

**2014 Trial Examination**

**STUDENT NUMBER**

Figures


Words

Letter

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**FURTHER MATHEMATICS**

**Units 3 & 4 – Written examination 1**

Reading time: 15 minutes

Writing time: 1 hour and 30 minutes

**MULTIPLE-CHOICE QUESTION BOOK**

**Structure of book**

<i>Section</i>	<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of modules</i>	<i>Number of modules to be answered</i>	<i>Number of marks</i>
A	13	13			13
B	54	27	6	3	27
					Total 40

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, one bound reference, one approved graphic calculator or approved CAS calculator or CAS software and if desired, one scientific calculator
  - 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 35 pages.
- Instructions**
- Print your **name** in the space provided on the top of this page.
  - All written responses must be in English.

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

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**SECTION A****Instructions for Section A**

Answer **all** questions.

Choose the response that is correct for the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

**Core: Data analysis**

*Use the following information to answer Questions 1 & 2*

The weights of 92 new born babies and their mothers are classified as “below average”, “average” and “above average”. The results are displayed in a frequency table below.

		Mother		
		below average	average	above average
New born babies	below average	16	10	3
	average	8	14	11
	above average	5	7	18

**Question 1**

Of the mothers classified as “above average”, the percentage of new born babies with “average” weight is closest to:

- A. 9%
- B. 34%
- C. 56%
- D. 11%
- E. 32%

**Question 2**

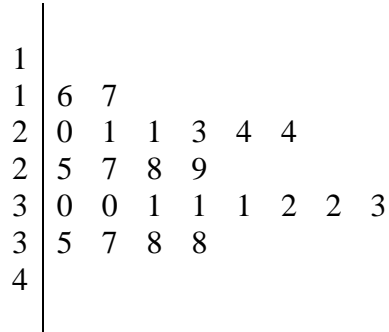
The number of new born babies classified as “average” is:

- A. 14
- B. 25
- C. 31
- D. 33
- E. 38

**SECTION A - continued**  
**TURN OVER**

Use the following information to answer Questions 3 & 4

The following ordered stem plot shows the percentage of students eating a healthy breakfast for 24 different schools.



Key 1|6=16%

**Question 3**

The number of schools with more than 21% of students eating a healthy breakfast is:

- A. 5
- B. 6
- C. 19
- D. 21
- E. 23

**Question 4**

Which of the following statements is true for the above stem plot?

- A. The median is 30%
- B. The range is 24%
- C. The first quartile is 24%
- D. The inter-quartile range is 8.5%
- E. The mode of the data is 38%

**SECTION A - continued**

*Use the following information to answer Questions 5 & 6*

The time spent, per week, on doing homework by 450 students of a particular year level is approximately normally distributed with a mean of 7.8 hours and a standard deviation of 0.6 hours.

**Question 5**

The time that 32% of students did homework could be:

- A. less than 7.2 hours and more than 8.4 hours
- B. between 7.2 hours and 8.4 hours
- C. between 8.4 hours and 9 hours
- D. less than 7.2 hours
- E. more than 9 hours

**Question 6**

The number of students who spent more than 8.4 hours per week doing homework is closest to:

- A. 16
- B. 36
- C. 72
- D. 76
- E. 225

**Question 7**

For a group of VCE students in Metropolitan Region, the correlation coefficient between amount of money spent on buying clothing items per week and their weekly expenditure on eating junk food was  $-0.67$ .

Given this information which one of the following statements is true?

- A. 67% of variation in expenditure on junk food can be explained by the variation in expenditure on clothing items.
- B. The rate at which the expenditure on junk food increases as expenditure on clothing items decreases is 0.67.
- C. Increase in expenditure on junk food causes an increase in expenditure on clothing items.
- D. As expenditure on junk food increases, expenditure on clothing items tends to decrease.
- E. There is a strong association between weekly expenditure on clothing items and expenditure on junk food.

**SECTION A - continued**  
**TURN OVER**

**Question 8**

The following table shows the number of minutes spent preparing for a test and the score achieved in the test by 15 students.

Time (in minutes) spent preparing	Score
75	25
30	31
35	30
65	38
110	55
60	20
40	39
80	47
56	35
70	45
50	32
110	33
18	34
80	38
22	17

The value of the coefficient correlation,  $r$ , for the above data set is closest to:

- A. 0.5261
- B. 0.6561
- C. 0.7523
- D. 0.9542
- E. 0.9956

**Question 9**

The monthly sales of red wine (in thousands of litres) in a particular year is shown below

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sales (in 000s of litres)	464	675	703	887	1139	1077	1318	1260	1120	963	996	1543

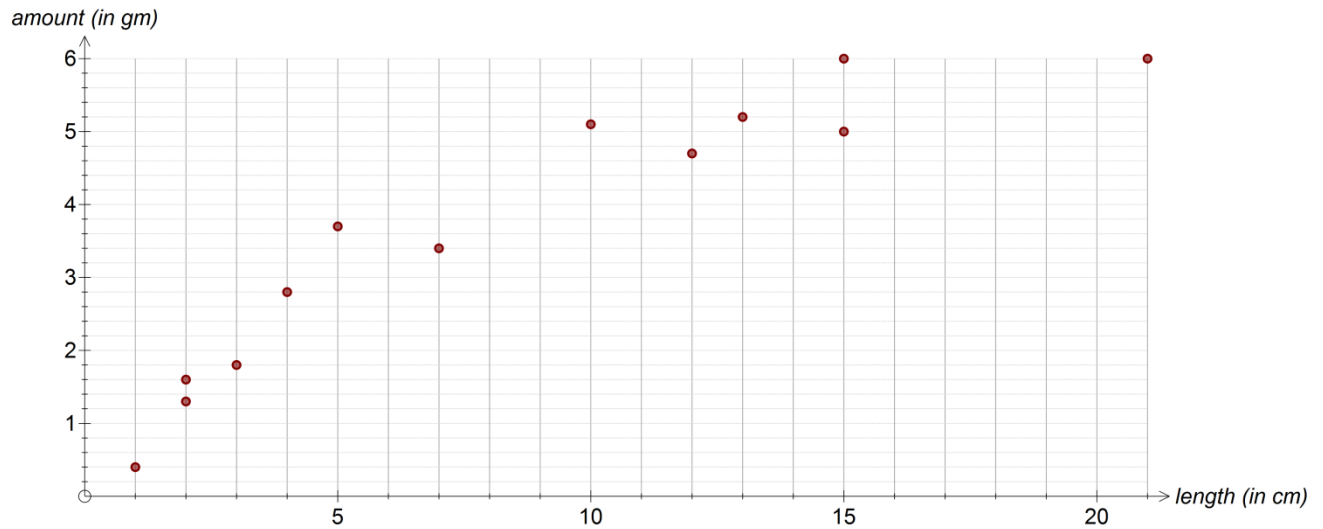
Using the two-mean moving method with centring, the smoothed value for sales, in thousands of litres, in May, is closest to:

- A. 951.5
- B. 1013
- C. 1060.5
- D. 1108
- E. 1139

**SECTION A - continued**

**Question 10**

The data in the scatterplot below shows the length of fish, in cm, and the amount of fish they can eat, in grams.



To linearise the data, an  $(\text{amount})^2$  transformation is used and the following least squares regression line is found:

$$(\text{amount})^2 = -0.2498 + 1.9648 \times \text{length}$$

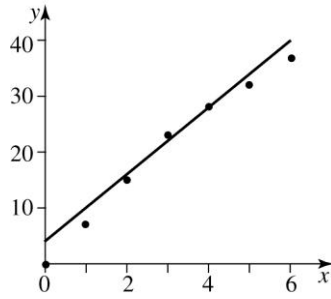
Using this transformed equation, the amount of fish, in gm, eaten by a 14 cm long fish is closest to:

- A. 27.26
- B. 5.22
- C. 7.25
- D. 99.88
- E. 7.00

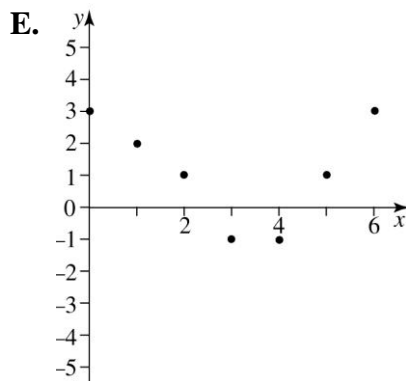
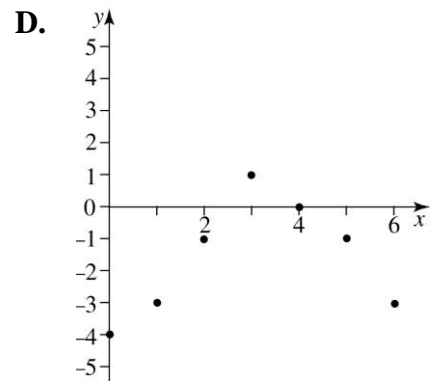
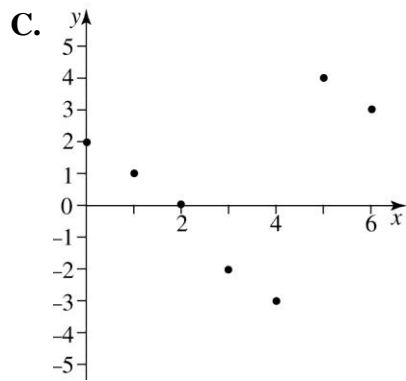
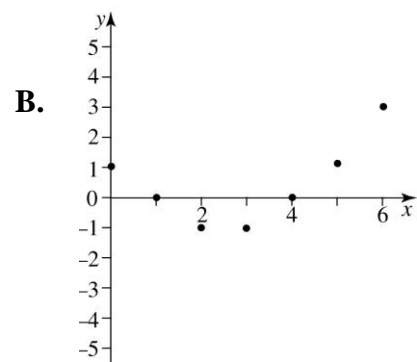
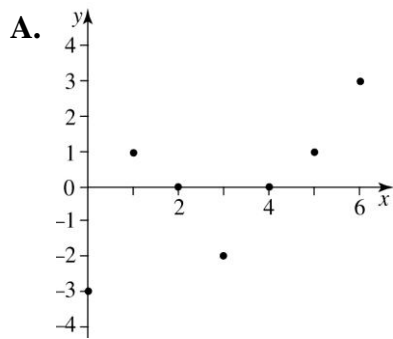
**SECTION A - continued**  
**TURN OVER**

**Question 11**

A least-squares regression line is fitted to the 7 points shown in the figure below.



Which of the following looks most similar to the plot of the residuals?



SECTION A - continued



**Question 12**

The following information was obtained when performing a least-squares regression on a data set

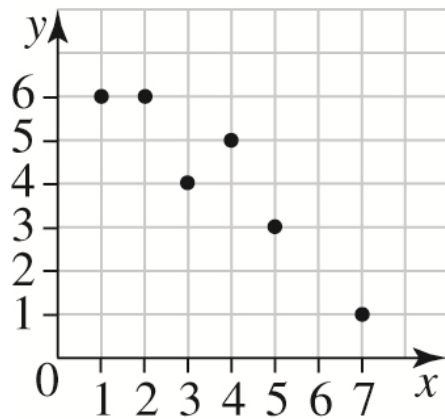
$$\bar{x} = 8.4, s_x = 1.2, \bar{y} = 12.5, s_y = 1.5 \text{ and } r = -0.90$$

The y-intercept of the regression line is closest to:

- A. 21.95
- B. -1.13
- C. 3.05
- D. 18.55
- E. 20.45

**Question 13**

A three-median line is to be fitted to the following scatter plot.



The value of the gradient of the three-median regression line is:

- A.  $\frac{8}{9}$
- B.  $-\frac{8}{9}$
- C.  $-\frac{4}{3}$
- D.  $-\frac{5}{4}$
- E.  $-\frac{4}{5}$

**END OF SECTION A  
TURN OVER**

**SECTION B**

**Instructions for Section B**

Select **three** modules and answer **all** questions within the modules.  
Choose the response that is **correct** or **best answers** the question and mark this response on the multiple-choice response sheet.  
A correct answer scores 1, an incorrect answer scores 0.  
No mark will be given if more than one answer is completed for any question.  
Marks will not be deducted for incorrect answers.

<b>Module</b>	<b>Page</b>
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**Module 1: Number patterns**

**Question 1**

The second, third and fourth terms of an arithmetic sequence are 3, 8, and 13. The eighth term is:

- A. 28
- B. 33
- C. 38
- D. 71
- E. 124

**Question 2**

A student played computer games for 15 minutes on the first day. Each day he played 9 minutes longer than the previous day. The total time, in minutes, that he spent on playing computer games after 10 days is:

- A. 96
- B. 651
- C. 660
- D. 24
- E. 555

**Question 3**

A sequence is generated by the difference equation  $t_{n+1} = -2 \times t_n, t_1 = 1$ . The rule for the  $n$ th term of this sequence is:

- A.  $t_n = -2n$
- B.  $t_n = 1 + (n - 1) \times -2$
- C.  $t_n = (-2)^{n-1}$
- D.  $t_n = (-2)^{n-1} + 1$
- E.  $t_n = 1 - 2n$

**Question 4**

There are 300 newspapers to be sold each day by a newsagent who opens his shop at 6.00am. 120 newspapers are sold in the first hour and the sale decreases by 25% each subsequent hour. In how many hours would the newsagent be able to sell all his newspapers?

- A. 2
- B. 3
- C. 4
- D. 5
- E. 8

**SECTION B - continued**  
**TURN OVER**

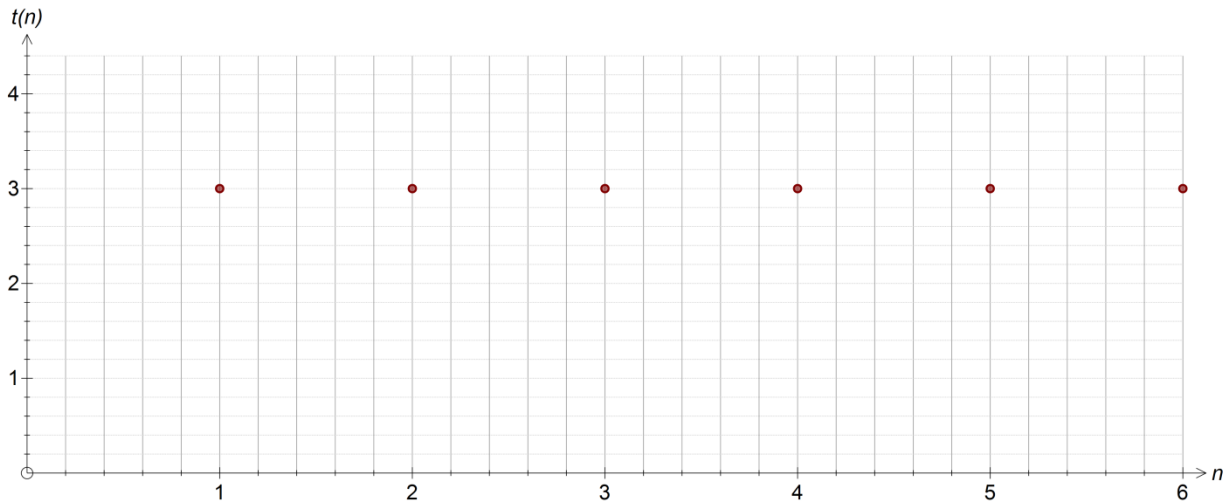
**Question 5**

For a geometric sequence, the fourth term is 5 and the seventh term is -625. The second term of the sequence is:

- A. -2.5
- B. -1.25
- C. 0.25
- D. -0.25
- E. 0.20

**Question 6**

Consider the following graph:



Which of the following describes the sequence above?

- A.  $t_n = n$
- B.  $t_{n+2} = t_{n+1} + t_{n+1}$ ,  $t_1 = 1, t_2 = 1$
- C.  $t_n = (-1)^n$
- D.  $t_n = 3$
- E.  $t_{n+1} = t_n + 1$ ,  $t_1 = 1$

**SECTION B** - continued

**Question 7**

The sequence  $t_n = 81 \times \left(\frac{1}{3}\right)^{n-1}$  and the series  $S_n = 1 - 0.1n$ .

The ratio  $\frac{t_9}{S_9}$  is:

- A.  $\frac{1}{27}$
- B.  $\frac{10}{81}$
- C.  $\frac{1}{243}$
- D.  $\frac{1}{81}$
- E.  $\frac{1}{270}$

**Question 8**

The second term in the sequence  $t_{n+1} = 2t_n - 8$ , where  $t_4 = 24$  is:

- A. 12
- B. 16
- C. 26
- D. 40
- E. 72

**Question 9**

The first non-negative term of the Fibonacci sequence 8, 10, 18, 28, 46, ..... is:

- A. 8
- B. 2
- C. 6
- D. 0
- E. 4

**SECTION B - continued  
TURN OVER**

**Module 2: Geometry and trigonometry**

**Question 1**

The area of the triangle with side lengths 10 cm, 14 cm and 20 cm is closest to:

- A.  $41 \text{ cm}^2$
- B.  $65 \text{ cm}^2$
- C.  $106 \text{ cm}^2$
- D.  $137 \text{ cm}^2$
- E.  $1038 \text{ cm}^2$

**Question 2**

A parallelogram of area  $240 \text{ cm}^2$  has sides of length 14 cm and 18 cm. The angle included between these two sides is closest to:

- A.  $1.2^\circ$
- B.  $28^\circ$
- C.  $29^\circ$
- D.  $72^\circ$
- E.  $54^\circ$

**Question 3**

A triangle has sides measuring 5 cm, 8 cm and 10 cm. The largest angle in the triangle can be found by calculating:

- A.  $\cos^{-1}\left(\frac{5^2+10^2-8^2}{2 \times 5 \times 10}\right)$
- B.  $\sin^{-1}\left(\frac{5^2+10^2-8^2}{2 \times 5 \times 10}\right)$
- C.  $\cos^{-1}\left(\frac{5^2+8^2-10^2}{2 \times 5 \times 8}\right)$
- D.  $\sin^{-1}\left(\frac{11}{80}\right)$
- E.  $\cos^{-1}\left(\frac{5^2+10^2-8^2}{2 \times 5 \times 10}\right)$

**Question 4**

The scale on a map is 1 : 50 000. A distance of 5 km on this map can be represented by:

- A. 1 cm
- B. 10 cm
- C. 50 cm
- D. 100 cm
- E. 500 cm

**SECTION B - continued**

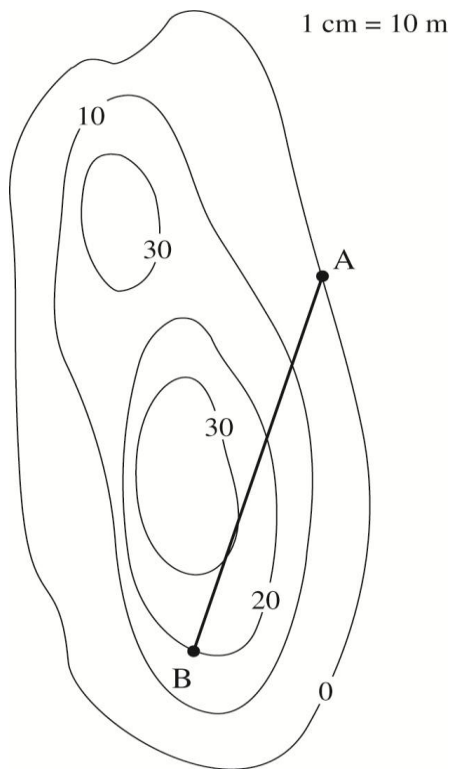
**Question 5**

An ice cream van sells two similar cones. The larger cone has radius 6 cm and the smaller cone has radius 4 cm. If the volume of the larger cone is  $300 \text{ cm}^3$ , the volume of the smaller cone is closest to:

- A.  $89 \text{ cm}^3$
- B.  $200 \text{ cm}^3$
- C.  $189 \text{ cm}^3$
- D.  $450 \text{ cm}^3$
- E.  $133 \text{ cm}^3$

**Question 6**

Consider the following contour map.



The straight line distance from A to B in the figure above is closest to:

- A. 54 m
- B. 5.4 m
- C. 55 m
- D. 60 m
- E. 50 m

**SECTION B - continued**  
**TURN OVER**

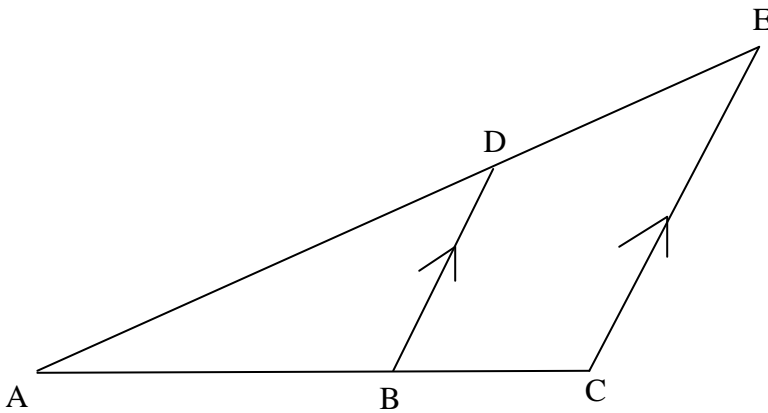
**Question 7**

A boat travels on a bearing of  $065^\circ\text{T}$  for 141 km. How far north of its starting point is the boat:

- A. 156 km
- B. 302 km
- C. 60 km
- D. 334 km
- E. 128 km

**Question 8**

In the triangle below,  $AB = 3$  cm,  $BC = 2$  cm,  $BD = 2$  cm and  $BD \parallel CE$ .



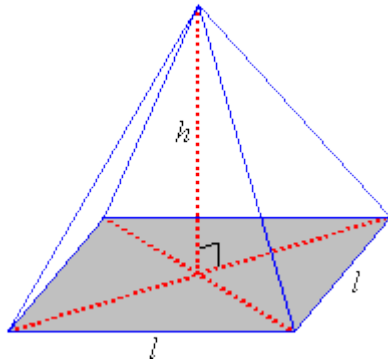
The length CE is:

- A. 3 cm
- B. 4 cm
- C. 5 cm
- D.  $\frac{4}{3}$  cm
- E.  $\frac{10}{3}$  cm



**Question 9**

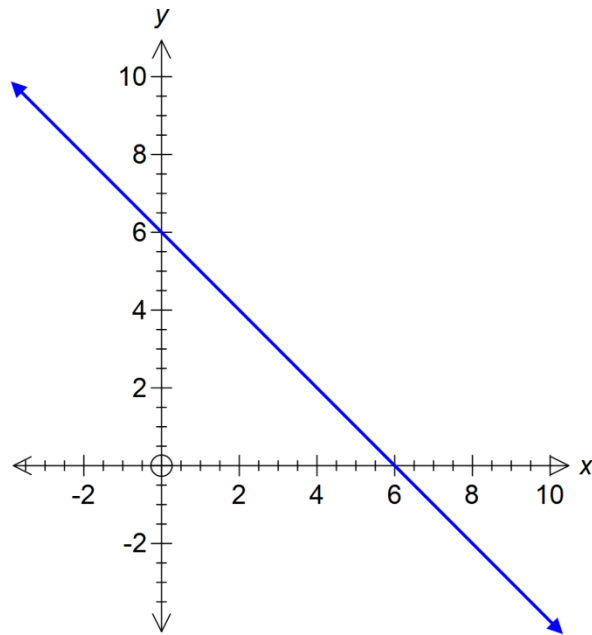
If the height of the square-based pyramid is 20 cm and the slant edge is 30 cm, the length,  $l$ , of the base edge is:



- A.  $5\sqrt{26}$  cm
- B.  $10\sqrt{5}$  cm
- C. 30 cm
- D.  $10\sqrt{10}$  cm
- E.  $20\sqrt{5}$  cm

**Module 3: Graphs and relations**

**Question 1**



The equation of the line shown in the graph above is:

- A.  $y = x - 6$
- B.  $y = -x - 6$
- C.  $y = -x + 6$
- D.  $y = -6x$
- E.  $y = 6$

**Question 2**

If (2, -1) lies on the line  $y = ax - 5$ , the value of  $a$  is:

- A. 2
- B. -2
- C. -7
- D. 5
- E. 1

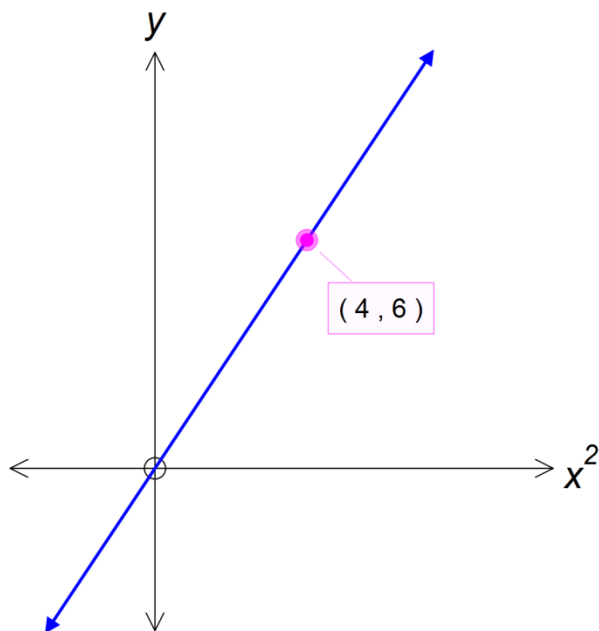
**Question 3**

The total cost of 2 children's tickets and one adult ticket to a show is \$225. Also, the cost of one adult ticket is three times the cost of a child ticket. The cost of 2 adult tickets is:

- A. \$45
- B. \$90
- C. \$135
- D. \$270
- E. \$180

**Question 4**

The graph of  $y$  against  $x^2$  is shown below.



The rule connecting  $x$  and  $y$  is:

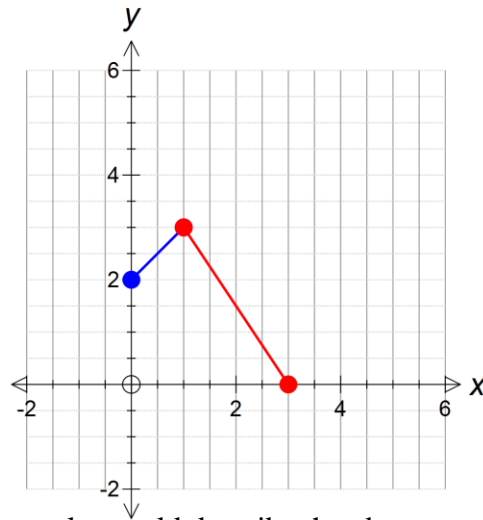
- A.  $y = 3x$
- B.  $y = \frac{3}{8}x$
- C.  $y = \frac{3}{2}x$
- D.  $y = \frac{2}{3}x^2$
- E.  $y = \frac{3}{2}x^2$

**SECTION B - continued**  
**TURN OVER**

**Question 5**

A manufacturer finds that to produce  $n$  articles it will cost him  $\$C$ , where  $C = 6250 + 24n$ . If he sells these articles for  $\$82$  each then the least number of articles he has to produce and sell is:

- A. 107
- B. 108
- C. 168
- D. 198
- E. 231

**Question 6**

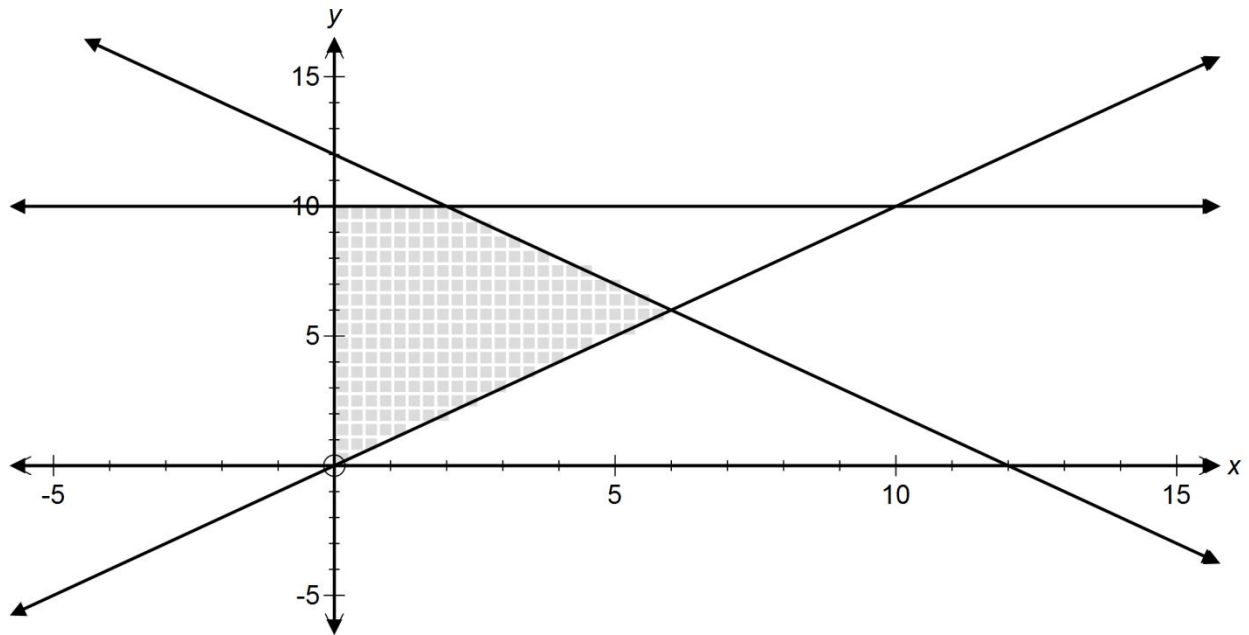
Which of the following rules could describe the above graph?

- A.  $y = \begin{cases} 2+x, & 0 \leq x < 1 \\ \frac{9-3x}{2}, & 1 \leq x \leq 3 \end{cases}$
- B.  $y = \begin{cases} 2-x, & 0 \leq x < 1 \\ \frac{9-3x}{2}, & 1 \leq x \leq 3 \end{cases}$
- C.  $y = \begin{cases} 2+x, & 0 \leq x < 1 \\ 3-x, & 1 \leq x \leq 3 \end{cases}$
- D.  $y = \begin{cases} 2+x, & 0 \leq x < 1 \\ \frac{9+3x}{2}, & 1 \leq x \leq 3 \end{cases}$
- E.  $y = \begin{cases} 2-x, & 0 \leq x < 1 \\ 9-3x, & 1 \leq x \leq 3 \end{cases}$

**SECTION B - continued**

The following information relates to Questions 7 and 8

The feasible region for a linear programming problem is shaded in the graph below.



**Question 7**

Two of the constraints are  $x \geq 0$ ,  $0 \leq y \leq 10$ . The remaining constraints are given by:

- A.  $x \geq y$  and  $x + y \geq 12$
- B.  $0 \leq x + y \leq 12$
- C.  $y \geq x$  and  $x + y \geq 12$
- D.  $y \geq x$  and  $x + y \leq 12$
- E.  $y \leq x$  and  $x + y \leq 12$

**Question 8**

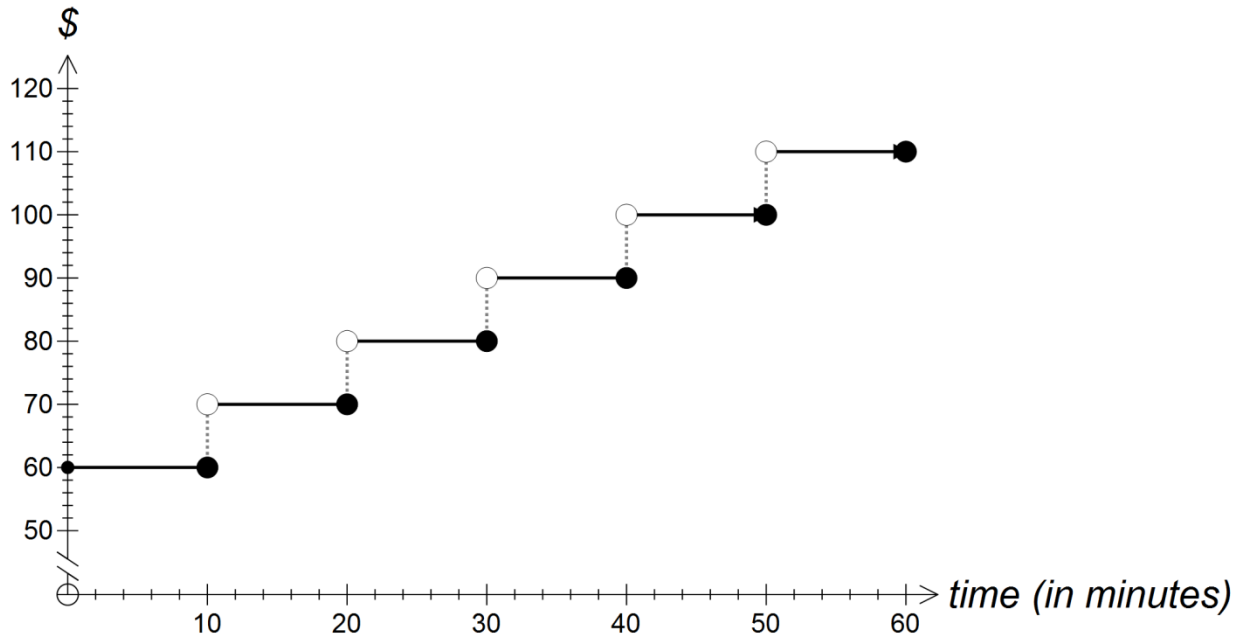
If the objective function of the above linear programming problem is  $P = 2.3x + 5.1y$ , then the point which maximises the objective function is:

- A. (0, 0)
- B. (0, 10)
- C. (10, 2)
- D. (2, 10)
- E. (6, 6)

**SECTION B - continued**  
**TURN OVER**

**Question 9**

An electrician charges a call-out fee plus an amount for every 10 minutes or part thereof needed to complete a job. The following graph shows the cost charged up to 60 minutes.



The cost that the electrician charges for a job that takes him 20 minutes is:

- A. \$60
- B. \$70
- C. \$80
- D. \$130
- E. \$150

**Module 4: Business-related mathematics**

**Question 1**

A painting that normally costs \$250 is now selling for \$195. The percentage discount is:

- A. 12%
- B. 22%
- C. 28%
- D. 30%
- E. 55%

**Question 2**

\$20 000 is invested for four years and earns an interest of 8% per annum, compounded quarterly. The total interest earned, in dollars, by this investment is given by:

- A.  $20000 \times 1.08^{16} - 20000$
- B.  $20000 \times 1.08^5 - 20000$
- C.  $20000 \times 1.08^{16}$
- D.  $20000 \times 1.02^{16} - 20000$
- E.  $20000 \times 1.02^{16}$

**Question 3**

Mira borrowed \$5000 and intended to pay it back in 3 years. Interest was to be paid at a rate of  $9\frac{3}{4}\%$  per annum. The interest to be paid by Mira on this loan amount is:

- A. \$146 250
- B. \$446.25
- C. \$1462.50
- D. \$121.88
- E. \$1211.88

**Question 4**

A reducing balance loan of \$25 000 is being charged 6.8% per annum interest. If repayments of \$160 are made each month then the amount, to the nearest dollar, still owing after the first payment is closest to

- A. \$24982
- B. \$24858
- C. \$23290
- D. \$24698
- E. \$24859

**SECTION B - continued**  
**TURN OVER**

**Question 5**

Electrical equipment is purchased for \$15000 and depreciates by 20% p.a. using the reducing balance method.

The total depreciation of the equipment after four years is:

- A. \$6144
- B. \$12000
- C. \$3000
- D. \$240
- E. \$8856

**Question 6**

The bill for heater installation was \$1080. The GST that was included in this bill was closest to:

- A. \$98
- B. \$982
- C. \$110
- D. \$100
- E. \$108

*Use the following information to answer Questions 7 & 8*

Lending Company offer loans of \$30 000 to employees at a rate of 6.5% p.a., debited monthly. The loan is repaid in monthly instalments of \$504.30 over 6 years.

**Question 7**

The monthly growth rate is closest to:

- A. 0.5417%
- B. 1.0054%
- C. 1.0650%
- D. 0.0054%
- E. 1.5417%

**Question 8**

The amount owing after 36 payments is closest to:

- A. \$2777.43
- B. \$22763.80
- C. \$16453.89
- D. \$19986.38
- E. \$6309.60

**SECTION B - continued**



**Question 9**

For a hire-purchase with monthly repayments of \$200 over 3 years, the effective rate of interest is approximately 22%. The flat rate of interest charged per annum is closest to:

- A. 11.3%
- B. 14.7%
- C. 20.1%
- D. 33.0%
- E. 42.8%

**SECTION B - continued**  
**TURN OVER**

**Module 5: Networks and decision mathematics**

**Question 1**

The minimum number of edges for a graph with nine vertices to be connected is:

- A. 6
- B. 8
- C. 9
- D. 36
- E. 72

**Question 2**

The adjacency matrix for a graph is shown below.

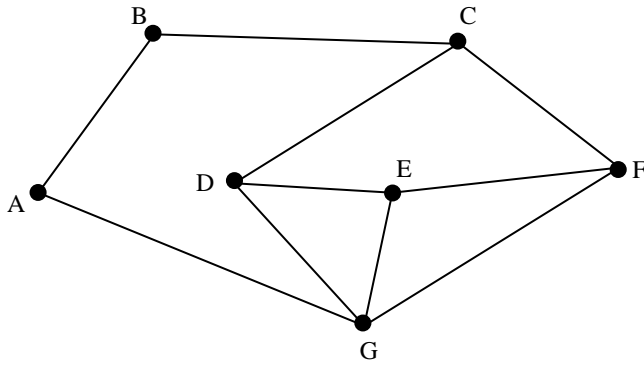
$$\begin{bmatrix} 0 & 1 & 2 & 0 \\ 1 & 1 & 0 & 0 \\ 2 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Which one of the following is not true for this graph?

- A. There are loops on two of the vertices.
- B. One of the vertices is isolated.
- C. There are eight edges on this graph.
- D. There are two edges joining one pair of vertices.
- E. There four vertices on this graph.

**Question 3**

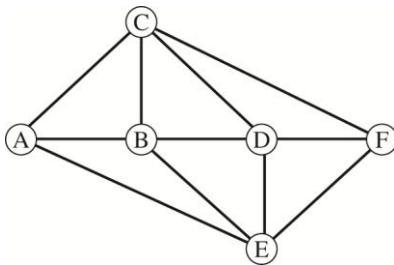
For the graph shown below



A Hamiltonian path is:

- A. B-A-C-D-G-E-F
- B. A-B-C-F-E-G
- C. A-B-C-D-G-E-F
- D. A-G-E-D-C-F
- E. B-A-C-D-G-E

**Question 4**

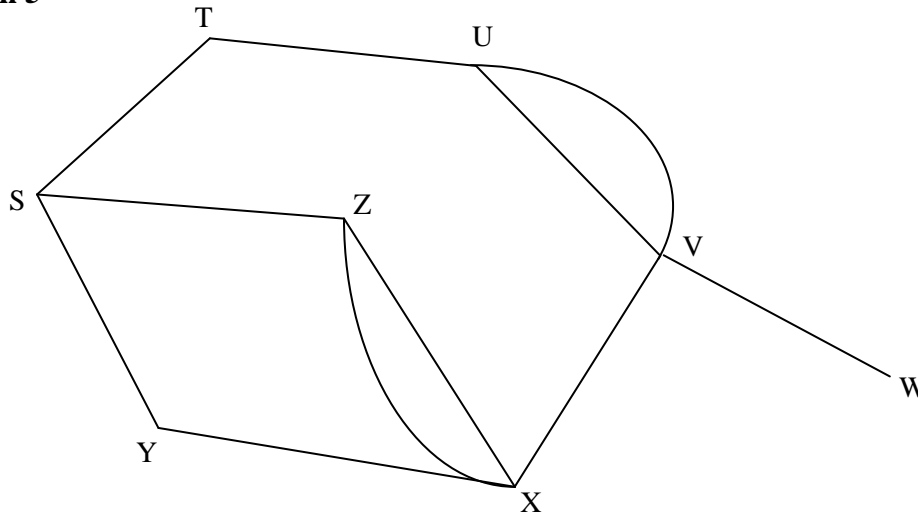


The sum of the degrees of all the vertices of the network shown above is :

- A. 10
- B. 16
- C. 19
- D. 20
- E. 22

**SECTION B - continued**  
**TURN OVER**

**Question 5**

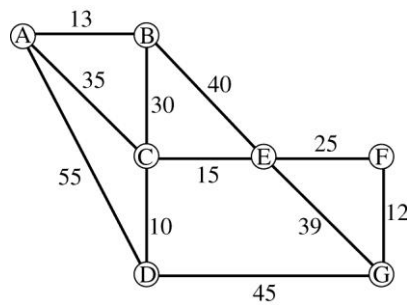


By adding one edge to the above graph, it will have an Euler path. The edge could be:

- A. S - T
- B. S - X
- C. X - W
- D. Z - Y
- E. S - U

**Question 6**

The following network shows the distances, in km, between each pair of vertices.

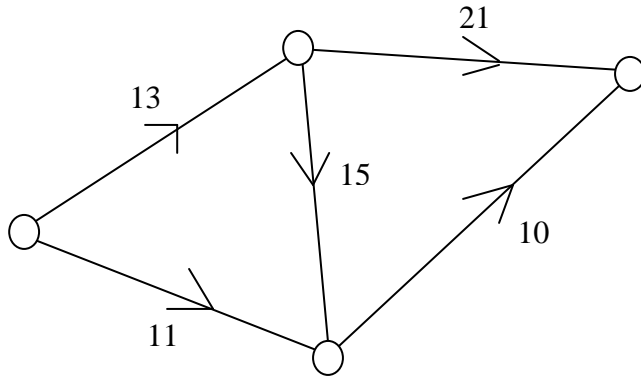


The shortest distance from A to G is:

- A. 78
- B. 87
- C. 89
- D. 90
- E. 100

**SECTION B - continued**

**Question 7**



The maximum flow from source to sink through the above network is:

- A. 23
- B. 24
- C. 28
- D. 31
- E. 47

**Question 8**

The following table shows three tasks and three people. The numbers denote the competency level of each candidate where 1 is the most competent.

	<b>Task 1</b>	<b>Task 2</b>	<b>Task 3</b>
<b>Ana</b>	3	1	5
<b>Ben</b>	5	1	2
<b>Camila</b>	2	3	2

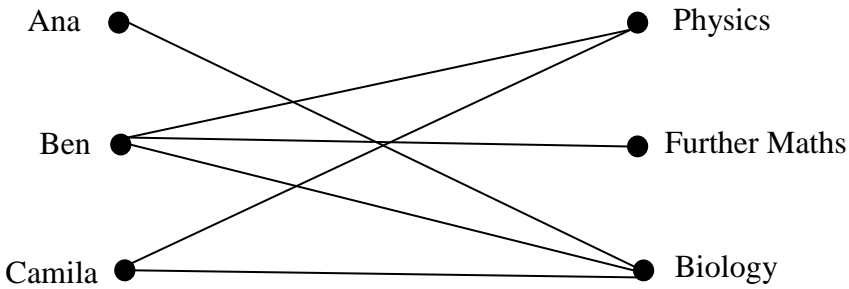
If each candidate must be assigned to only one task, which of the following allocations maximises the use of task skills of these candidates?

- A. Ana task 1, Ben task 2 and Camila Task 3
- B. Ana task 3, Ben task 2 and Camila Task 1
- C. Ana task 2, Ben task 1 and Camila Task 3
- D. Ana task 1, Ben task 3 and Camila Task 2
- E. Ana task 2, Ben task 3 and Camila Task 1

**SECTION B - continued**  
**TURN OVER**

**Question 9**

The following bipartite graph shows student preferences for three different subjects.



Which of the following statements does not follow from the graph?

- A. Ana prefers only Biology
- B. Ben prefers all three subjects
- C. Camila prefers Physics and Biology
- D. The most preferred subject is Physics
- E. The most preferred subject is Biology

**Module 6: Matrices****Question 1**

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 2 \\ 0 \\ 0 \end{bmatrix} + 2 \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix} \text{ is:}$$

A.  $\begin{bmatrix} 3 \\ -1 \\ 3 \end{bmatrix}$

B.  $\begin{bmatrix} 4 \\ -2 \\ 2 \end{bmatrix}$

C.  $\begin{bmatrix} 2 \\ -2 \\ 2 \end{bmatrix}$

D.  $\begin{bmatrix} 2 \\ -1 \\ 1 \end{bmatrix}$

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

**Question 2**

Matrices  $A$  and  $C$  both have three rows and two columns and  $C = AB$

The matrix  $B$  has:

- A. two rows and two columns
- B. two rows and three columns
- C. three rows and two columns
- D. three rows and three columns
- E. two rows and one column

**SECTION B - continued**  
**TURN OVER**

**Question 3**

Consider the following system of linear equations

$$2.1x + 5.1y = 8$$

$$lx + my = 9$$

If the above equations have no solution, the ratio  $\frac{l}{m}$  is:

A.  $\frac{7}{17}$

B.  $\frac{17}{7}$

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

D.  $-\frac{7}{17}$

E.  $-\frac{17}{7}$

**Question 4**

The solution set  $\begin{bmatrix} x \\ y \end{bmatrix}$  to the following system of equations

$$5x + 2y = 180$$

$$8x + 3y = 280$$

can be calculated by:

A.  $\begin{bmatrix} 5 & 2 \\ 8 & 3 \end{bmatrix} \begin{bmatrix} 180 \\ 280 \end{bmatrix}$

B.  $\begin{bmatrix} 3 & -2 \\ -8 & 2 \end{bmatrix} \begin{bmatrix} 180 \\ 280 \end{bmatrix}$

C.  $\frac{1}{31} \begin{bmatrix} 3 & -2 \\ -8 & 2 \end{bmatrix} \begin{bmatrix} 180 \\ 280 \end{bmatrix}$

D.  $\begin{bmatrix} -5 & 2 \\ 8 & -3 \end{bmatrix} \begin{bmatrix} 180 \\ 280 \end{bmatrix}$

E.  $\begin{bmatrix} -3 & 2 \\ 8 & -5 \end{bmatrix} \begin{bmatrix} 180 \\ 280 \end{bmatrix}$

**SECTION B - continued**



**Question 5**

The matrix  $M$  for which  $2M - I = \begin{bmatrix} 7 & -5 \\ 2 & -3 \end{bmatrix}$ , where  $I$  is the identity matrix of order  $(2 \times 2)$ , is:

- A.  $\begin{bmatrix} 8 & -5 \\ 2 & -2 \end{bmatrix}$
- B.  $\begin{bmatrix} 3 & -2.5 \\ 1 & -2 \end{bmatrix}$
- C.  $\begin{bmatrix} 4 & -2.5 \\ 1 & -1 \end{bmatrix}$
- D.  $\begin{bmatrix} 3.5 & -2.5 \\ 1 & -1.5 \end{bmatrix}$
- E.  $\begin{bmatrix} 4 & -2 \\ 1 & -1 \end{bmatrix}$

**Question 6**

$A$ ,  $B$ ,  $C$  and  $D$  are matrices such that  $A = BCD$  is defined. Matrices  $B$  and  $D$  are square-matrices for which  $B + D$  is not defined. Which one of the following matrices is defined?

- A.  $C - D$
- B.  $B + C$
- C.  $A^2$
- D.  $C^{-1}$
- E.  $A \times D$

**SECTION B - continued**  
**TURN OVER**

Use the following information to answer Questions 7 & 8

The cost prices of three different electrical items in a store are \$230, \$290 and \$310 respectively. The shopkeeper decides to mark up the price of the first item by 5%, mark down the price of the second item by 10% and mark up the price of the third item by 8%.

**Question 7**

The matrix that calculates the new prices could be:

A.  $[230 \ 290 \ 310] \begin{bmatrix} 1.05 & 0 & 0 \\ 0 & 0.9 & 0 \\ 0 & 0 & 1.08 \end{bmatrix}$

B.  $[230 \ 290 \ 310] \begin{bmatrix} 1.05 \\ 0.9 \\ 1.08 \end{bmatrix}$

C.  $\begin{bmatrix} 1.05 \\ 0.9 \\ 1.08 \end{bmatrix} [230 \ 290 \ 310]$

D.  $[230 \ 290 \ 310] \begin{bmatrix} 1.5 & 0 & 0 \\ 0 & 0.9 & 0 \\ 0 & 0 & 1.8 \end{bmatrix}$

E.  $\begin{bmatrix} 230 & 0 & 0 \\ 0 & 290 & 0 \\ 0 & 0 & 310 \end{bmatrix} \begin{bmatrix} 1.05 & 0 & 0 \\ 0 & 0.9 & 0 \\ 0 & 0 & 1.08 \end{bmatrix}$

**Question 8**

If Ryan buys one of the first item, two of the second item and one of the third item, the total price that Ryan has to pay the shopkeeper based on the new prices is:

- A. \$837.30
- B. \$1098.30
- C. \$1078.80
- D. \$1916.10
- E. \$1120.00

**SECTION B - continued**

**Question 9**

People of a particular suburb in the Northern region purchase their groceries either from store *A* or store *B*. The following transition matrix shows the transition from store *A* to store *B* in a week's time.

$$\begin{bmatrix} 0.75 & 0.4 \\ 0.25 & 0.6 \end{bmatrix}$$

where 0.25 means that 25% of people who purchased their groceries from Store *A* in a particular week, purchased groceries from store *B* the following week.

The percentage of people who purchased their groceries from store *B* after 4 weeks, if initially equal number of people purchased their groceries from Store *A* and Store *B*, is closest to:

- A. 61%
- B. 62%
- C. 38%
- D. 39%
- E. 50%

**END OF MULTIPLE-CHOICE QUESTION BOOK**