations

Question 6



The graph above represents the hybrid function with the rule

A. $y = \begin{cases} -\frac{1}{4}x + 6 & 0 \le x \le 4 \\ -\frac{1}{2}x + 5 & 0 \le x \le 14 \end{cases}$

B. $y = \begin{cases} -\frac{1}{4}x + 6 & 0 \le x \le 4 \\ -\frac{1}{2}x + 7 & 4 < x \le 14 \end{cases}$

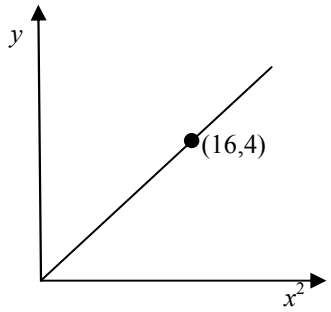
C. $y = \begin{cases} \frac{1}{4}x + 6 & 0 \le x \le 4 \\ \frac{1}{2}x - 5 & 4 < x \le 14 \end{cases}$

D. $y = \begin{cases} \frac{1}{4}x + 6 & 0 \le x \le 4 \\ \frac{1}{2}x - 7 & 4 \le x \le 14 \end{cases}$

E. $y = \begin{cases} -\frac{1}{4}x + 14 & 0 \le x \le 4 \\ -\frac{1}{2}x + 11 & 4 \le x \le 14 \end{cases}$

Module 3: Graphs and relations

Question 7



The above graph shows the relationship between y and x^2. The rule connecting y and x is

A. $y = \frac{1}{4}x$

B. $y = 4x$

C. $y = \frac{1}{4}x^2$

D. $y = 4x^2$

E. $y = x^2$

Module 3: Graphs and relations

Question 8

Which one of the following sets of equations could represent two lines that are parallel to each other?

A. $y = 2x + 5$
$y = -2x + 5$

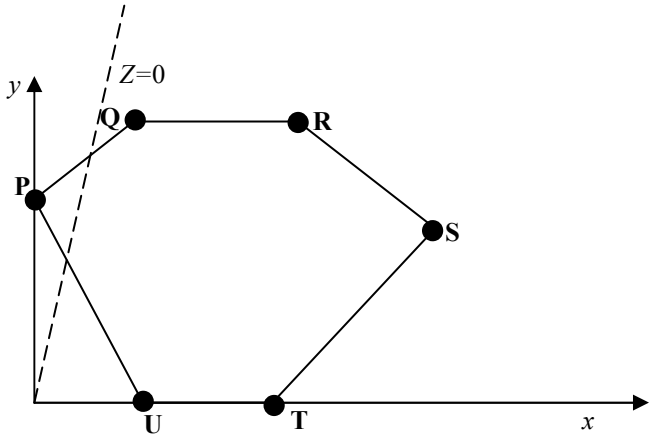
B. $2y + 6x = 8$
$y = 3x + 4$

C. $2y - 6x = 8$
$y = 3x + 4$

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

E. $2y + x = 7$
$7y + x = 2$

Question 9



In the above graph the required set of points lie on and within the boundary **PQRSTU**. The line, $Z = 0$ is shown. If $Z = 3x - y$, then the maximum value of Z occurs at

A. P

B. Q

C. R

D. S

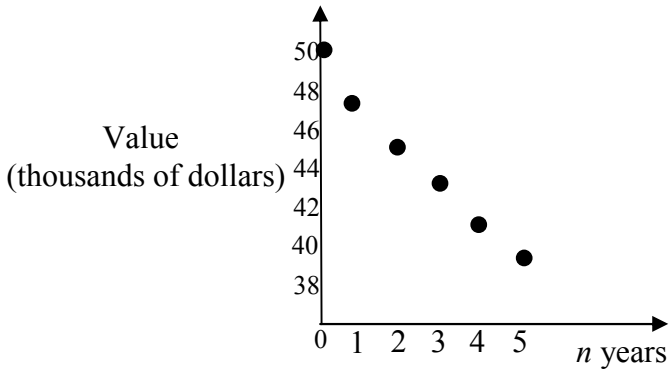
E. Either T or U or a point inside the given boundary.

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



The above graph represents the value, V, of a car in thousands of dollars over several years, n. A rule describing the value, V, could be

A. $V = 50000(0.95)^n$

B. $V = 50000(1.05)^n$

C. $V = 50000 - (0.95)^n$

D. $V = 50000 + (0.95)^n$

E. $V = 50000 - (1.05)^n$

Question 2

In a certain country, a dishwasher costs \$950 and has a GST of \$118.75 added to the price. The GST in this country is

A. 8.5%

B. 9.5%

C. 10.5%

D. 11.5%

E. 12.5%

Module 4: Business-related mathematics

Question 3

A dining table can be purchased for $1200 cash. Brian buys the table on hire purchase and pays $396 deposit and then he pays monthly instalments of $66 for $2\frac{1}{2}$ years. The total amount of interest charged is

A. $176

B. $198

C. $396

D. $1176

E. $2376

Question 4

Salman invests $9400 at 7.2% compound interest for 2 years. If the interest is compounded annually, the interest earned in this time is closest to

A. $49

B. $1354

C. $1402

D. $4873

E. $10800

Question 5

Geoff borrowed $800 and repaid $139 per month for 6 months. The effective annual interest rate was closest to

A. 1.2%

B. 7.0%

C. 8.5%

D. 12.1%

E. 14.6%

Question 6

Minnie invests a certain amount of money for 5 years at a simple interest of 9.6%. At the end of this time, her investment has grown to $740. The amount she invested is closest to

A. $355

B. $400

C. $500

D. $550

E. $600

Module 4: Business-related mathematics

Question 7

Office furniture costs $13500 and is to be sold after 10 years for $920. If it depreciates at a constant rate each year, then the percentage annual depreciation of the cost price is closest to

A. 0.68%

B. 4.3%

C. 6.8%

D. 7.3%

E. 9.3%

Question 8

Brad takes out a $250000 interest only loan for the total price of an investment property. The interest rate is 9.2% per annum, compounding monthly. If Brad takes the loan out for ten years, making his repayments monthly, and then sells the property for $485000, the profit he makes on this investment at the end of the ten years is closest to

A. $5000

B. $8000

C. $15000

D. $18000

E. $28000

Question 9

Kate's deposit increased by 8% compound interest for the first 5 years and then 6% compound interest for the next 2 years. All interest is compounded annually. If at the end of these seven years, her investment was worth $12000, then the value of her original deposit was closest to

A. $6240

B. $7269

C. $7473

D. $7508

E. $9523

End of Module 4

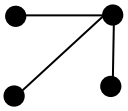
Module 5: Networks and decision mathematics

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

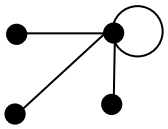
Question 1

Which one of the following graphs is **not** connected?

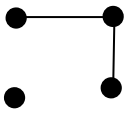
A.



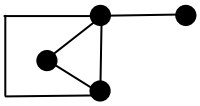
B.



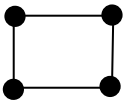
C.



D.



E.



Question 2

If a complete graph has 20 vertices, then the number of edges this graph has is

A. 10

B. 20

C. 120

D. 190

E. 200

Question 3

A planar graph has seven vertices. Six of the vertices have degree three and one of the vertices has degree six. The number of edges of this graph is

A. 4

B. 10

C. 11

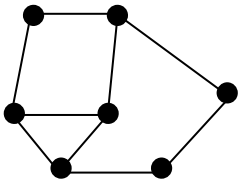
D. 12

E. 16

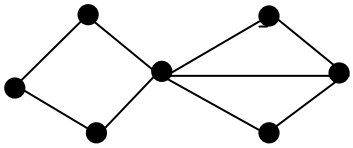
Module 5: Networks and decision mathematics

Question 4

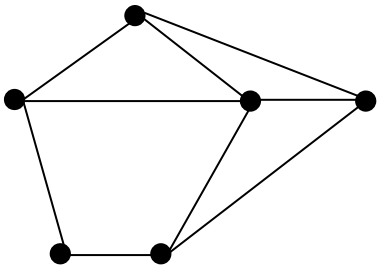
P.



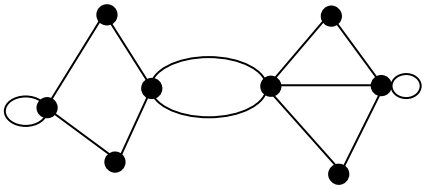
Q.



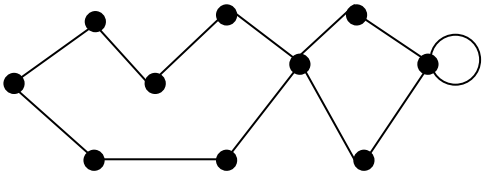
R.



S.



T.



The graphs above that have an Euler path and not an Euler circuit are

A. Q and S only.

B. S and T only.

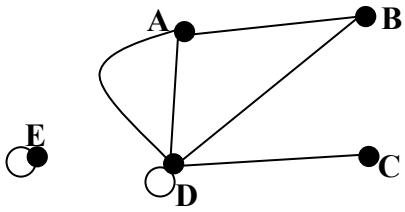
C. Q, S and T only.

D. P, R and Q only.

E. T only.

Module 5: Networks and decision mathematics

Question 5



An adjacency matrix that can represent the above graph is

A.

$$\begin{array}{c} \\ A \\ B \\ C \\ D \\ E \end{array}\begin{array}{c} \begin{array}{ccccc} A & B & C & D & E \end{array} \\ \begin{bmatrix} 3 & 1 & 0 & 3 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 3 & 1 & 1 & 3 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

B.

$$\begin{array}{c} \\ A \\ B \\ C \\ D \\ E \end{array}\begin{array}{c} \begin{array}{ccccc} A & B & C & D & E \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 2 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 2 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \end{array}$$

C

$$\begin{array}{c} \\ A \\ B \\ C \\ D \\ E \end{array}\begin{array}{c} \begin{array}{ccccc} A & B & C & D & E \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 2 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 2 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

D

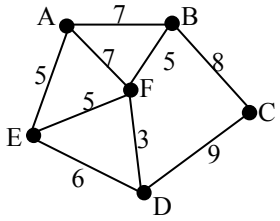
$$\begin{array}{c} \\ A \\ B \\ C \\ D \\ E \end{array}\begin{array}{c} \begin{array}{ccccc} A & B & C & D & E \end{array} \\ \begin{bmatrix} 3 & 1 & 0 & 2 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 2 & 1 & 1 & 3 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \end{array}$$

E

$$\begin{array}{c} \\ A \\ B \\ C \\ D \\ E \end{array}\begin{array}{c} \begin{array}{ccccc} A & B & C & D & E \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 3 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 2 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

Module 5: Networks and decision mathematics

Question 6



The six towns A, B, C, D, E and F are to be connected by cable. The cable is to be laid along certain roads which are shown as edges, together with their lengths in the above graph.
The minimum length of cable required is

A. 18

B. 24

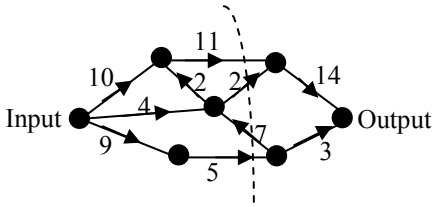
C. 25

D. 26

E. 27

Module 5: Networks and decision mathematics

The following graph refers to questions7 and 8.



Question 7

The capacity of the cut shown in the above graph is

A. 5

B. 11

C. 18

D. 23

E. 25

Question 8

The maximum flow of the network is

A. 16

B. 17

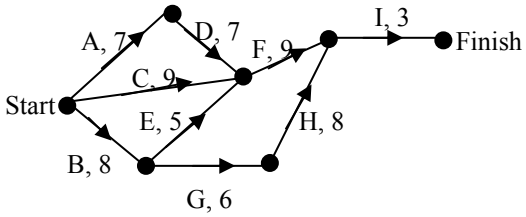
C. 18

D. 19

E. 26

Module 5: Networks and decision mathematics

Question 9



The above network shows the activities required to complete a project, and the time each activity took. Which **one** of the following statements is true?

A. The critical path is **C F I.**

B. Taking two hours longer to complete activity **C** will delay the finishing time for the project by two hours.

C. Taking six hours longer to complete activity **C** will not delay the finishing time for the project.

D. Taking six hours longer to complete activity **E** will delay the finishing time for the project by six hours.

E. Taking two hours longer to complete activity **H** will delay the finishing time for the project by one hour.

End of Module 5

Module 6: Matrices

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

Question 1

$-3\begin{bmatrix} 2 & 6 \\ -4 & 1 \end{bmatrix} - \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix}$ equals

A. $\begin{bmatrix} -9 & -14 \\ 11 & -5 \end{bmatrix}$

B. $\begin{bmatrix} -9 & -22 \\ 11 & -5 \end{bmatrix}$

C. $\begin{bmatrix} -9 & -22 \\ 11 & -1 \end{bmatrix}$

D. $\begin{bmatrix} -9 & 14 \\ 11 & -5 \end{bmatrix}$

E. $\begin{bmatrix} -9 & 14 \\ 11 & 5 \end{bmatrix}$

Question 2

Which one of the following sets of simultaneous equations **does not** have a unique solution?

A.
$$4x - 2y = 7$$
$$6x + 3y = 10$$

B.
$$4x + 3y = 12$$
$$4x - 3y = 16$$

C.
$$4x + 8y = 27$$
$$3x + 6y = 11$$

D.
$$4x - 5y = 12$$
$$2x - 8y = 9$$

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

Module 6: Matrices

Question 3

If $\begin{bmatrix} a & b \\ -b & a \end{bmatrix} + X = \begin{bmatrix} -2 & 0 \\ 4 & -3 \end{bmatrix}$ then X is the matrix

A. $\begin{bmatrix} a-2 & b \\ 4-b & a-3 \end{bmatrix}$

B. $\begin{bmatrix} 2-a & b \\ 4+b & 3-a \end{bmatrix}$

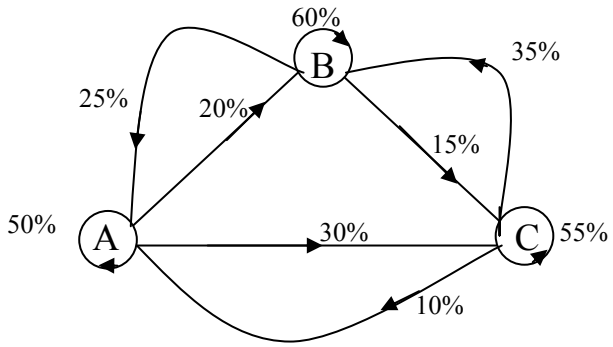
C. $\begin{bmatrix} 2-a & -b \\ 4+b & 3-a \end{bmatrix}$

D. $\begin{bmatrix} -2-a & -b \\ 4+b & -3-a \end{bmatrix}$

E. $\begin{bmatrix} -2-a & b \\ 4+b & -3-a \end{bmatrix}$

Module 6: Matrices

Question 4



The transition matrix that represents the above diagram is

A. $\begin{bmatrix} 0.5 & 0.2 & 0.25 \\ 0.25 & 0.6 & 0.15 \\ 0.1 & 0.15 & 0.55 \end{bmatrix}$

B. $\begin{bmatrix} 0.2 & 0.15 & 0.3 \\ 0.1 & 0.25 & 0.35 \\ 0.5 & 0.6 & 0.55 \end{bmatrix}$

C. $\begin{bmatrix} 0.2 & 0.25 & 0.35 \\ 0.3 & 0.15 & 0.1 \\ 0.5 & 0.6 & 0.55 \end{bmatrix}$

D. $\begin{bmatrix} 0.5 & 0.25 & 0.1 \\ 0.2 & 0.6 & 0.35 \\ 0.3 & 0.15 & 0.55 \end{bmatrix}$

E. $\begin{bmatrix} 0.5 & 0.25 & 0.1 \\ 0.3 & 0.6 & 0.55 \\ 0.2 & 0.15 & 0.35 \end{bmatrix}$

Module 6: Matrices

Question 5

If $T = \begin{bmatrix} 0.4 & 0.8 \\ 0.6 & 0.2 \end{bmatrix}$ and $S_o = \begin{bmatrix} 200 \\ 300 \end{bmatrix}$, then the steady state solution is closest to

A. $\begin{bmatrix} 320 \\ 180 \end{bmatrix}$

B. $\begin{bmatrix} 287 \\ 213 \end{bmatrix}$

C. $\begin{bmatrix} 291 \\ 208 \end{bmatrix}$

D. $\begin{bmatrix} 285 \\ 215 \end{bmatrix}$

E. $\begin{bmatrix} 286 \\ 214 \end{bmatrix}$

Question 6

If $A = \begin{bmatrix} 3p & -2q \\ 4r & s \end{bmatrix}$, then A^{-1} equals

A. $\dfrac{1}{3ps+8qr}\begin{bmatrix} s & 2q \\ -4r & 3p \end{bmatrix}$

B. $\dfrac{1}{3ps+8qr}\begin{bmatrix} -3p & -2q \\ 4r & -s \end{bmatrix}$

C. $\dfrac{1}{3ps+8qr}\begin{bmatrix} -3p & 2q \\ 4r & -s \end{bmatrix}$

D. $\dfrac{1}{3ps-8qr}\begin{bmatrix} -3p & 2q \\ 4r & -s \end{bmatrix}$

E. $\dfrac{1}{3ps-8qr}\begin{bmatrix} s & 2q \\ -4r & 3p \end{bmatrix}$

Module 6: Matrices

Question 7

The simultaneous equations

$2x+2y+2z=1$

$x+z=-1$

$4z-5y=5$

can be written in matrix form as

A. $\begin{bmatrix}2 & 2 & 2\\ 1 & 1 & 1\\ 1 & 4 & -5\end{bmatrix}\begin{bmatrix}x\\ y\\ z\end{bmatrix}=\begin{bmatrix}1\\ -1\\ 5\end{bmatrix}$

B. $\begin{bmatrix}2 & 2 & 2\\ 1 & 1 & 0\\ 5 & -4 & 0\end{bmatrix}\begin{bmatrix}x\\ y\\ z\end{bmatrix}=\begin{bmatrix}1\\ -1\\ 5\end{bmatrix}$

C. $\begin{bmatrix}1 & 1 & 1\\ 1 & 0 & 1\\ 1 & -5 & 4\end{bmatrix}\begin{bmatrix}x\\ y\\ z\end{bmatrix}=\begin{bmatrix}0.5\\ -1\\ 5\end{bmatrix}$

D. $\begin{bmatrix}2 & 2 & 2\\ 1 & 1 & 0\\ 0 & 4 & -5\end{bmatrix}\begin{bmatrix}x\\ y\\ z\end{bmatrix}=\begin{bmatrix}1\\ -1\\ 5\end{bmatrix}$

E. $\begin{bmatrix}1 & 1 & 1\\ 1 & 0 & 0\\ 0 & -5 & 4\end{bmatrix}\begin{bmatrix}x\\ y\\ z\end{bmatrix}=\begin{bmatrix}1\\ -1\\ 5\end{bmatrix}$

Module 6: Matrices

Question 8

A shop sells raincoats (*RC*) and umbrellas (*U*). The manager believes that 80% of those who bought a raincoat last year, will buy a raincoat this year and the remainder of these people will buy an umbrella this year. She also believes that 10% of those who bought an umbrella last year, will buy a raincoat this year and the remainder of these people will buy an umbrella again this year. The transition matrix which shows this information is

A.

$$\begin{array}{c} \\ \text{This year} \end{array} \begin{array}{c} \begin{array}{cc} \text{Last year} & \\ RC & U \end{array} \\ \begin{array}{c} RC \\ U \end{array} \begin{bmatrix} 0.08 & 0.01 \\ 0.02 & 0.09 \end{bmatrix} \end{array}$$

B.

$$\begin{array}{c} \\ \text{This year} \end{array} \begin{array}{c} \begin{array}{cc} \text{Last year} & \\ RC & U \end{array} \\ \begin{array}{c} RC \\ U \end{array} \begin{bmatrix} 0.08 & 0.02 \\ 0.01 & 0.09 \end{bmatrix} \end{array}$$

C.

$$\begin{array}{c} \\ \text{This year} \end{array} \begin{array}{c} \begin{array}{cc} \text{Last year} & \\ RC & U \end{array} \\ \begin{array}{c} RC \\ U \end{array} \begin{bmatrix} 0.8 & 0.2 \\ 0.1 & 0.9 \end{bmatrix} \end{array}$$

D.

$$\begin{array}{c} \\ \text{This year} \end{array} \begin{array}{c} \begin{array}{cc} \text{Last year} & \\ RC & U \end{array} \\ \begin{array}{c} RC \\ U \end{array} \begin{bmatrix} 0.8 & 0.9 \\ 0.2 & 0.1 \end{bmatrix} \end{array}$$

E.

$$\begin{array}{c} \\ \text{This year} \end{array} \begin{array}{c} \begin{array}{cc} \text{Last year} & \\ RC & U \end{array} \\ \begin{array}{c} RC \\ U \end{array} \begin{bmatrix} 0.8 & 0.1 \\ 0.2 & 0.9 \end{bmatrix} \end{array}$$

Module 6: Matrices

Question 9

A is a matrix
B is a matrix of order $4 \times m$
C is a matrix of order $p \times 2$
The answer to $A(B+C)$ could be a matrix of order

A. 2×3

B. 3×2

C. 4×2

D. 2×5

E. 3×4

End of Module 6

End of 2008 Further Mathematics Trial Examination 1
Multiple Choice Question Book

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