Engage
Education
Foundation

Units 3 and 4 Further Maths: Exam 1

Practice Exam Question and Answer Booklet

Duration: 15 minutes reading time, 1 hour 30 minutes writing time

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 examination room: pens, pencils, highlighters, erasers and rulers.
- Students are not permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.
- No calculator is allowed in this examination.

Materials supplied:
- This question and answer booklet of 32 pages.

Instructions:
- You must complete all questions of the examination.
- Write all your answers in the spaces provided in this booklet.

Section A – Multiple-choice questions

Instructions

Answer all questions by circling your choice.

Choose the response that is correct or that best answers 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

The following information relates to question 1 and 2:

A study is being undertaken to compare the impact of immigration on the population of two cities, Manlee and Melburn, over the past 50 years.

Question 1

The variables *city* (Manlee or Melburn) and *population* (millions) are respectively:

    A. numerical and categorical
    B. both categorical
    C. categorical and numerical
    D. both numerical
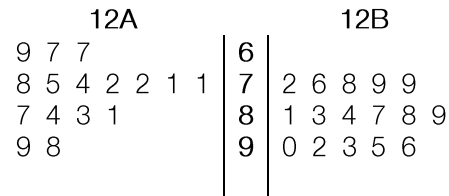   E. none of the above

Question 2

Which of the following is the best way to display this study?

    A. scatterplot
    B. two-way frequency table
    C. segmented bar chart
    D. dot plot
    E. parallel box plots

The following information relates to questions 3 to 6:

The back-to-back stem and leaf plot below displays the distribution of test scores out of 100 for students in two Year 12 classes, 12A and 12B, for their most recent Accounting test.

Key: 7|2 = 72 out of 100

```
          12A                    12B
      9 7 7            6 |
8 5 4 2 2 1 1          7 | 2 6 8 9 9
      7 4 3 1          8 | 1 3 4 7 8 9
          9 8          9 | 0 2 3 5 6
```

Question 3
The distribution for 12A can best be described as:

A. negatively skewed
B. positively skewed
C. negatively skewed with outliers
D. positively skewed with outliers
E. symmetrical

Question 4
The difference in standard deviations of each class is closest to:
A. 10
B. 7
C. 3
D. 2
E. 1

Question 5
The most accurate measure of centre for the 12B results is closest to:

A. 77
B. 84
C. 86
D. 93
E. 95

Question 6
Which of the following statements about the two classes is incorrect:
A. 12A's results have a greater spread than 12B's
B. the spread of the middle 50% of 12B's results is greater than the spread of the middle 50% of 12A's results
C. 12A had the student with the highest and lowest result
D. 75% of 12A's results were greater than 71
E. 25% of 12B's results were lower than 79

The following information relates to questions 7 and 8:

A study was conducted to show the relationship between eight people's incomes and their spending on luxury items, as a percentage of their income. The results from the study are shown below.

Income ($000's per year)	Spending on luxury items (% of income)
46	7.4
78	11.1
32	6.2
103	18.9
21	5.8
97	12.6
65	9.9
54	8.2

Question 7
A least squares regression line is fitted to the data in the above table. The equation of the least squares regression line is closest to:

   A.   % spent on luxury items = -1.69 + 0.13*(income)
   B.   *Income = 1.69 + 0.13*(% spent on luxury items)*
   C.   *% spent on luxury items = 1.69 + 0.13*(income)*
   D.   *% spent on luxury items = 1.69 – 0.13*(income)*
   E.   *Income = -1.69 + 0.13*(%spent on luxury items)*

Question 8
The strength of the linear relationship between *income* and *% spent on luxury items* can best be described as:

   A.   strong positive
   B.   weak negative
   C.   moderate negative
   D.   moderate positive
   E.   no relationship

Question 9
The seasonal index for snowfall in winter is 1.25. In order to adjust for seasonality, the winter snowfall figures should be:
   A.   decreased by 25%
   B.   increased by 25%
   C.   decreased by 20%
   D.   decreased by 125%
   E.   increased by 20%

Question 10
The results from a test studying the relationship between eye test results and age are shown in the table below.

Age (years)	Eye test result
18	19.3
29	18.9
45	16.5
56	15.9
68	14.2
79	12.0

The following least squares regression line was obtained in order to estimate the eye test score for a person at any given age.

   Eye test result = 21.94 – 0.12*(age)*

What is the residual value when trying to predict the eye test score for a person aged 23 if their actual score was 19.1?

    A.   -5.6
    B.   5.6
    C.   0.08
    D.   -0.08
    E.   0.8

Question 11
The mean height of players in a football team is 184.5cm with a standard deviation of 3.6cm. The percentage of players' heights that are between 177.3cm and 188.1cm is closest to:

    A.   82%
    B.   68%
    C.   95%
    D.   50%
    E.   34%

Question 12

Warren, Cara, Alicia, Mike and Ari are professional divers competing in a diving competition where the competitor with the highest score wins.

The mean score was 8.2 and the standard deviation was 1.1.The table below shows the standard scores of all five of the divers.
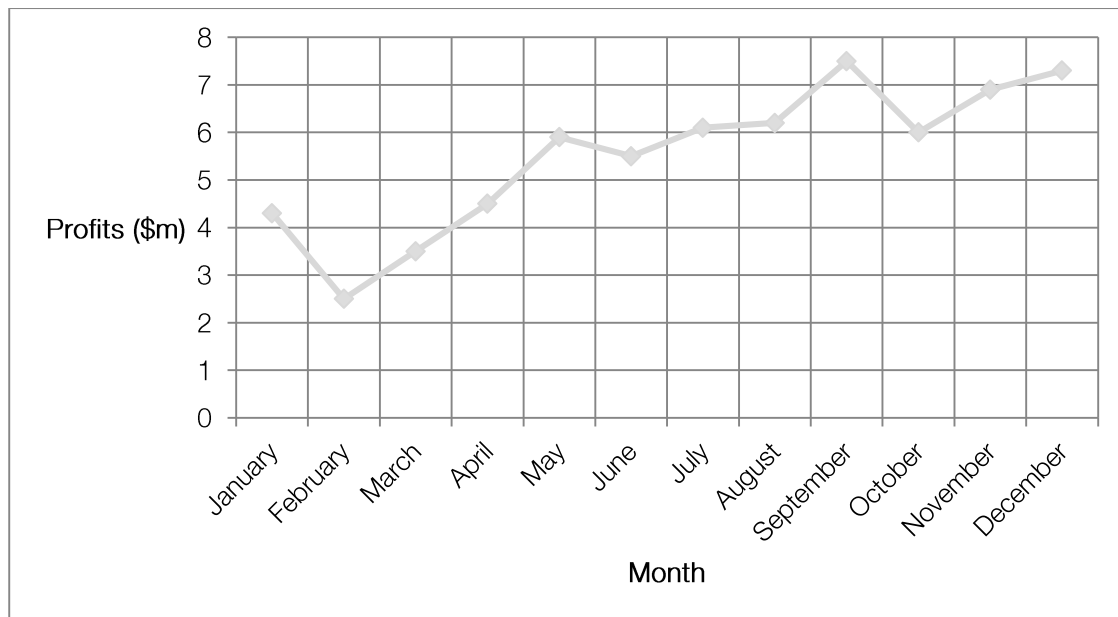
Diver	Standard Score
Warren	-0.28
Cara	?
Alicia	-1.93
Mike	0.75
Ari	1.24

If Cara achieved a score of 9.9, who won the competition?

    A.   Harvey
    B.   Cara
    C.   Alicia
    D.   Mike
    E. Ari

Question 13
The time series plot below shows profits made by a company over the past year.

The data is to be smoothed using three-point median smoothing. The smoothed profits for October are closest to
   A. $7m
   B. $6m
   C. $5m
   D. $7.5m
   E. $4m

Section B

Instructions

Select three modules and answer all questions within the modules by circling your choice.

Choose the response that is correct or that best answers 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.

Module 1: Number patterns

Question 1

The first three terms of an arithmetic sequence are 3,7,11. What is the tenth term of this sequence?

    A.   15
    B.   39
    C.   35
    D.   40
    E.   43

Question 2

An athlete is training for a marathon. On Monday he runs 100m. For every consecutive day he runs 50m further than the day before. How much has he run in total by Friday?

    A.   300
    B.   50
    C.   1000
    D.   700
    E.   1350

Question 3

The first four terms of a sequence are 3, 12, 39 and 120. The difference equation for the sequence could be:

    A. $t_{n+1} = 4 \times t_n$, $t_1 = 3$
    B. $t_{n+1} = 5t_n - 3$, $t_1 = 3$
    C. $t_{n+2} = t_n + 2t_{n+1}$, $t_1 = 3$ and $t_2 = 12$
    D. $t_{n+2} = 5t_n + t_{n+1}$, $t_1 = 3$ and $t_2 = 12$
    E. $t_{n+2} = 3t_n + 3$, $t_1 = 3$

Question 4

The total sales of a new coffee shop is recorded each day from the opening day (in hundreds of dollars):
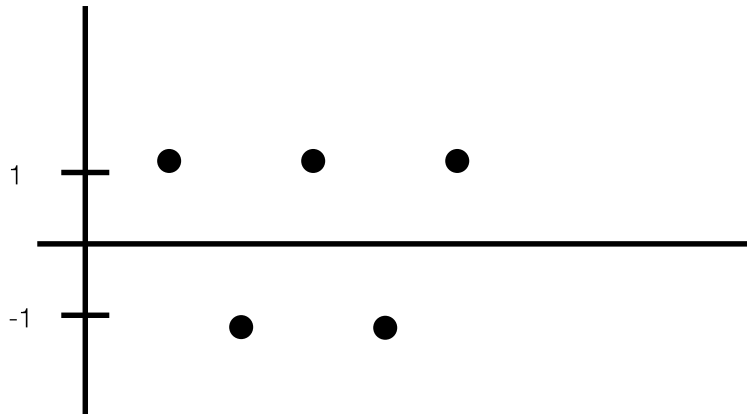
$$120, \$100, \$83.33, \$69.44$$

The total number of sales (in hundreds) by the end of five days in closest to:

    A. $58
    B. $120
    C. $431
    D. $479
    E. $70

Question 5
The graph below shows the first five terms of a sequence:

This sequence could be

    A.   an arithmetic sequence that sums to zero
    B.   an arithmetic sequence with a common difference of 2
    C.   a geometric sequence with a common ratio of -1
    D.   a geometric sequence with a common ratio of 1
    E.   not a arithmetic or geometric sequence

Question 6
Jane has $100 in her bank account. At an ATM, Jane first withdraws $12 from her bank account. On her second time she withdraws $14 and on her third time she withdraws $16. If Jane continues this pattern, how many times in total can Jane withdraw from the ATM and not have the ATM reject her request? Including her first three times.

    A.   5
    B.   6
    C.   88
    D.   45
    E.   4

Page 9

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The following information relates to questions 7 and 8:

Jane realises that her funds in her bank account are diminishing so she sets up a new bank account with $200 in it. For the first month she saves an additional $36 and successively increases the amount she saves by $4. So, the second month she saves $40 and the third month she saves $44.

Question 7
How much will she save in her 12th month?

    A. 80
    B. 76
    C. 84
    D. 88
    E. 72

Question 8
What is the total amount of funds she will have in her bank account by the end of the 24th month?

    A. $128
    B. $1840
    C. $1968
    D. $2100
    E. $2168

Question 9
Which of the following show a Fibonacci-related sequence?

    A. 1,1,1,1,1,1…
    B. 2,5,7,12,19,31…
    C. 1,2,3,5,7,9…
    D. 13,8,5,3,2,1…
    E. 1,1,2,4,7,13…

Module 2: Geometry and Trigonometry

Question 1

Find the value of ϕ in the diagram below, correct to 2 decimal places.

11m

6m

ϕ
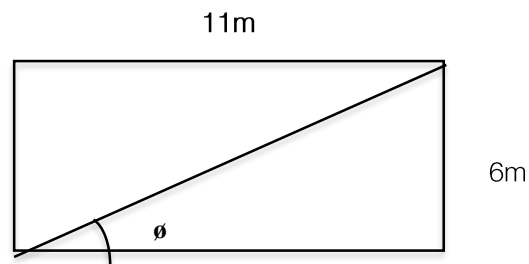
    A.   21.41
    B.   61.39
    C.   33.06
    D.   28.61
    E.   56.94

Question 2

The area of the triangle below is:

3.6m

4.3m

7.2m
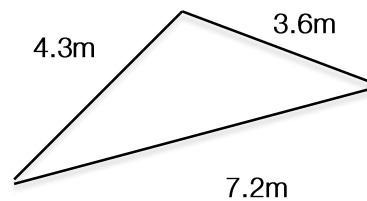
    A.   10.56 m^2
    B.   33.92 m^2
    C.   7.55 m^2
    D.   29.00 m^2
    E.   5.82 m^2

Question 3

The sun casts a shadow on two trees, knowing the height of the smaller tree we are able to work out the size of the bigger tree by using the shadows. If the smaller tree casts a shadow of 1.2 m and the taller tree casts a shadow of 6m, how tall is the bigger tree if the smaller one is 3 m?

    A. 4.2 m
    B. 15 m
    C. 7.2 m
    D. 6 m
    E. 18 m

Question 4

The solid cone shown has a volume of 66cm^3 and radius 3cm, what is its height?
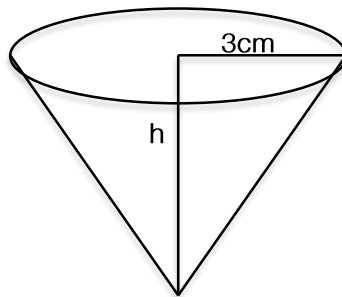
    A. 7.1 cm
    B. 3.5 cm
    C. 7.0 cm
    D. 2.3 cm
    E. 21.0 cm

The following information relates to questions 5 and 6:

A bushwalker treks 6 km from his tent on a bearing of 065°. He then walks on a bearing of 170° for 6 km alongside a river.

Question 5

How far is the bushwalker from his tent?

    A. 6.7 km
    B. 6.0 km
    C. 7.2 km
    D. 3.3 km
    E. 7.8 km

Question 6

What bearing is the bushwalker from his tent?

    A. 59°
    B. 124°
    C. 75°
    D. 304°
    E. 314°

The following information relates to questions 7 and 8:

Ed is standing on a 32 m cliff that overlooks the ocean and sees two boats. One boat is 120 from the base of the cliff and the other 670 m from the cliff.

Question 7
What is the angle of depression seen on the closest boat?

    A. 2.7°
    B. 20.6°
    C. 26.7°
    D. 10.2°
    E. 14.9°

Question 8
What is the magnitude of the difference in angles of depression between the two boats?

    A. 12.2°
    B. 2.7°
    C. 17.7°
    D. 14.9°
    E. 9.9°

Question 9
From point X the bearing of point Y is 075°, and from point Z the bearing of Y is 320°. If the point Z is 12.2 km from point X on a bearing of 095°, then the distance from point Y to point Z is closest to:

    A. 6 km
    B. 7 km
    C. 4 km
    D. 5 km
    E. 3 km

Module 3: Graphs and Relations

Question 1

The graph of y verses x^2 is shown below.
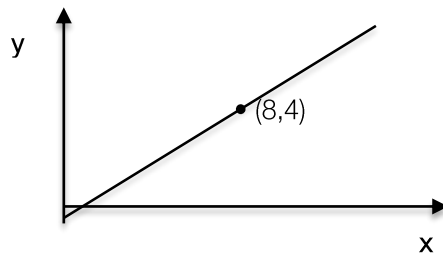
A. $y = 2x$
B. $y = \frac{1}{2} x$
C. $y = 2x^2$
D. $y = \frac{1}{2} x^2$
E. $8x^2 + 4y = 0$

The following information relates to questions 2 and 3:

Dan the Man's Taxi Service charges a fixed fee (flagfall) of $4.20 and then charges $0.65 per each kilometre travelled.

Question 2

If the cost, in dollars of a taxi ride is represented as C and the number of kilometres travelled is represented as n, then an equation relating the two variables will be such that:

A. n is dependant on C, with n-intercept of 4.20
B. C is dependant on n, with a gradient of 0.65
C. C is dependant on n, with a gradient of 4.20
D. n is dependant on C, with a gradient of 0.65
E. n is dependant on C, with n-intercept of 0.65
F. None of the above

Question 3

If you were charged a total fare of $15.50 for a journey with Dan the Man's Taxi Service, the closest number of kilometres you travelled was?

A. 17
B. 24
C. 4
D. 18
E. 23

Question 4

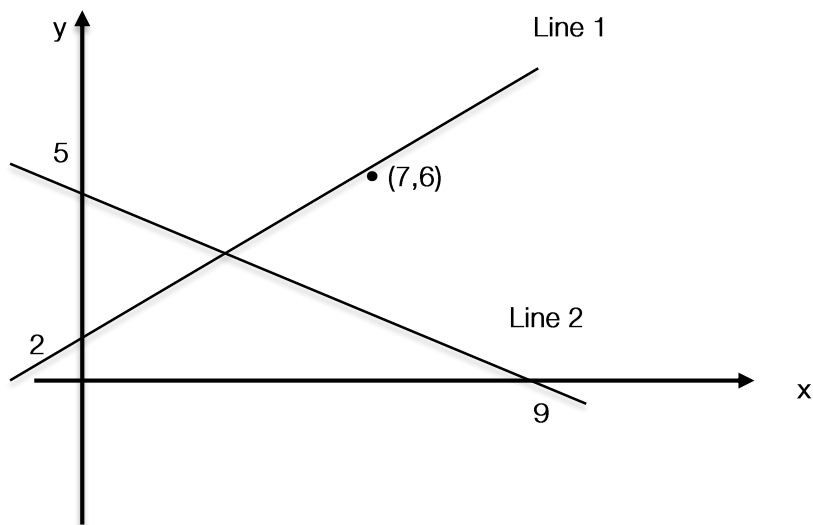The solution for y and x respectively for the below simultaneous equations is:

$$3y - 2x = 4$$

$$4x - 4y = 1$$

A. 9/2, 4/19
B. 9/2, 19/4
C. -9/2, -19/4
D. 9/4, 19/2
E. 2/9, 4/19

Question 5

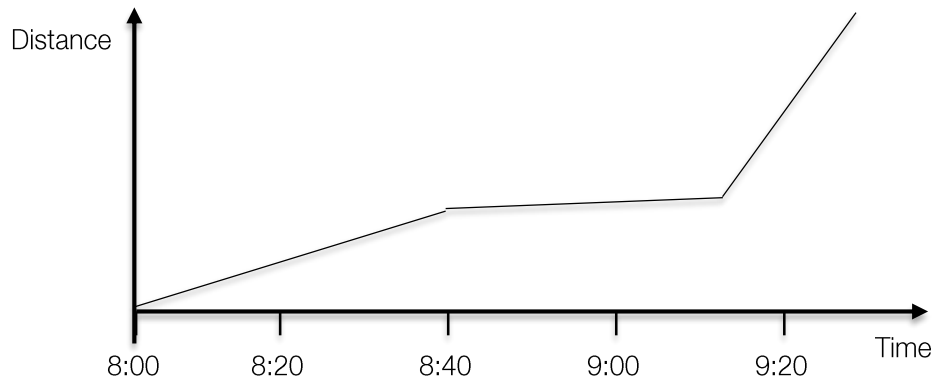On the axis below, the gradients of Line 1 and Line 2 respectively are:

A. 7/6, -5/9
B. -5/9, 4/7
C. 4/7, -5/9
D. 4/7, 5/9
E. 6/7, 5/9

Question 6
The graph below shows Alex's journey to her friend Tasha's house, who lives quite far away.

The time that Alex was travelling fastest was:

    A. 8:00
   B. 8:20
    C. 8:40
    D. 9:00
    E. 9:20

Question 7
Jacob wants to start manufacturing customised computers. The cost of manufacturing computers will start with a fixed cost of $700 for tools, plus a cost of $200 for parts for each computer. To make a profit, how many computers must Jacob make and sell?

    A. 5 computers sold at $300 each
    B. 8 computers sold at $280 each
    C. 10 computers sold at $270 each
    D. 3 computers sold at $420 each
    E. 7 computers sold at $320 each

Question 8

For the feasible region shown, which point gives M as a maximum if M=2y+3x?
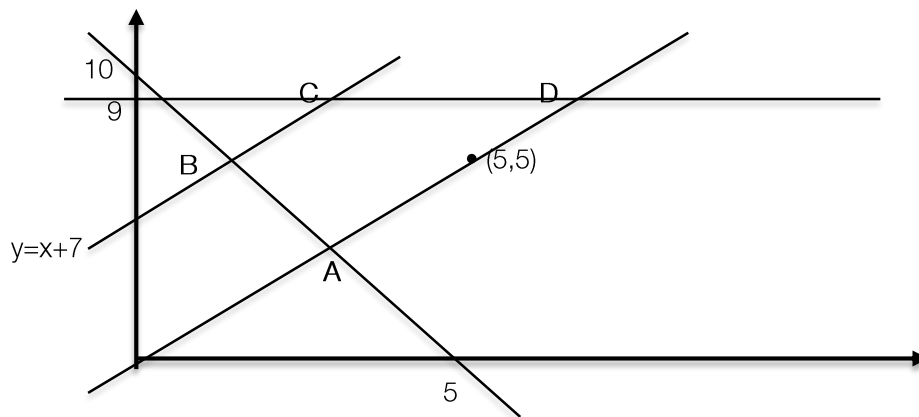
A. A
B. B
C. C
D. D
E. None of the above.

Question 9

The gradient of the line joining (a, 5) and (-4, b) is 2. The values of **a** and **b** respectively could be:

A. -2, -1/2
B. 5, -10
C. 2, 2
D. 10, -8
E. -1/2, -2

Module 4: Business-related mathematics

Question 1

The selling price of a men's sports jacket is $399.

After a 30% discount, what would be the selling price of the jacket?

    A. $279.3
    B. $119.7
    C. $518.7
    D. $429
    E. $434

Question 2

$15 000 is invested for 4 years. The interest is earned at a rate of 4% per annum, compounding quarterly. Which of the following equations will give the total interest earned by this investment?

    A. $15 000 x 1.01^{16}
    B. $15 000 x 1.01^{16} – $15 000
    C. $15 000 x 1.04^{16}
    D. $15 000 x 1.04^{16} - $15 000
    E. $15 000 x 1.04^{4} – $15 000

Question 3

$2000 is invested at a simple interest rate of 3.5% per annum.

What is the total interest earned over 8 years?

    A. $70
    B. $560
    C. $2560
    D. $2070
    E. $1930

Question 4

If Jennifer takes out a $20,000 loan from a bank she must pay compound interest of 15%, compounding annually.

If Jennifer makes no repayments, what is the total amount owed to the bank after 4 years?

    A. $3000
    B. $31000
    C. $32000
    D. $34980.13
    E. $112000

Question 5

Two months ago Rob purchased a coffee machine valued at $2400. For every coffee made, the value of the coffee machine depreciates by 20c. Currently now, the coffee machine is valued at $2245

How many coffees were made in the last 2 months?

A. 155
B. 77
C. 660
D. 775
E. 2245

Question 6

Rob also purchases a washing machine valued at $10 000, which depreciates every year by the 6% using the reducing balance method.

After 8 years, how much has the photocopier depreciated by?

A. $4000
B. $6484.78
C. $3904.31
D. $6095.69
E. $9400

Question 7

The flat interest rate is 6% p.a. on a hire purchase with quarterly repayments over 5 years. The effective rate is closest to:

A. 11.4%
B. 6%%
C. 5.7%
D. 10%
E. 12%

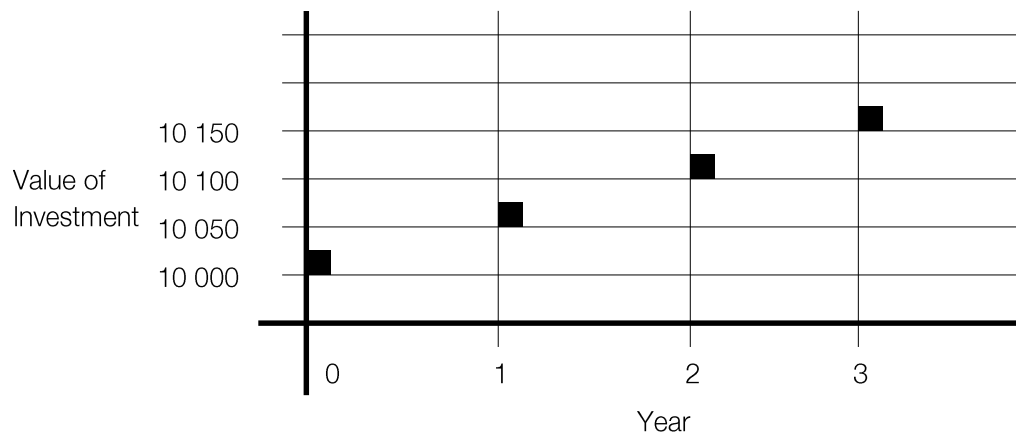## Question 8

Charles takes out a home loan of $200 000 with a compounding interest rate of 4% per annum. If Charles makes regular monthly repayments of $1600, how much of the loan does he still owe after 5 years?

A. $0
B. $96 000
C. $104 000
D. $147 330.58
E. $160 000

Question 9

Below shows the growth in value of a $10 000 investment over 3 years:

If Brittany were to invest $12 000 under the same conditions for 6 years, how much money from investment will she make?

    A. $300
    B. $360
    C. $12 300
    D. $12 360
    E. There is not enough information to answer.

Module 5: Networks and decision mathematics

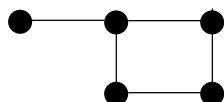### Question 1

A connected, planar graph has 24 vertices and 34 edges. How many faces does it have?

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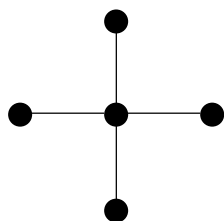   E. 12

Question 2
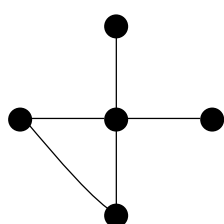
Which of the following is a tree:

    A.

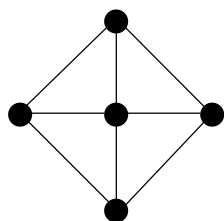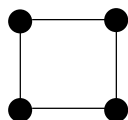   B.

    C.

    D.

    E.
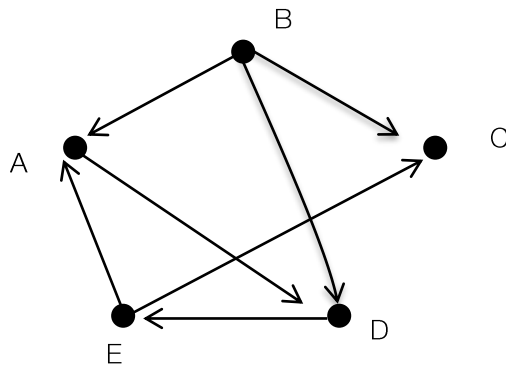
Question 3
Which of the following is true for the adjacency matrix below?

$$\begin{bmatrix} 1 & 0 & 4 \\ 0 & 1 & 0 \\ 4 & 0 & 0 \end{bmatrix}$$

A. The graph has 4 vertices.
B. There are no isolated vertices
C. There are two vertices with a degree of 4.
D. One of the vertices has a degree of 5.
E. There two isolated vertices.

Question 4

In the figure above the results of five chess players Albert (A), Beth (B), Caroline (C), David (D) and Eliza (E) playing off against each other are displayed. Each arrow shows the winner of the game between the two players. For example, the arrow from B to A shows that Beth defeated Albert.

To determine the winner, each player is given a ranking that is determined by calculating the sum of his or her one-step and two-step dominances. The player with the highest sum was ranked number 1 and with the player with the lowest sum ranked last. Using this method, determine the ranking of each player.

A. Beth (1), David and Eliza (2), Albert (3), Caroline (4)
B. Beth (1), Eliza (2), David (3), Albert (4), Caroline (5)
C. Beth (1), David (2), Eliza (3), Albert (4), Caroline (5)
D. Beth (1), David (2), Albert (3), Eliza (4), Caroline (5)
E. Beth (1), David (2), Albert and Eliza (3) Caroline (4)

Question 5
The network below represents a series of tasks that are involved in a cake shop. The numbers are in minutes. What is the shortest path to the finish?
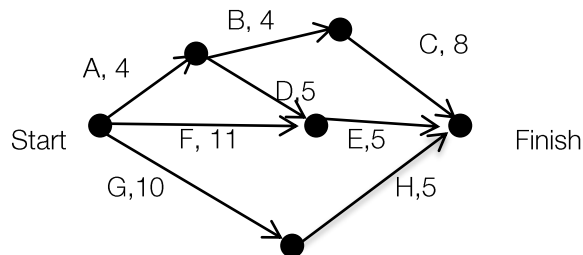
    A.   A, B, C
    B.   A, D, E
   C.   F, G
    D.   F, E
    E.   A, B, D, E

Question 6
A minimum spanning tree with 10 vertices could present:

    A.   The shortest path it takes for a postman to visits 10 homes.
    B.   The allocation of projects to 10 students.
    C.   A cycle that can be taken to visit 10 towns in the shortest possible route.
    D.   The shortest length of wire needed to connect 10 lights.
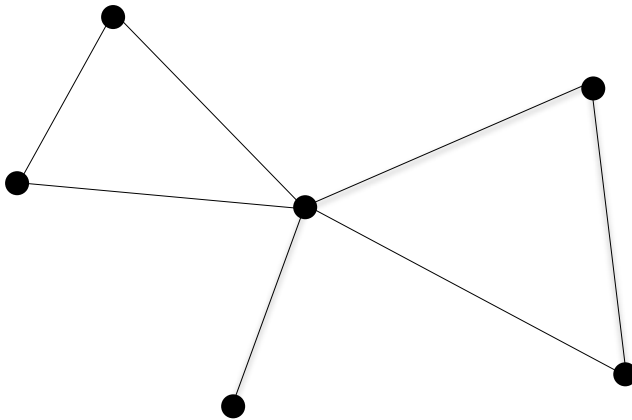   E.   The minimum amount of time it takes a person to complete 10 tasks in succession.

Question 7
The number of Hamiltonian circuits involving all seven vertices in the graph below is:
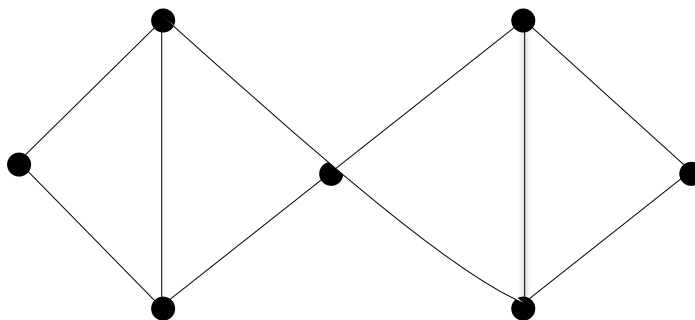
    A.   7
    B.   8
    C.   9
    D.   10
    E.   11

Question 8
Which one of the following statements is **true** regarding the network below?

    A.   An Euler path is not possible for the graph
    B.   There is only one Euler path
    C.   A Hamiltonian path is not possible for the graph
    D.   There is an isolated vertex
    E.   For every Hamiltonian path it is also an Euler path.

Question 9
An Euler path through a connected network starts at a vertex A and ends at a vertex Z. Which of the following statements is true?

    A.   The path could have passed through an isolated vertex
    B.   There could be three vertices with degree equal to one.
    C.   The sum of the degrees of vertices A and Z could equal seven.
    D.   The path could have included vertex Z more than once.
    E.   The sum of the degrees of all vertices in the network could equal seven.

Module 6: Matrices

Question 1

The determinant of the matrix $\begin{vmatrix} 5 & -2 \\ -1 & -3 \end{vmatrix}$ is:

    A. 1/17

    B. -17

    C. 17

    D. $\begin{vmatrix} -3 & 2 \\ 1 & 5 \end{vmatrix}$

    E. -1/17

Question 2

If J, X and K are invertible matrices and JX=K then matrix X is equal to:

    A. JK^{-1}

    B. KJ

    C. $J^{-1}K$

    D. KJ^{-1}

    E. $K^{-1}J$

Question 3

If X = $\begin{vmatrix} 2 & a \\ 0 & b \end{vmatrix}$ and Y = $\begin{vmatrix} -1 & 2a \\ 4 & 0 \end{vmatrix}$ then 2X-3Y is the matrix:

    A. $\begin{vmatrix} 1 & -4a \\ -12 & 2b \end{vmatrix}$

    B. $\begin{vmatrix} 1 & 8a \\ 12 & 2b \end{vmatrix}$

    C. $\begin{vmatrix} 3 & 3a \\ 4 & b \end{vmatrix}$

    D. $\begin{vmatrix} 7 & -4a \\ -12 & 2b \end{vmatrix}$

    E. $\begin{vmatrix} 4 & 2a \\ 0 & 2b \end{vmatrix}$

Question 4

If $I = \begin{vmatrix} 1 & 0 \\ 1 & 0 \end{vmatrix}$, $O = \begin{vmatrix} 0 & 0 \\ 0 & 0 \end{vmatrix}$ & $Z = \begin{vmatrix} 9 & 8 \\ 7 & 6 \end{vmatrix}$,

which of the following would not be true:

    A.   Z + I = Z
    B.   I + O = I
    C.   IO = I
    D.   Z − O = Z
    E.   ZO = O

Question 5

If $x \begin{vmatrix} 2 & 2 \\ - & 1 \\ 4 & \end{vmatrix} + y \begin{vmatrix} - & 4 \\ 2 & \\ 1 & 5 \end{vmatrix} . = \begin{vmatrix} 6 & 30 \\ -24 & 27 \end{vmatrix}$

x and y respectively are:

    A.   6, 3

    B.   5, -4

    C.   2, 5

    D.   7, 4

    E.   3, 6

Question 6
Which one of the following statements is not true regarding matrix A?

$$A = \begin{vmatrix} 7 & 4 & 1 \\ 4 & 0 & 2 \end{vmatrix}$$

    A.   Matrix subtraction A − C exists if C is any 2x3 matrix.

    B.   The product matrix AB exists if B is any 3x2 matrix.

    C.   A2 does not exist for matrix A.

    D.   The matrix A contains 3 columns.

    E.   The determinant of matrix A is equal to 1.

Question 7

H is matrix such that $\begin{vmatrix} 41 & -71 \\ -22 & 38 \end{vmatrix} = H \begin{vmatrix} -3 & 5 \\ 1 & -3 \end{vmatrix}$.

H is the matrix:

A. $\begin{vmatrix} 44 & -76 \\ -23 & 41 \end{vmatrix}$

B. $\begin{vmatrix} -3.25 & 5.75 \\ 6.25 & -10.75 \end{vmatrix}$

C. $\begin{vmatrix} -0.75 & -1.25 \\ -0.25 & -0.75 \end{vmatrix}$

D. $\begin{vmatrix} -13 & 2 \\ 7 & -1 \end{vmatrix}$

E. $\begin{vmatrix} -3 & 5 \\ 1 & -3 \end{vmatrix}$

The following information relates to question 8 and 9:

The Giggity Grocers holds 34% of the market share, but has found that only 70% of the customers who shop at Giggity Grocers in one week will return the following week. Of the customers who shop at Fritzy Food Market in any week, 10% will shop at Giggity Grocers in the following week. (Assume that all customers in this town shop at either of these grocers every week.)

Question 8
A transition matrix for this situation could be:

A. $\begin{vmatrix} 0.34 & 0.9 \\ 0.66 & 0.1 \end{vmatrix}$

B. $\begin{vmatrix} 0.34 & 0.1 \\ 0.66 & 0.9 \end{vmatrix}$

C. $\begin{vmatrix} 0.7 & 0.9 \\ 0.3 & 0.1 \end{vmatrix}$

D. $\begin{vmatrix} 0.7 & 0.1 \\ 0.3 & 0.9 \end{vmatrix}$

E. $\begin{vmatrix} 0.34 & 0.7 \\ 0.66 & 0.3 \end{vmatrix}$

Question 9
In 3 weeks' time how much of the market share will Fritzy Food Market hold?

  A. 26.9 %
  B. 73.1 %
  C. 41.2 %
  D. 80.4 %
  E. 71.8 %

Formula Sheet

Core: Data analysis

Standardised score: $z = \dfrac{x - \bar{x}}{s_x}$

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

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

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

Module 1: Number patterns

Arithmetic series: $a + (a + d) + \cdots + (a + (n-1)d) = \dfrac{n}{2}[2a + (n-1)d] = \dfrac{n}{2}(a + l)$

Geometric series: $a + ar + ar^2 + \cdots + ar^{n-1} = \dfrac{a(1 - r^n)}{1 - r}, r \neq 1$

Infinite geometric series: $a + ar + ar^2 + ar^3 + \cdots = \dfrac{a}{1 - r}, |r| < 1$

Module 2: Geometry and trigonometry

Area of a triangle: $\dfrac{1}{2} bc \sin A$

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: $\dfrac{4}{3}\pi r^3$

Surface area of a sphere: $4\pi r^2$

Volume of a cone: $\dfrac{1}{3}\pi r^2 h$

Volume of a cylinder: $\pi r^2 h$

Volume of a prism: $\text{area of base} \times \text{height}$

Volume of a pyramid: $\dfrac{1}{3}\text{area of base} \times \text{height}$

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

Sine rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

Module 3: Graphs and relations

Straight line graphs

Gradient (slope):

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Equation:

$$y = mx + c$$

Module 4: Business-related mathematics

Simple interest:

$$I = \frac{PrT}{100}$$

Compound interest:

$$A = PR^n, \text{ where } R = 1 + \frac{r}{100}$$

Hire purchase:

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

Module 5: Networks and decision mathematics

Euler's formula:

$$v + f = e + 2$$

Module 6: Matrices

Determinant of a 2 x 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 x 2 matrix:

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

End of Booklet

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