2019 PRACTICE EXAM

FURTHER MATHS UNITS 3&4

Exam 1 Question Booklet
Exam 2 Question Booklet
Worked Solution Booklet

ATARNotes

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ATARNotes

FURTHER MATHEMATICS

Written examination 1

2019

Reading time: 9:00 a.m. to 9:15 a.m. (15 minutes)
Writing time: 9:15 a.m. to 10:45 a.m. (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 – Core	24	24			24
B – Modules	32	16	4	2	16
					Total 40

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, one bound reference, one approved technology (calculator or software) and, if desired, one scientific calculator. Calculator memory DOES NOT need to be cleared. For approved computer-based CAS, full functionality may be used
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.

Materials supplied

- Question and answer book of 27 pages
- Formula sheet
- Answer sheet for multiple-choice questions
- Working space is provided throughout the book

Instructions

- 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 and the formula sheet

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

SECTION A – Core

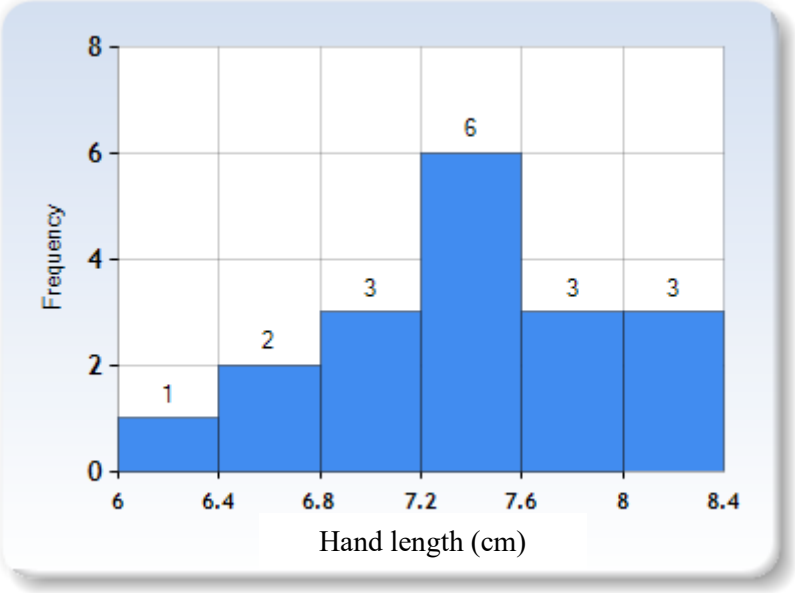
Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.
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.
Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Data analysis

Use the following information to answer Questions 1 and 2.

The following histogram displays the hand lengths of 18 men.



Question 1

The **percentage** of these men with hand lengths less than 7.2 cm is closest to

A. 50%
B. 33%
C. 6%
D. 55%
E. 75%

Question 2

The median hand length is within the range:

A. 6.0–6.3 cm
B. 6.4–6.7 cm
C. 6.8–7.1 cm
D. 7.2–7.5 cm
E. 7.6–7.9cm

Question 3

The table below shows the time spent looking at memes in one day, in minutes, of a sample of 9 year 12 students

Time	123	130	97	60	62	182	40	23	30

The mean, $\bar{x}$, and standard deviation s_x, of the time spent looking at memes in one day for this sample of students are closest to

A. $\bar{x} = 50.59$, $s_x = 53.66$
B. $\bar{x} = 83$, $s_x = 53.66$
C. $\bar{x} = 53.66$, $s_x = 83$
D. $\bar{x} = 83$, $s_x = 50.59$
E. $\bar{x} = 747$, $s_x = 50.59$

Use the following information to answer Questions 4–6.

The weights of a population of mice are approximately normally distributed with a mean of 34 grams and a standard deviation of 2 grams.

Question 4

There are 435 mice in this population. The expected number of mice in the population with weights between 34 and 38 grams is closest to

A. 48
B. 200
C. 350
D. 207
E. 435

Question 5

A mouse selected at random from this population has a standardised weight of $z = -2.2$

The mouse's actual weight is

A. 30 grams
B. 29.2 grams
C. 34 grams
D. 32 grams
E. 29.6 grams

Question 6

Another mouse selected at random from this population has a standardised pulse rate of $z = 2$
The percentage of mice in this population with weights greater than this mouse is closest to

A. 2.5%
B. 5%
C. 16%
D. 68%
E. 84%

Question 7

Data was collected to investigate the association between the following two variables:

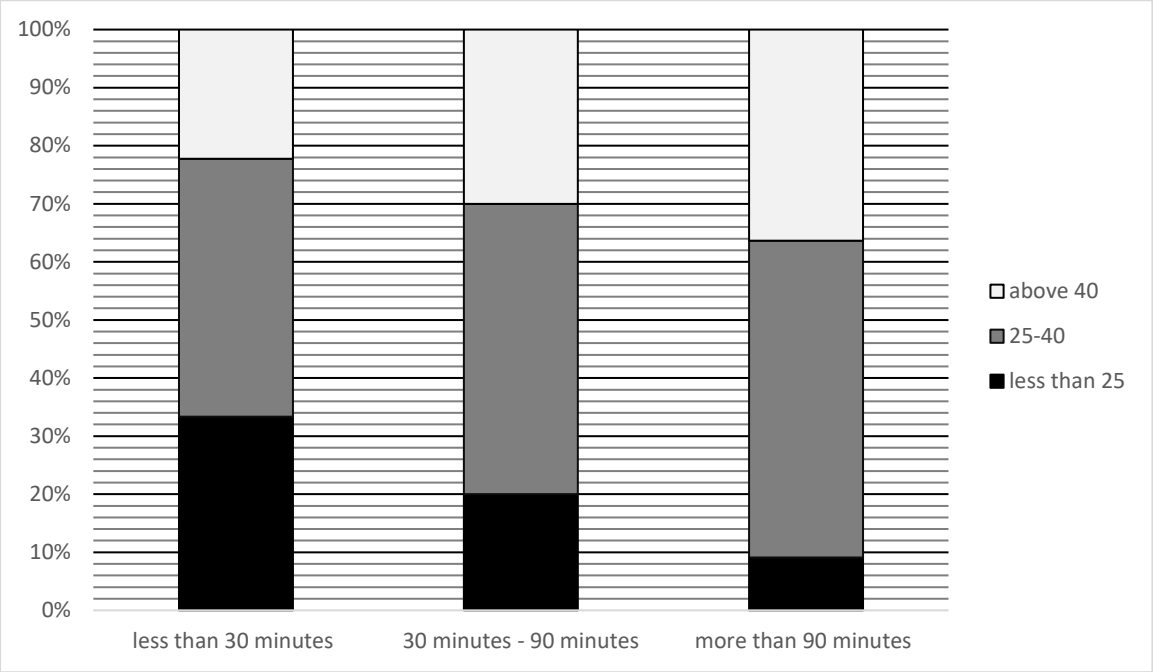
- Age (14 and under, 15-30, 31 and over)
- Eats at MacDonald's (yes, no)

Which one of the following is appropriate to use in the statistical analysis of this association?

A. Parallel box plots
B. A scatterplot
C. The coefficient of determination r^2
D. A segmented bar chart
E. A least squares regression line

Use the following information to answer Questions 8–10.

A study was conducted to investigate the association between the *Further Maths study scores* (less than 25, 25-40, above 40) achieved by a group of year 12 students and the *amount of time spent on social media a day* (less than 30 minutes, 30 minutes – 90 minutes, more than 90 minutes). The results are summarised in the percentage segmented bar chart below.



Question 8

There were 75 students who spent less than 30 minutes on social media a day.

The number of students who spent less than 30 minutes on social media a day and got a study score between 25 and 40 is closest to

A. 30
B. 44
C. 33
D. 50
E. 69

Question 9

The data displayed in the percentage segmented bar chart supports the contention that there is an association between the *further maths study scores* and the *amount of time spent on social media* because

A. 30% of students who spent 30–90 minutes on social media a day achieved study scores above 40
B. The percentage of students who spent less than 30 minutes on social media and got a study score below 25 is less than the percentage of students who spent more than 90 minutes on social media and got a study score above 40
C. The percentage of students who spent less than 30 minutes on social media and got a study score below 25 is greater than the percentage of students who spent more than 90 minutes on social media and got a study score below 25
D. 20% of students who spent 30-90 minutes on social media got a study score less than 25, and 30% of these students got a study score above 40
E. Most of the students who spent more than 90 minutes on social media got a study score between 25 and 40

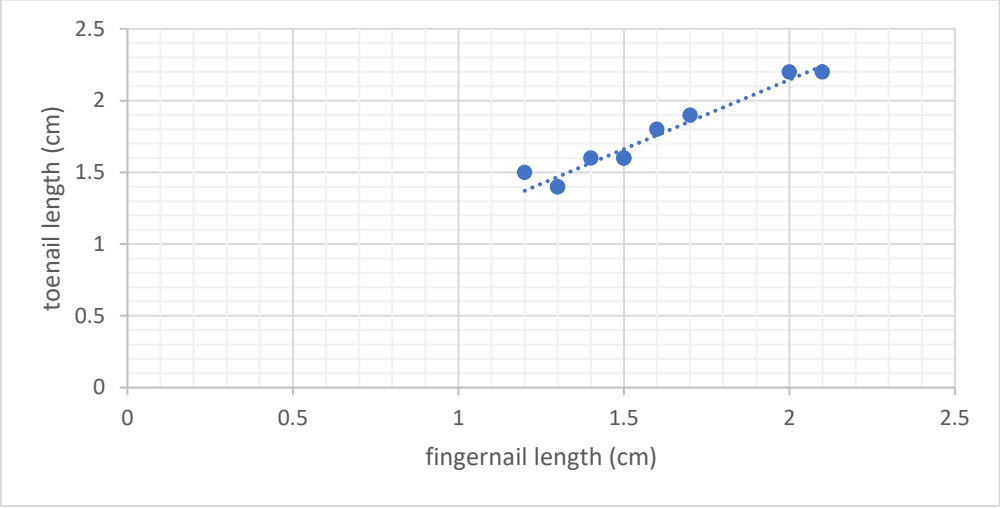
Question 10

The variables *Further Maths study scores* (less than 25, 25-40, above 40) and *amount of time spent on social media a day* (less than 30 minutes, 30–90 minutes, more than 90 minutes) are

A. Both nominal variables
B. A categorical and nominal variable respectively
C. An ordinal and discrete variable respectively
D. Both ordinal variables
E. A numerical and categorical variable respectively

Use the following information to answer Questions 11 and 12.

The scatterplot below shows the fingernail and toenail length, both in centimetres, of 11 people. A least squares line has been fitted to the scatterplot with fingernail length as the explanatory variable.



The equation of this least squares line is: *Toenail length* = 0.9677 × *fingernail length* + 0.2104.

The coefficient of determination is $r^2 = 0.9458$.

Question 11

Given this information, which of the following statements is **not** true?

A. 94.58% of the variation in toenail length is explained by the variation in fingernail length
B. On average, toenail length increases by 0.9677cm for every 1cm increase in fingernail length
C. The value of the correlation coefficient is -0.9725
D. The association between toenail length and fingernail length cam be described as having a strong, positive, linear association
E. Using the least squares line to predict the toenail length of someone with a fingernail length of 1.3cm is an example of interpolation

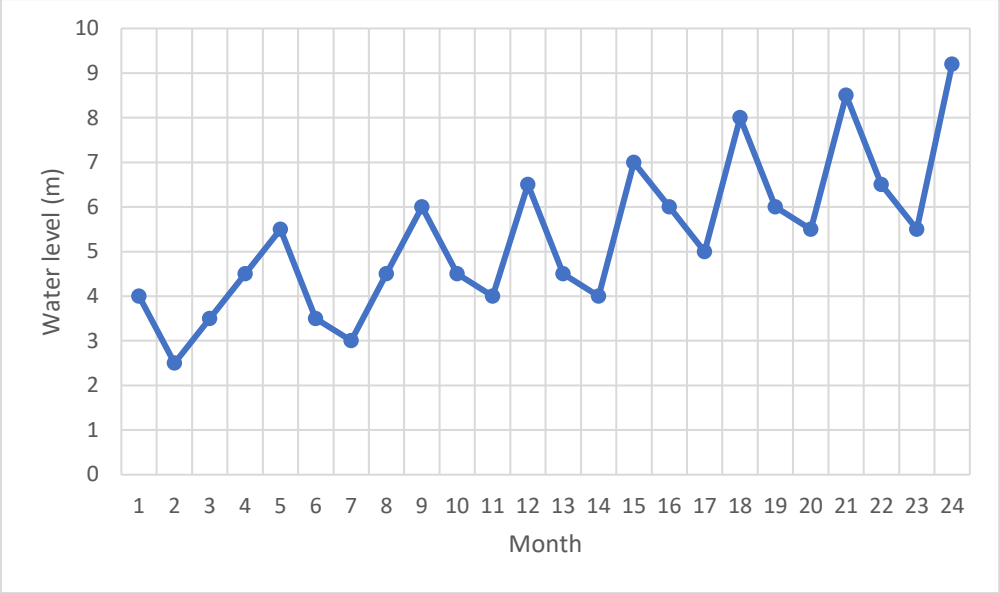
Question 12

The toenail length of someone with fingernail length of 1.5 cm is predicted using the least squares equation. Their actual toenail length is 1.6 cm. The residual is closest to

A. 0.06195
B. -0.06195
C. 0.07452
D. -0.07452
E. 0.9725

Use the following information to answer Questions 13 and 14.

The water level at a certain beach is measured each month. The time series plot below shows the daily minimum water level in meters, over a 2 year period



Question 13

The time series is best described as having

A. Seasonality only
B. A decreasing trend with irregular fluctuations
C. An increasing trend with irregular fluctuations
D. An increasing trend with seasonality
E. Irregular fluctuations only

Question 14

The 5-median smoothed minimum water level. In meters, for month 13 is closest to

A. 4
B. 6.5
C. 4.5
D. 4
E. 7

Use the following information to answer Questions 15 and 16.

The table below shows the quarterly sales figures for a Christmas tree farm, in tens of thousands of dollars, for 2017 and 2018.

Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2017	2.5	1.7	1.0	3.2
2018	2.3	1.4	1.2	3.3

Question 15

Using these sales figures, the seasonal index for Quarter 2 is closest to

A. 0.82
B. 0.75
C. 0.73
D. 0.68
E. 0.81

Question 16

The seasonal index for the sales of Christmas trees by this farm in quarter 1 of 2017 is 1.19.

To correct the sales for seasonality, the actual sales should be

A. Reduced by 84.0%
B. Reduced by 14%
C. Increased by 16%
D. Reduced by 16%
E. Increased by 14%

Recursion and financial modelling

Question 17

The value of a reducing balance loan, in dollars, after n months, V_n, can be modelled by the recurrence relation shown below.

$$V_0 = 35\,000, \qquad V_{n+1} = 1.0045\,V_n - 400$$

What is the value of this loan after 6 months?

A. $33776.50
B. $33528.50
C. $34023.40
D. $33204.30
E. $35000.00

Question 18

The first five terms of a number sequence are 3, 11, 51, 251, 151

The recurrence relation that generates this sequence could be

A. $A_0 = 3, A_{n+1} = A_n + 2$
B. $A_0 = 3, A_{n+1} = 2A_n + 2$
C. $A_0 = 3, A_{n+1} = 5A_n - 4$
D. $A_0 = 3, A_{n+1} = 3A_n + 4$
E. $A_0 = 3, A_{n+1} = 5A_n$

Question 19

Phil borrows $4000, which he intends to repay fully in a lump sum after 2 years. The annual interest rate and compounding period for five different compound interest loans are given below

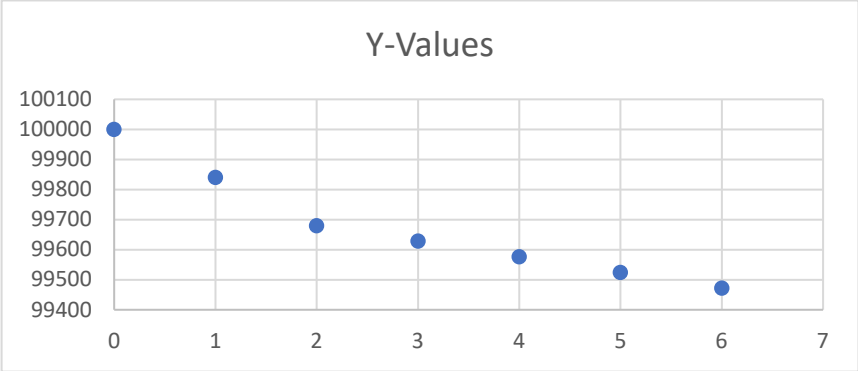
- Loan 1 – 11.5% per annum, compounding weekly
- Loan 2 – 13.2% per annum, compounding weekly
- Loan 3 – 11% per annum, compounding weekly
- Loan 4 – 12.6% per annum, compounding quarterly
- Loan 5 – 11% per annum, compounding monthly

When fully repaid, the loan that will cost Phil the least amount of money is

A. Loan 1
B. Loan 2
C. Loan 3
D. Loan 4
E. Loan 5

Question 20

The graph below shows the value, V_n of a loan as over a period of 6 months.



Which one of the following situations does this graph best represent?

A. A reducing balance loan with a decrease in interest rate after 2 months
B. A reducing balance loan with an increase in interest rate after 2 months
C. An interest only loan
D. A loan with 0% interest
E. A reducing balance loan with no change in the interest rate throughout the 6 months

Question 21

A pair of crocs was purchases for $25. After 3 years the crocs have a value of $3. On average, the owner of the crocs wore them for 350 days per year during those 3 years. The depreciation in the value of the crocs, per day walked in, is closest to

A. 2 cents
B. 3 cents
C. 4 cents
D. 5 cents
E. 6 cents

Question 22

Four lines of an amortisation table for an annuity investment is shown below. The interest rate for this investment remains constant, but the payment value may vary.

Payment number	Payment	Interest	Principal addition	Balance of investment
13	90.00	12.97	105.20	10258.00
14	90.00	13.10	103.10	10361.10
15	90.00	13.23	103.23	10464.30
16				10700

The balance of the investment after payment number 16 is $10,700. The value of payment number 16 is closest to

A. $90
B. $230
C. $326
D. $236
E. $222

Question 23

Celina invests $3000 in a savings account that pays interest at the rate of 2.7% per annum compounding monthly. At the end of each month, immediately after interest has been paid, she adds $150 to her investment.

After 3 years, the value of her investment will be closest to

A. $8871
B. $5287
C. $9212
D. $4568
E. $7920

Question 24

Isabel takes up a reducing balance home loan with a present value of $186,920.37. She hopes to pay the loan off in 30 years.

The interest rate of the loan when she takes it up is 3.6% per annum, compounding monthly. She pays $2,500 off the loan at the end of each month.

After 2 years, the interest rate increases to 4.2% per annum, compounding monthly. It is expected to stay at this rate until she pays off the loan.

When the interest rate increases, she must increase her monthly payment if she is to pay off the loan in 30 years. The value of this new monthly payment will be closest to

A. $270
B. $703
C. $682
D. $704
E. $654

SECTION B – Modules

Instructions for Section B

Select **two** modules and answer **all** questions within the selected modules 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 **and** writing the name of the module in the box provided.

Choose the response that is **correct** for the question

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

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Contents

END OF MULTIPLE-CHOICE QUESTION BOOK

Module 1 – Matrices

Before answering these questions, you must **shade** the 'Matrices' box on the answer sheet for multiple-choice questions and write the name of the module in the box provided.

Question 1

Which of the following matrices has a determinant of zero?

A. $\begin{bmatrix} 3 & 6 \\ 1 & 2 \end{bmatrix}$

B. $\begin{bmatrix} 6 & 15 \\ 3 & 2 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 2 \\ 6 & 7 \end{bmatrix}$

D. $\begin{bmatrix} 3 & 4 \\ 8 & 9 \end{bmatrix}$

E. $\begin{bmatrix} 4 & 2 \\ 3 & 1 \end{bmatrix}$

Question 2

The matrix product for the following is

$$\begin{bmatrix} 5 & 3 & 1 \\ 6 & 4 & 2 \end{bmatrix} \times \begin{bmatrix} 2 & 7 \\ 3 & 1 \end{bmatrix}$$

A. $\begin{bmatrix} 69 & 109 & 23 \\ 20 & 34 & 6 \\ 59 & 67 & 19 \end{bmatrix}$

B. $\begin{bmatrix} 68 & 108 & 22 \\ 18 & 33 & 5 \\ 58 & 66 & 18 \end{bmatrix}$

C. $\begin{bmatrix} 14 & 180 & 96 \\ 120 & 67 & 88 \\ 24 & 20 & 69 \end{bmatrix}$

D. $\begin{bmatrix} 69 & 109 & 23 \\ 21 & 35 & 7 \\ 60 & 68 & 20 \end{bmatrix}$

E. A matrix product cannot be found for the above equation.

Question 3

Which of the following is a permutation matrix?

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

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

C. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 12 \\ 0 & 0 & 1 \end{bmatrix}$

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

E. None of the above are permutation matrices.

Question 4

Four people, Bob (B), Ruby (R), Kirk (K) and Maya (M), competed in a table tennis tournament.

Each competitor played every other competitor once only.

Each match resulted in a winner and a loser and the matrix below shows the tournaments results.

Loser

Winner	B	R	K	M
B	0	0	1	1
R	1	0	1	1
K	0	0	0	0
M	0	0	1	0

A ‘1’ in the matrix shows that the competitor named in that row defeated the competitor named in that column.
A ‘0’ in the matrix shows that the competitor named in that row lost to the competitor named in that column.

Given this, which of the following is true?

A. Kirk defeated Ruby

B. Ruby lost all of her matches

C. Kirk defeated Bob

D. Ruby wins all of her matches

E. None of the above

Question 5

The table below shows information about one matrix.

Rule: $a_{ij} = 6i + j$

The element in row i and column j of the matrix is a_{ij}.

Which of the following matrices would follow this rule?

A. $\begin{bmatrix} 7 & 8 \\ 13 & 14 \end{bmatrix}$

B. $\begin{bmatrix} 7 & 8 \\ 13 & 8 \end{bmatrix}$

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

D. $\begin{bmatrix} 7 & 3 \\ 6 & 8 \end{bmatrix}$

E. $\begin{bmatrix} 7 & 2 \\ 7 & 9 \end{bmatrix}$

Question 6

Each week, the 300 swimming students at a local sports academy choose Freestyle (F), Backstroke (B) or Cardio training (C).

The transition matrix below shows how the students' choices change from week to week.

This week

	F	**B**	**C**	
	0.1	0.3	0.2	**F**
	0.5	0.4	0.1	**B**
	0.4	0.3	0.7	**C**

Next week

Based on the information provided above, it can be concluded that, in the long term

A. The majority of students will complete cardio training (C).
B. The majority of students will complete backstroke (B)
C. The majority of students will complete freestyle (F)
D. The students will remain equally distributed amongst all activities.
E. No student would choose freestyle.

Question 7

Consider the following system of three linear equations

$5x + 2z = 15$

$2x - 3y = 0$

$y - z = -5$

The matrix product which would display the total number of coins and the total value of these coins is

A. $\begin{bmatrix} 2 & 1 \\ 1 & -2 \\ 1 & -1 \end{bmatrix} \times \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 15 \\ 0 \\ -5 \end{bmatrix}$

B. $\begin{bmatrix} 5 & 0 & 2 \\ 2 & -3 & 0 \\ 0 & 1 & -1 \end{bmatrix} \times \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 15 \\ 0 \\ -5 \end{bmatrix}$

C. $\begin{bmatrix} 5 & 2 & 2 \\ 1 & 1 & 2 \\ 1 & 1 & 1 \end{bmatrix} \times \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 15 \\ 0 \\ -5 \end{bmatrix}$

D. $\begin{bmatrix} 5 & 2 \\ 2 & 3 \\ 1 & 1 \end{bmatrix} \times \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -5 \\ 0 \\ 15 \end{bmatrix}$

E. $\begin{bmatrix} 5 & 2 \\ 2 & -3 \\ 1 & -1 \end{bmatrix} \times \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 15 \\ 0 \\ -5 \end{bmatrix}$

Question 8

Consider the matrix recurrence relation below.

$P_0 = \begin{bmatrix} 79 \\ 74 \\ 65 \end{bmatrix}, P_{n+1} = TP_n \qquad where\ T = \begin{bmatrix} 0.9 & 0.2 & 0.5 \\ 0.1 & 0.4 & 0.5 \\ 0 & 0.4 & 0 \end{bmatrix},$

Given the above, the value of P2 is closest to

A. $\begin{bmatrix} 79 \\ 74 \\ 64 \end{bmatrix}$

B. $\begin{bmatrix} 130 \\ 32 \\ 21 \end{bmatrix}$

C. $\begin{bmatrix} 135 \\ 55 \\ 28 \end{bmatrix}$

D. $\begin{bmatrix} 135 \\ 50 \\ 28 \end{bmatrix}$

E. $\begin{bmatrix} 140 \\ 49 \\ 22 \end{bmatrix}$

Module 2 – Networks and decision mathematics

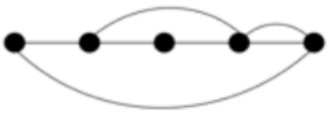
Before answering these questions, you must **shade** the 'Networks and decision mathematics' box on the answer sheet for multiple-choice questions and write the name of the module in the box provided.

Question 1

Which of the following graphs has a loop?

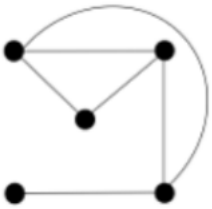
A.

B.

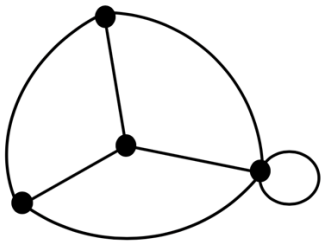


C.

D.



E.



Question 2

Which of the following is true about planar graphs?

A. A planar graph has no edges which overlap.
B. A planar graph must have all vertices equally spaced apart.
C. A planar graph is when all the vertices are not connected by any edges.
D. A planar graph is when two vertices are directly next two each other.
E. None of the above are true.

Question 3

A planar graph has 8 faces. Using this information, this planar graph could have

A. 3 vertices and 9 edges
B. 2 edges and 12 vertices
C. 13 vertices and 12 edges
D. 15 edges and 13 vertices
E. 12 edges and 3 vertices

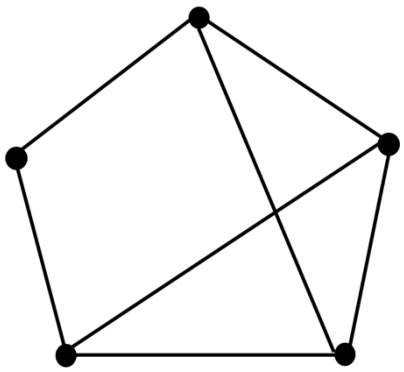
Question 4

Which of the following represents a tree?

A. A graph with 6 edges and 7 vertices
B. A graph with 12 edges and 10 vertices
C. A graph with 15 edges and 9 vertices
D. A graph with 25 edges and 17 vertices
E. None of the above

Question 5

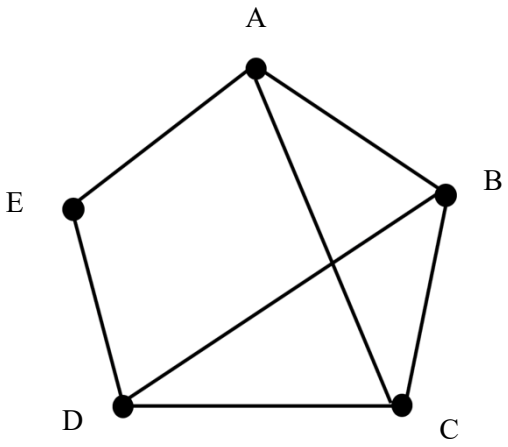
How many edges does the graph below have?



A. 6 edges
B. 7 edges
C. 8 edges
D. 9 edges
E. 10 edges

Question 6

Consider the following graph.



The adjacency matrix for this graph, with some elements missing is shown below.

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

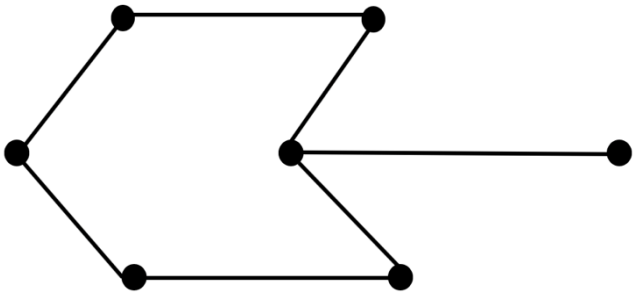
The adjacency matrix contains 16 elements when complete.

Of the 16 elements

A. 11 are '1' and 5 are '0'
B. 14 are '1' and 2 are '0'
C. 10 are '1' and 6 are '0'
D. 12 are '1' and 4 are '0'
E. 8 are '1' and 8 are '0'

Question 7

In the network below, the number of vertices with an even degree is



A. 5 vertices
B. 6 vertices
C. 7 vertices
D. 8 vertices
E. 9 vertices

Question 8

What is the correct definition of a minimum spanning tree?

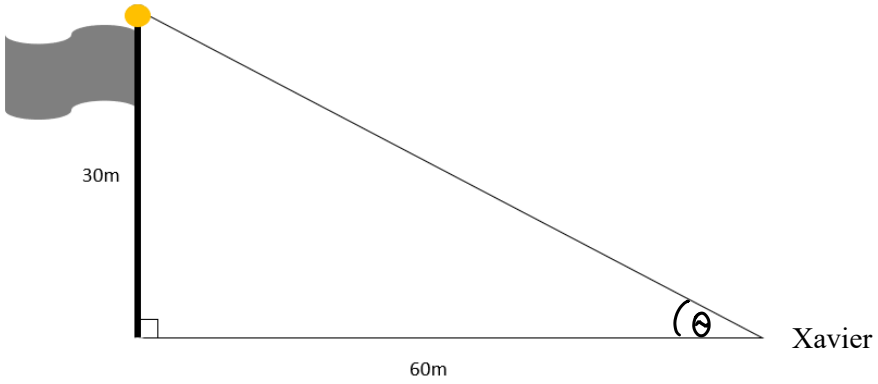
A. A minimum spanning tree is a spanning tree with the lowest weight.
B. A minimum spanning tree is a spanning tree with the largest weight.
C. A minimum spanning tree is a spanning tree with no weight.
D. A minimum spanning tree can be formed through a degenerate network.
E. None of the above are true.

Module 3 – Geometry and measurement

Before answering these questions, you must **shade** the 'Geometry and measurement' box on the answer sheet for multiple-choice questions and write the name of the module in the box provided.

Question 1

Xavier stands 60m away from a 30m tall flagpole.

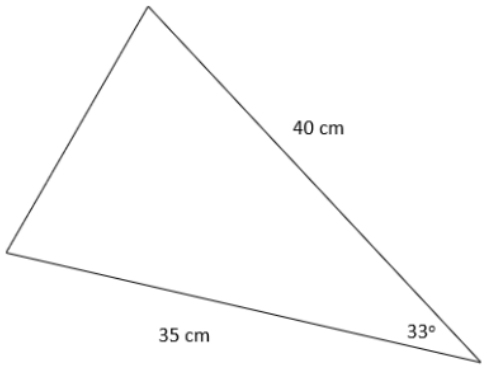


The angle of elevation of Xavier to the flagpole, rounded to two decimal places, is closest to:

A. 26.57°
B. 0.46°
C. 23.42°
D. 0.45°
E. 22.14°

Question 2

A diagram of a triangle is shown below.

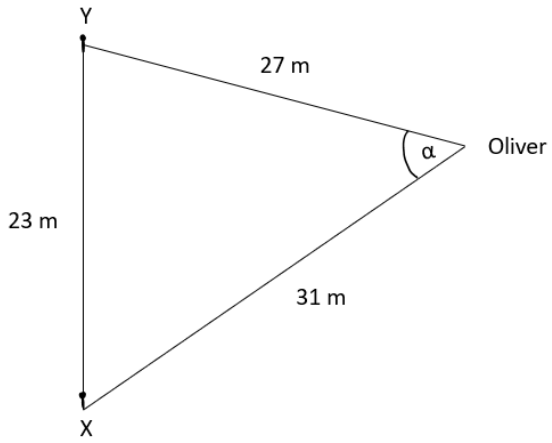


The area of the triangle, rounded to two decimal places, is closest to:

A. 456.02 cm^2
B. 323.50 cm^2
C. 485.63 cm^2
D. 381.25 cm^2
E. 712.23 cm^2

Question 3

Oliver is looking at a 23 m long, straight fence section (between fenceposts X and Y). He stands 27 m away from fencepost Y and 31 m from fencepost X.

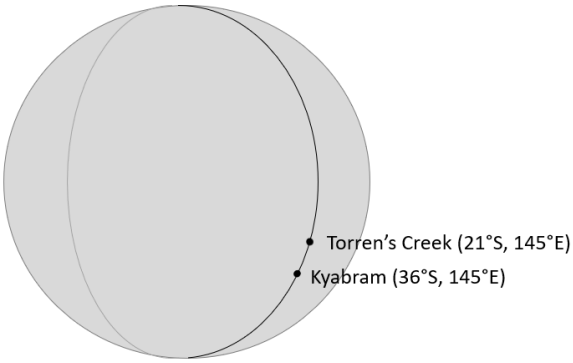


From Oliver's perspective, the angle between X and Y, rounded to two decimal places, is closest to:

A. 46.09°
B. 76.16°
C. 57.75°
D. 53.23°
E. 21.68°

Question 4

A diagram of the Earth and the 145th meridian east is shown below. Torren's Creek and Kyabram are on the same longitude, 145°E.



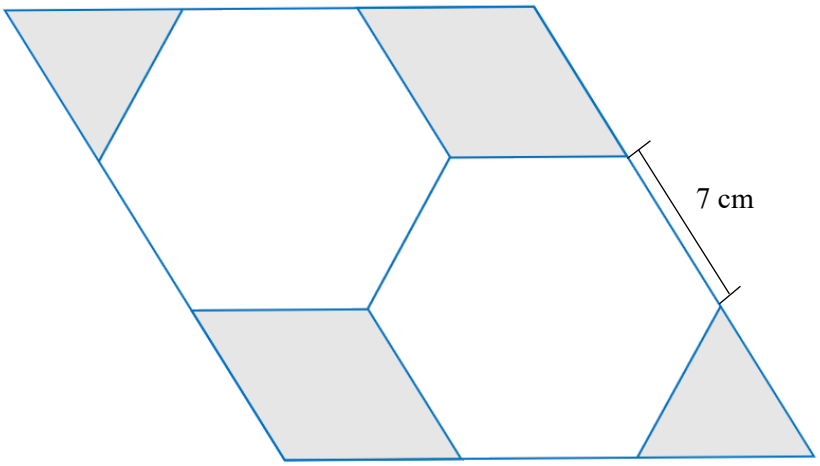
The radius of the Earth is 6,400 km. What is the distance, rounded to two decimal places, between Torren's Creek and Kyabram?

A. 1893.23 km
B. 1675.52 km
C. 3424.89 km
D. 6366.96 km
E. 3825.23 km

Question 5

An image of a tile design is shown below. The tile composes of a parallelogram with two regular hexagons, placed directly next to each other, placed in the parallelogram.

The length of the sides of the hexagons are 7 cm.

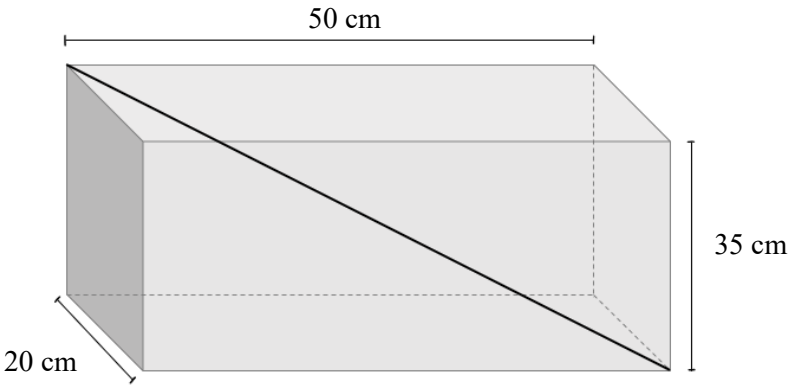


The area of the shaded region of the tile is closest to:

A. 115.31 cm^2
B. 42.44 cm^2
C. 127.31 cm^2
D. 44.56 cm^2
E. 148.23 cm^2

Question 6

A diagram of a toy storage chest, in the shape of a rectangular prism, is shown below. The dimensions of the chest are 50cm/20cm/35cm (length/width/height). A toy sword is to be placed in the box.



The longest length the toy sword could be, to fit in the chest, is:

A. 64.22 cm
B. 17.25 cm
C. 75.98 cm
D. 86.09 cm
E. 73.57 cm

Question 7

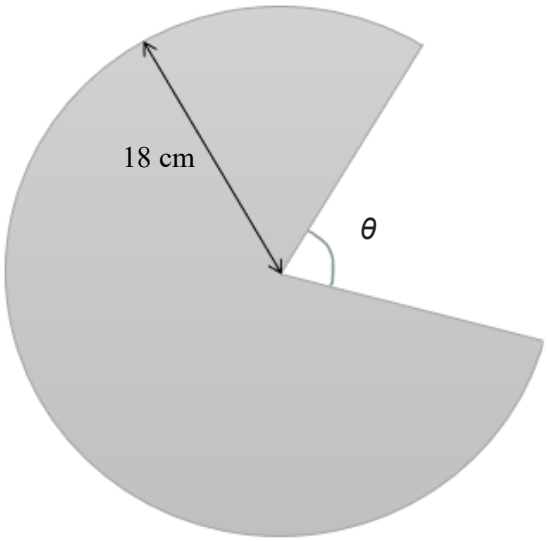
Toronto, Canada (44° N, 79° W) and Florence, Italy (44° N, 11° E) are on the same latitude.

Given that it is 2:35 p.m. in Toronto, the time in Florence is:

A. 4:35 p.m.
B. 8:35 a.m.
C. 7:35 a.m.
D. 8:35 p.m.
E. 12:35 p.m.

Question 8

A diagram of a 36 cm diameter cylindrical pie is shown below. A slice of pie is taken out. The surface area of the pie's base is 839.75cm^2.



The angle (θ°) of the pie slice taken out is closest:

A. 34°
B. 75°
C. 107°
D. 63°
E. 54°

Module 4 – Graphs and relations

Before answering these questions, you must **shade** the 'Graphs and relations' box on the answer sheet for multiple-choice questions and write the name of the module in the box provided.

Question 1

The graph below shows the water level of at the shore of a beach over 11 hours of a day

The time period during which the rate of water level increase in the greatest is

A. 1–2.5 hours
B. 4–6 hours
C. 6–7 hours
D. 7–11 hours
E. 3–4 hours

Question 2

A point that lies on the line $5x + 4y = 3$ is

A. $(-\frac{1}{5}, 1)$
B. (5 , 4)
C. (4 . 5)
D. (0 , 3)
E. (2 , 0)

Question 3

A straight line passes through the points (0,3) and (2,4). The coordinates of the point where the line crosses the x-axis are

A. (5,0)
B. (-6,0)
C. (6,0)
D. (2.5,0)
E. (4,0)

Question 4

The point (1,3) satisfies the inequality

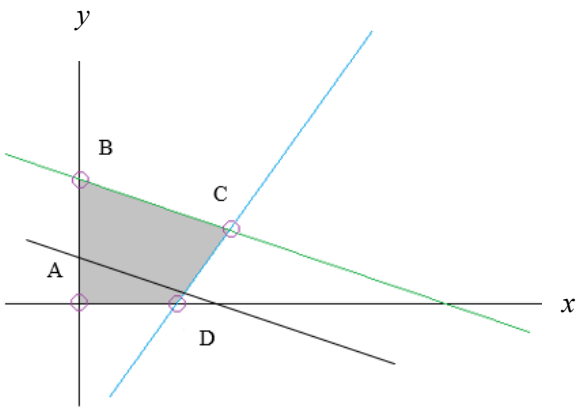
A. $y \leq 0$
B. $y < 3x$
C. $2y > 6x$
D. $-2 < x < 2$
E. $y \geq 2x + 4$

Question 5

A water park lazy river needs at least one lifeguard for every 50 visitors. Let x be the number of lifeguards employed, and let y be the number of water park visitors. Which one of the following is the inequality that represents this situation?

A. $y \geq \frac{x}{50}$
B. $y \leq 50\,x$
C. $y \geq 50x$
D. $y \leq \frac{50}{x}$
E. $y \leq \frac{x}{50}$

Question 6
The shaded region represents the feasible region in the following linear programming model.

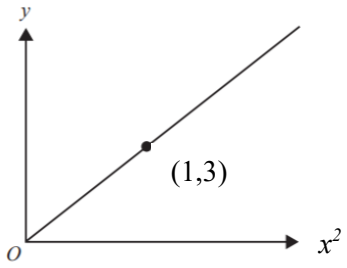


The solid line has the same gradient as the objective function. The maximum value of the objective function can be found at

A. Any point between line segment CD
B. Point B
C. Point C
D. Point D
E. Any point between line segment BC

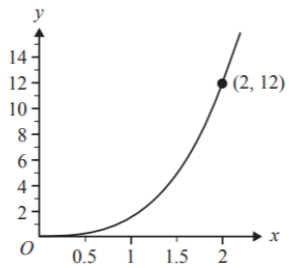
Question 7

The graph below shows a relationship between y and kx^2

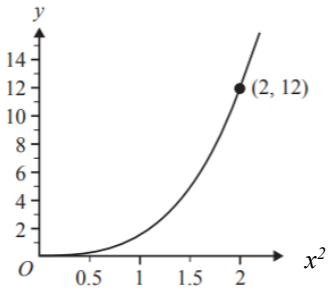


The graph that shows the same relationship between y and x is

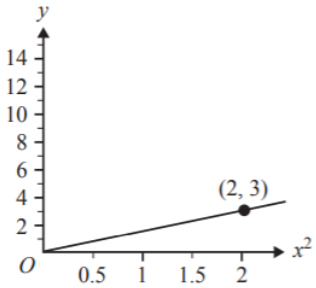
A.



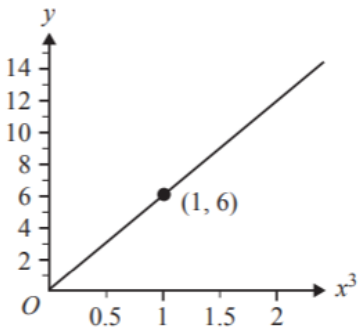
B.



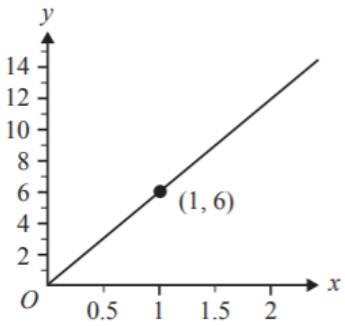
C.



D.



E.



Question 8

A Go Kart rental company charges a fixed cost of $40 and an additional cost which depends on both time and distance travelled. Phil, Sydney and Celina go Go Karting together but spend different amounts of time and travel different distances in total.

Phil pays $181. He drove for 40 minutes and travelled a distance of 550 m. Sydney pays $224. She drove for 60 minutes and travelled a distance of 700 m. Celina drives for 50 minutes and travels a distance of 600 m.

How much does Celina pay?

A. $257
B. $197
C. $189
D. $157
E. $207

END OF MULTIPLE-CHOICE QUESTION BOOK