

Trial Examination 2021

VCE Further Mathematics Units 3&4

Written Examination 2

Question and Answer Booklet

Reading time: 15 minutes

Writing time: 1 hour 30 minutes

Student's Name: _____

Teacher's Name: _____

Structure of booklet

	<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
Section A – Core	8	8	36
	<i>Number of modules</i>	<i>Number of modules to be answered</i>	<i>Number of marks</i>
Section B – Modules	4	2	24
			Total 60

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 booklet of 28 pages

Formula sheet

Working space is provided throughout the booklet.

Instructions

Write your **name** and your **teacher's name** in the space provided above on this page.

Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

All written responses must be in English.

At the end of the examination

You may keep the formula sheet.

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

Students are advised that this is a trial examination only and cannot in any way guarantee the content or the format of the 2021 VCE Further Mathematics Units 3&4 Trial Examination.

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SECTION A – CORE**Instructions for Section A**

Answer **all** questions in the spaces provided.

You need not give numerical answers as decimals unless instructed to do so. Alternative forms may include, for example, π , surds or fractions.

In ‘Recursion and financial modelling’, all answers should be rounded to the nearest cent unless otherwise instructed.

Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

Data analysis**Question 1** (6 marks)

Throughout 2020, there was a sharp drop in the occupancy rates of a particular hotel. A survey of 1000 guests was conducted to determine which hotel amenities guests consider the most important.

The first question on the survey related to the number of nights guests stayed and provided the following results.

<i>Nights per stay</i>	Frequency
1	740
2	210
3	10
4	10
5	5
6	5
7	20
>7	0

- a. Describe the shape of the data set. 1 mark

- b. Calculate the mean *nights per stay*.
Round your answer to one decimal place. 1 mark

- c. Write the five-number summary. 1 mark

- d. Use a calculation to identify the outliers, if any, in this data. 1 mark

The survey also included questions asking the guests to rate a variety of services at the hotel, including how comfortable they found the bed. The figures were then grouped according to whether the guest stayed one night only or more than one night.

	Excellent	Satisfactory	Needs improvement	Total
One night per stay	700	120	30	850
More than one night per stay	120	20	10	150
Total	820	140	40	1000

- e. How many of the guests with more than one *night per stay* thought the comfort of the bed needed improvement? 1 mark

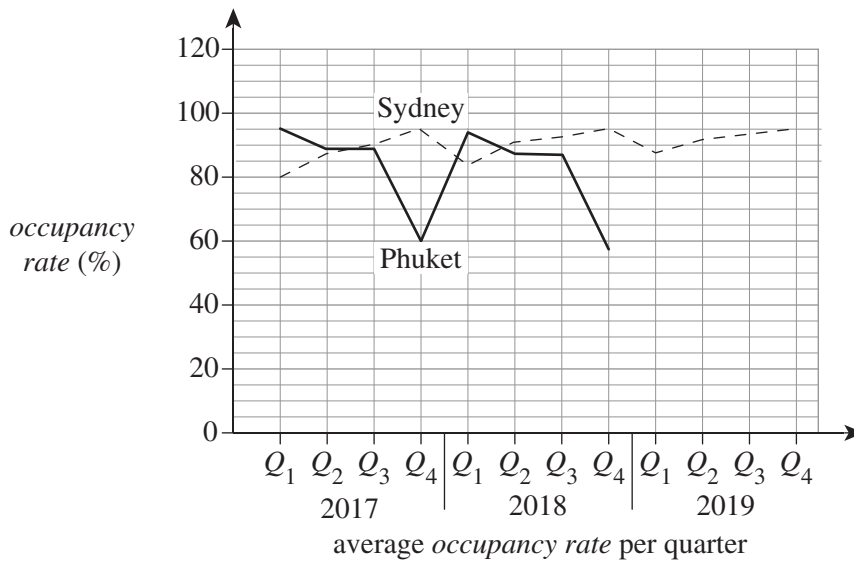
- f. Calculate which group had a higher percentage of guests who thought the bed was excellent. 1 mark

Question 2 (7 marks)

A hotel chain operates two hotels of the same size, one in the tourist district of Phuket, Thailand and the other in the business district of Sydney, Australia. The following table shows the quarterly average *occupancy rate*, expressed as a percentage, recorded over a three year period prior to their business being affected by the COVID-19 pandemic in 2020. For example, an *occupancy rate* of 70 means that 70% of available rooms are occupied.

	2017				2018				2019			
	Q_1	Q_2	Q_3	Q_4	Q_1	Q_2	Q_3	Q_4	Q_1	Q_2	Q_3	Q_4
Sydney	80	90	92	95	84	91	93	95	88	92	94	96
Phuket	95	90	90	60	94	88	87	58	95	89	86	64

- a. Complete the time series plot below to display all of the information from the table above. 1 mark



- b. Describe the pattern in the Phuket *occupancy rate* over the three years. 1 mark

- c. The following table shows the mean *occupancy rate* in the Phuket hotel for the three years.

	Q_1	Q_2	Q_3	Q_4	Mean <i>occupancy rate</i> for the year
2017	95	90	90	60	83.75
2018	94	88	87	58	81.75
2019	95	89	86	64	83.5

Find the seasonal index for the fourth quarter in the Phuket hotel. 2 marks

The COVID-19 pandemic disrupted the trade in the hotel chain from March 2020 onwards. The following table shows the monthly figures for *occupancy rates* for the year 2020 for the Sydney and Phuket hotels.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Sydney	92	90	92	64	60	60	50	45	50	48	51	52
Phuket	95	90	70	40	35	20	10	11	14	10	25	12

- d. What are the similarities and differences between the two patterns of *occupancy rates* for the year 2020? 1 mark

- e. In the space below, draw a back-to-back stem plot to display the information in the table above for both hotels. 2 marks

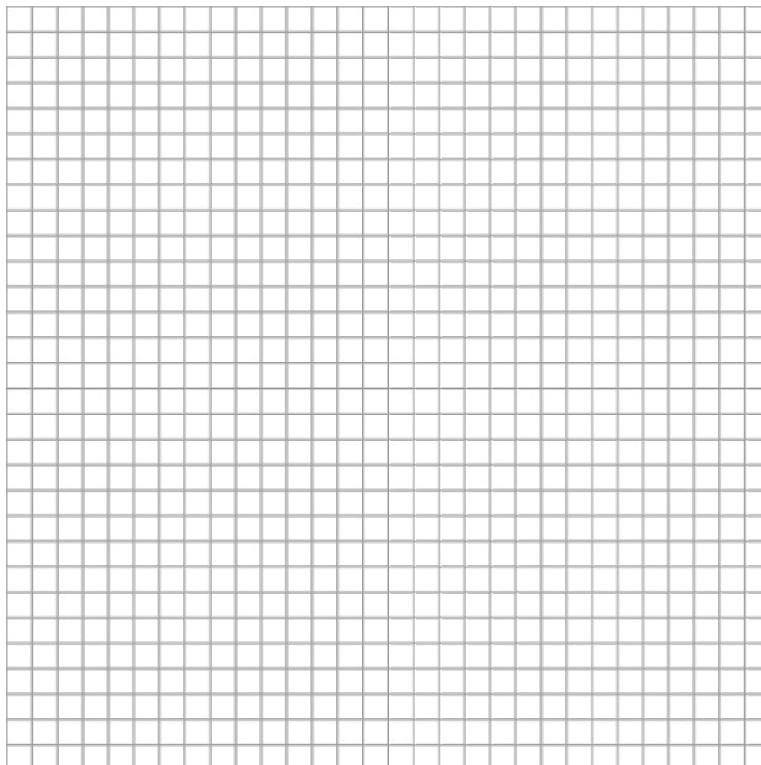
Question 3 (6 marks)

To investigate the effectiveness of a 12-month advertising campaign being run to boost *occupancy rates*, the figures for the *cost of advertising*, in 1000s of dollars, and the average *occupancy rate* for each month, expressed as a percentage, were recorded.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
<i>Cost of advertising</i> (× \$1000)	25	26	12	30	45	40	50	30	30	25	40	28
<i>Occupancy rate</i> (%)	70	80	65	80	90	80	90	60	65	70	75	65

- a. Which of the variables, *cost of advertising* or *occupancy rate*, is the response variable? Briefly explain your answer. 1 mark

- b. Draw a fully labelled scatterplot for this data on the grid below. 2 marks



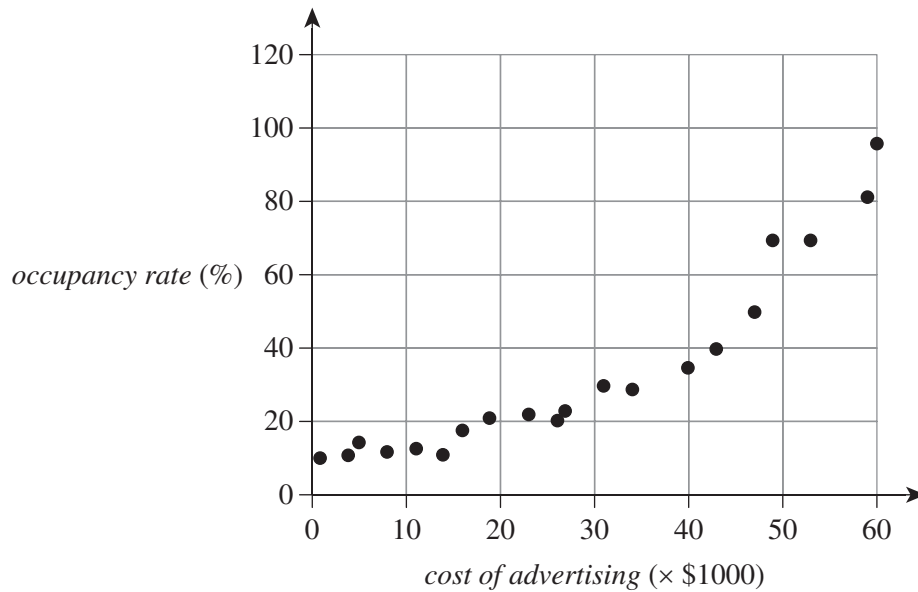
- c. i.** Find the correlation coefficient between *occupancy rate* and *cost of advertising*.
Round your answer to two decimal places. 1 mark

- ii.** Write the regression equation for *occupancy* versus *cost of advertising*.
Round all values in your equation to two decimal places. 1 mark

- iii.** The regression equation is used by one of the hotel staff to predict the *occupancy rate* if \$1 000 000 dollars were spent in advertising for the month.
Are there any problems with the employee using the regression equation? Briefly explain your answer. 1 mark

Question 4 (5 marks)

The scatterplot below shows the *occupancy rate* of 20 hotels in Phuket, expressed as a percentage, plotted against *cost of advertising*, in 1000s of dollars, over the last six months of 2020.

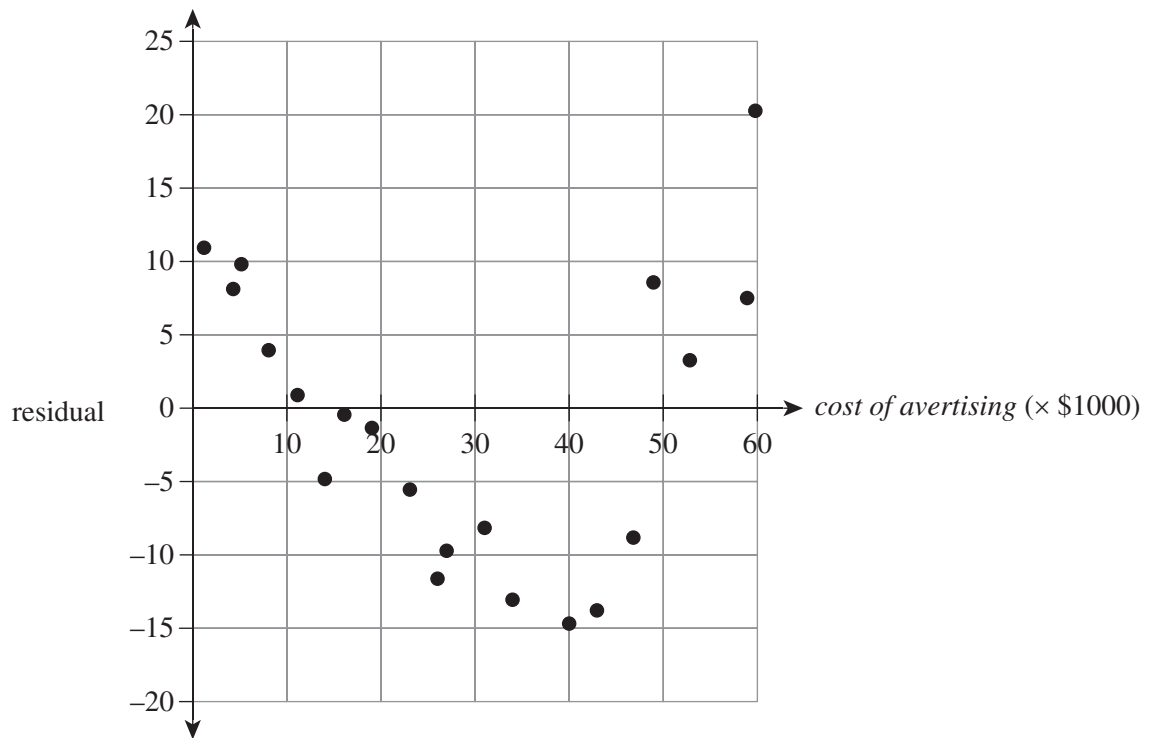


The regression equation is $occupancy\ rate = 1.3 \times cost\ of\ advertising - 2.3$ with a correlation of 0.925.

- a. Calculate the residual of the actual point (40, 35).

1 mark

b. Consider the following residual plot.



What does the residual plot above indicate about the assumption of a linear relationship?
Briefly explain your answer.

1 mark

A $\frac{1}{x}$ transformation is applied to the data and $r = 0.947$.

c. Complete the following sentence by filling in the boxes provided.

2 marks

% of the change in the value of is due
 to a change in the value of .

d. What extra information is needed to determine whether the linear or $\frac{1}{x}$ model better represents the data?

1 mark

Recursion and financial modelling

Question 5 (2 marks)

The Puzzle Hotel is named after its famous escape room and puzzle-themed guest rooms. Two of the escape room puzzles are recursion questions, which guests must solve to complete the escape room.

- a. Find the sum of the first 4 terms in the series described by $t_{n+1} = 2t_n + 9, t_1 = -6$. 1 mark

- b. Fully define the recursive relationship that describes the sequence 2, 3, 7, 23, 87. 1 mark

Question 6 (3 marks)

The owners of the Puzzle Hotel decided to borrow \$1.4 million to renovate the hotel. The hotel will be closed for 8 months while the renovations are completed. The loan is to be repaid over a ten-year period with a fixed interest rate of 3.2% per annum, compounding monthly.

- a.** Calculate the monthly repayment.

Round your answer to the nearest dollar.

1 mark

- b.** Find the balance still owing after 5 years of the loan, assuming all repayments have been made.

Round your answer to the nearest dollar.

1 mark

- c.** The owners of the hotel expect to be able to make an extra payment of \$800 000 after 2 years. Find the monthly repayment for the remaining 8 years of the loan.

Round your answer to the nearest dollar.

1 mark

Question 7 (3 marks)

The hotel manager predicts that in the first year after reopening, $n = 1$, the hotel will make a profit of \$50 000. It will then increase its profit by 8% each year until the yearly profit is at least \$90 000.

- a.** What is the predicted profit for the second year? 1 mark

- b.** Write a relationship to describe the predicted growth in profit. 1 mark

- c.** In what year will the profit first exceed the \$90 000 target? 1 mark

Question 8 (4 marks)

The cost of completely renovating a guest room is \$180 000, which can be depreciated over a six-year cycle using one of two options.

- Option 1: Depreciate using a flat 15% of the original purchase price.
- Option 2: Depreciate using a reducing balance of 25% per annum.

- a.** Write an expression to calculate the value of the renovated guest room after n years for each option. 2 marks

Option 1 _____

Option 2 _____

- b.** What is the value of the renovated guest room after 2 years using option 2? 1 mark

- c.** What is the scrap value when using option 1? 1 mark

SECTION B – MODULES

Instructions for Section B

Select **two** modules and answer **all** questions within the selected modules.

You need not give numerical answers as decimals unless instructed to do so. Alternative forms may include, for example, π , surds or fractions.

Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

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Module 4 – Graphs and relations	26

Module 1 – Matrices**Question 1** (4 marks)

Mason Bookstore sells children's books (C), paperback books (P) and hardback books (H). The price of these books, in dollars, can be found in matrix M below.

$$M = \begin{bmatrix} C & P & H \\ 15 & 30 & 50 \end{bmatrix}$$

- a. How much does a paperback book cost? 1 mark

A customer purchases 4 children's books, 6 paperback books and 1 hardback book from Mason Bookstore.

- b. Write this information as a column matrix. 1 mark

- c. Write a matrix calculation that will determine the cost of these books. 1 mark

- d. Mason Bookstore is holding a sale of 5% off the cost of each book.

Write a matrix calculation that will determine the new cost of these books if purchased during the sale. 1 mark

Question 2 (3 marks)

The bookstore has three branches, located at Boxville (B), Merakton (M) and Little Furness (L), and rotates stock daily between the three branches. Matrix S_0 below shows the number of books at each venue at the start of the day on Monday.

$$S_0 = \begin{bmatrix} 15000 \\ 15000 \\ 15000 \end{bmatrix}$$

The following equation describes the movement of stock between the three stores.

$$S_{n+1} = TS_n$$

- a. Matrix T is shown below. Two of the elements of this matrix are missing.

$$T = \begin{array}{ccc} & \begin{array}{c} \text{from} \\ B \quad M \quad L \end{array} & \\ \begin{array}{c} B \\ M \\ L \end{array} \text{ to} & \begin{bmatrix} 0.5 & \text{---} & \text{---} \\ 0.4 & 0.45 & 0.15 \\ 0.1 & 0.35 & 0.7 \end{bmatrix} & \end{array}$$

Complete matrix T above by filling in the missing elements.

1 mark

(Answer on matrix T above.)

- b. What does the element T_{21} represent?

1 mark

- c. What percentage of the books expected to be at Little Furness on Wednesday were in Merakton on Tuesday?

Round your answer to the nearest percentage.

1 mark

Question 3 (3 marks)

After a series of renovations, the bookstore owners create matrix B below, which shows the average number of books sold at the branches in Boxville (B), Merakton (M) and Little Furness (L) each day.

$$B = \begin{bmatrix} 1025 \\ 600 \\ 800 \end{bmatrix} \begin{matrix} B \\ M \\ L \end{matrix}$$

To know how many books are in each store on any day, the owners use an updated equation shown below, where S_1 represents Tuesday.

$$S_{n+1} = TS_n - B, \text{ where } S_1 = \begin{bmatrix} 11725 \\ 12900 \\ 17950 \end{bmatrix} \text{ and } T = \begin{matrix} & \text{from} \\ & B & M & L \\ \begin{bmatrix} 0.7 & 0.1 & 0.05 \\ 0.2 & 0.55 & 0.15 \\ 0.1 & 0.35 & 0.8 \end{bmatrix} & B \\ & M \\ & L \end{matrix} \text{ to}$$

- a. How many books were in Boxville on Wednesday? 1 mark

- b. The equation can also be used to model the movement of books from Monday to Tuesday.
Show that there were 15 000 books in Boxville on Monday. 1 mark

- c. The branches are open 7 days a week.
How many books need to be delivered to Merakton after closing on Sunday so that, upon opening on Monday, there are 15 000 books in Merakton? 1 mark

Question 4 (2 marks)

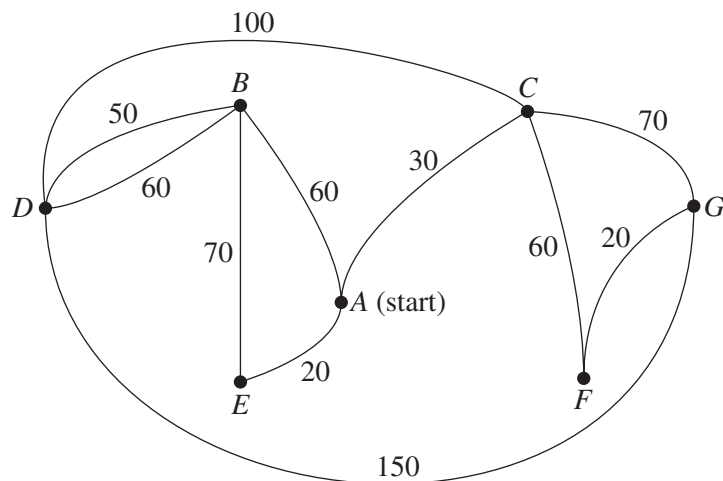
Two different bookstores, Ababooks (A) and Extrabooks (E), also transfer stock between each other on a daily basis. The stock levels at both bookstores remain the same after the books are transferred between them. The transition matrix below shows the movement of books.

$$T = \begin{array}{c} \text{today} \\ \begin{array}{cc} A & E \end{array} \\ \left[\begin{array}{cc} 0.8 & 0.05 \\ 0.2 & 0.95 \end{array} \right] \begin{array}{c} A \\ E \end{array} \text{ tomorrow} \end{array}$$

Given that 50 books moved from Ababooks to Extrabooks on a specific day, how many books do the bookstores have in total?

Module 2 – Networks and decision mathematics**Question 1** (5 marks)

Morgan is designing a school camp for Year 9 students. One of the activities being organised is orienteering. A map of the orienteering course is shown below with the edges on the graph representing the route between the markers. The number on each edge represents the distance between markers in metres.



- a. What is the shortest distance from marker D to marker F ? 1 mark

- b. To complete activity 1, students start at point A and visit every marker on the course without repeating a marker.

- i. What is the mathematical name for this type of journey? 1 mark

- ii. What is the shortest distance students can travel to complete activity 1? 1 mark

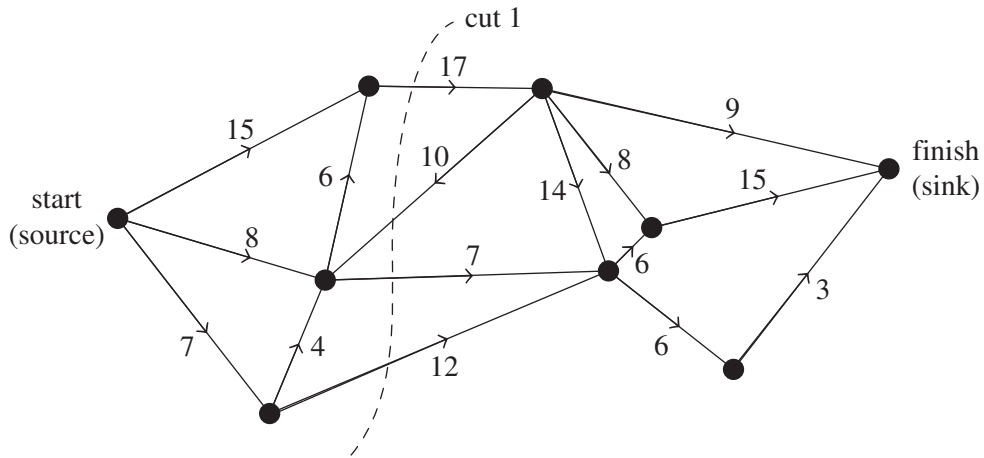
- c. To complete activity 2, students must travel along each of the routes between markers without repeating a route.

- i. Is activity 2 possible? Briefly explain your answer. 1 mark

- ii. If students are to complete activity 2, where would the route end? 1 mark

Question 2 (3 marks)

On a different day of the camp, there is an obstacle course with 8 activities. A diagram of the obstacle course is shown below. The numbers on the edges represent the maximum number of students that can participate on the activity at any one time.



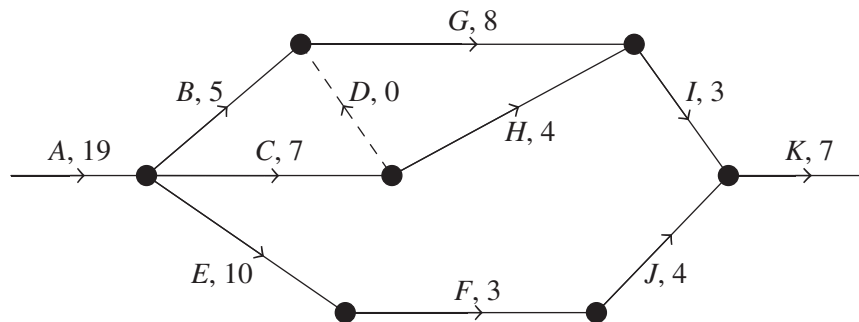
a. What is the number of possible routes through the obstacle course? 1 mark

b. The flow of a network can be determined by creating cuts.
Determine the capacity of cut 1. 1 mark

c. There are 30 students attending the camp.
Can the obstacle course accommodate all 30 students at once? Briefly explain your answer. 1 mark

Question 3 (4 marks)

In the evenings, students attending the camp are responsible for a number of tidying and preparation tasks. These tasks are outlined in the network below, along with the average number of minutes taken to complete each task.



- a. How many immediate predecessors does task *G* have? 1 mark
-
- b. How many minutes will it take to complete all the tasks? 1 mark
-
- c. What is the float time on task *J*? 1 mark
-
- d. One student is quicker than average at some of the tasks, as detailed in the table below.

Task	Time taken to complete tasks
<i>B</i>	3 minutes
<i>E</i>	6 minutes
<i>G</i>	7 minutes

In order to save the most time, which task should this student be assigned? 1 mark

Module 3 – Geometry and measurement**Question 1** (4 marks)

Airlineplus is an airline offering a variety of international flights. A table of the destinations is shown below.

Destination	Location	Time zone
Boston	42°N 71°W	GMT –5
Reykjavik	64°N 22°W	GMT +0
Istanbul	41°N 29°E	GMT +3
Bangkok	14°N 101°E	GMT +7
Santiago	33°S 71°W	GMT –4

- a. Which destination in the table above is closest to the equator? 1 mark

- b. Take the radius of the Earth to be 6400 km.

Write a calculation that shows the radius of the small circle of Earth at Reykjavik is 2806 km when rounded to the nearest kilometre.

1 mark

- c. What is the shortest distance between Boston and Santiago?

Round your answer to the nearest kilometre.

1 mark

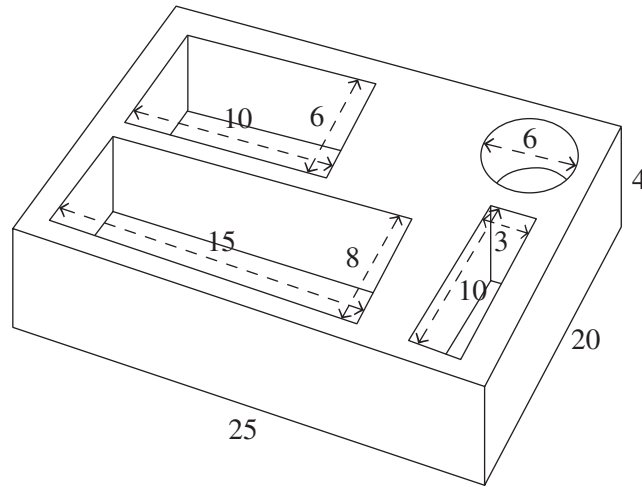
- d. A flight leaves Bangkok at 15:35 for Istanbul. The duration of the flight is 9 hours and 47 minutes.

At what time does the flight arrive in Istanbul?

1 mark

Question 2 (4 marks)

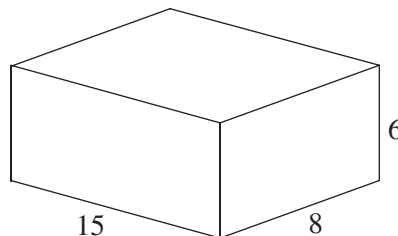
The meals on an Airlineplus flight come in a cardboard box. The box is a regular rectangular prism with different shapes cut out of the upper side for containers to rest inside, as shown in the following diagram. All measurements are in centimetres.



- a. Show, to the nearest square centimetre, that the amount of cardboard needed to make the upper side of the box is 262 square centimetres, when rounded to the nearest square centimetre. 1 mark

- b. What is the total surface area of the sides and bottom of the regular rectangular prism? 1 mark

- c. A container is placed in one of the cut-outs. The container is shown in the following diagram. All measurements are given in centimetres.



- What is the volume of the container, in cubic centimetres? 1 mark

- d.** A drink container in the shape of a cylinder is put into the circular hole of the cardboard box. The drink container has a capacity of 275 millilitres. Some of the drink container sticks up above the surface of the cardboard box.

What is the distance between the surface of the cardboard box and the top of the drink container?

Round your answer to the nearest centimetre.

1 mark

Question 3 (4 marks)

An Airlineplus plane takes off from Bangkok airport on a bearing of 035° and travels 400 km.

- a.** How far east of Bangkok airport has the plane travelled since taking off?
Round your answer to the nearest kilometre. 1 mark

- b.** What is the bearing of Bangkok airport from the plane? 1 mark

The plane then travels on a bearing of 055° for 1000 km.

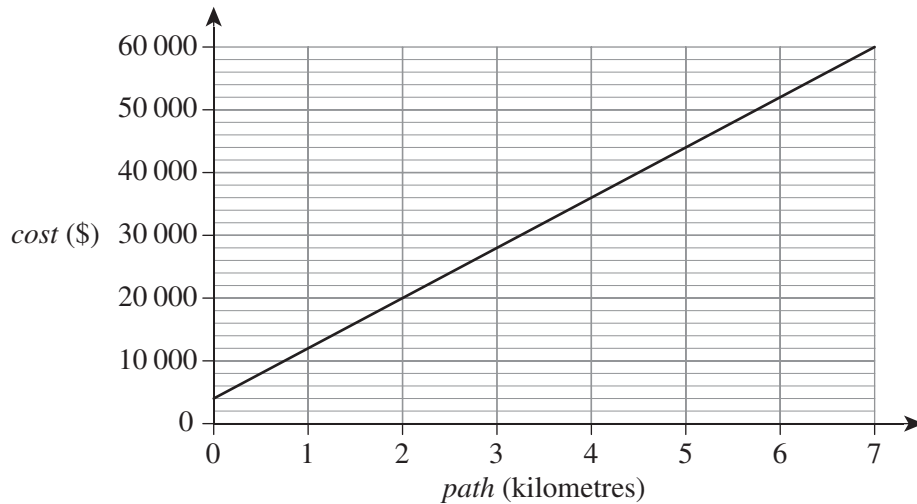
- c.** Show that the plane is now 901 km north of Bangkok airport when rounded to the nearest kilometre. 1 mark

- d.** To return to Bangkok airport, the plane flies in a straight line.
On what bearing will the plane travel to return to Bangkok airport?
Round your answer to the nearest degree. 1 mark

Module 4 – Graphs and relations

Question 1 (6 marks)

Plymouth council is planning to build a new 7-km bike path through the local park. It is proposed that the path will be 4 m wide, and crushed rock will be used for the covering of the path. The *cost* of the path, in dollars, for each kilometre of the *path* is represented on the graph below.



- a.** Complete the following sentences by filling in the boxes provided. 2 marks

The delivery cost is .

The cost of the path per kilometre is .

An alternative to crushed rock is a material made from recycled tyres. This material is flexible and can be sprayed directly on top of the old pathway. Constructing a bike path with this material requires an up-front cost of \$12 000. Each kilometre of path then costs \$4000.

- b.** Write an expression for the total cost, C , of materials for n kilometres using the recycled tyre material for the bike path. 1 mark

- c.** Sketch your answer to **part b.** on the **graph above.** 2 marks

(Answer on the graph above.)

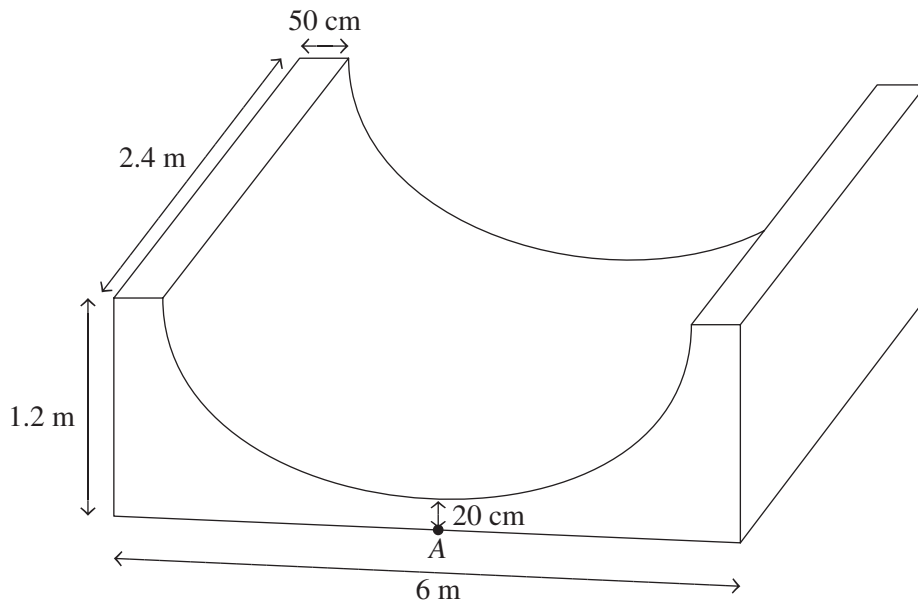
- d.** The council is considering whether the crushed rock option is more cost efficient than the recycled tyre option. Complete the following sentence by filling in the boxes provided. 1 mark

For a length of path that is less than km, it is cheaper

to use the option.

Question 2 (2 marks)

A halfpipe for skateboarding is constructed within the park as shown below.



The formula of the curved section of the halfpipe is described by the equation $y = kx^2$, with point A being (0, 0) for a set of axes that are drawn over the diagram.

- a.** Find the value of k .

Round your answer to two decimal places.

1 mark

- b.** The council wishes to add 400 mm to the height of the halfpipe to make it 1.6 m high.

If the same equation is applied, how long will the base need to be?

Round your answer to two decimal places.

1 mark

Question 3 (4 marks)

A souvenir shop within the park sells both T-shirts and tea towels, which they manufacture from a blend of cotton and polyester. They have 2 kilograms of cotton and 1.8 kilograms of polyester available. Each T-shirt uses 40 grams of cotton and 20 grams of polyester to manufacture. Each tea towel uses 20 grams of cotton and 30 grams of polyester to manufacture. The selling price for a T-shirt is \$25 and the selling price for a tea towel is \$8.

Let x = the number of T-shirts manufactured.

Let y = the number of tea towels manufactured.

- a. Three of the constraints for this relationship are shown below.

$$x \geq 0$$

$$y \geq 0$$

$$40x + 20y \leq 2000$$

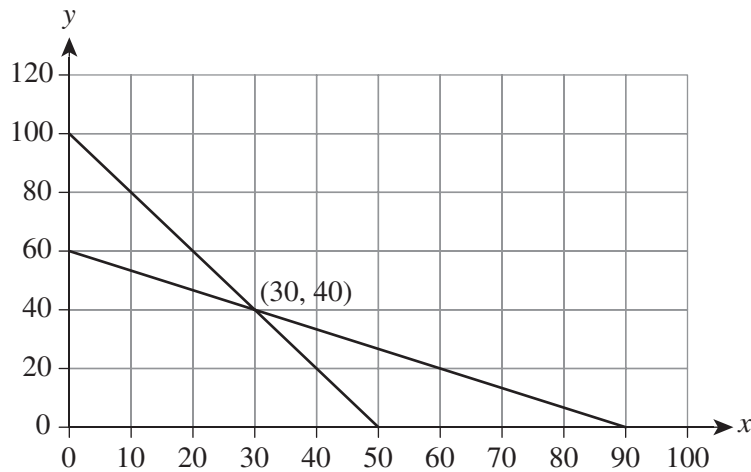
Write the fourth constraint.

1 mark

- b. Write the objective function.

1 mark

- c. Three of the constraints are sketched below.



How many T-shirts and tea towels should be sold to maximise the income of the souvenir shop? Show all working.

2 marks

END OF QUESTION AND ANSWER BOOKLET



Trial Examination 2021

VCE Further Mathematics Units 3&4

Written Examinations 1 & 2

Formula Sheet

Instructions

This formula sheet is provided for your reference.
A multiple-choice question booklet and a question and answer booklet are provided with this formula sheet.

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

FURTHER MATHEMATICS FORMULAS**Core – Data analysis**

standardised score	$z = \frac{x - \bar{x}}{s_x}$
lower and upper fence in a boxplot	lower $Q_1 - 1.5 \times IQR$ upper $Q_3 + 1.5 \times IQR$
least squares line of best fit	$y = a + bx$, 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 = $\frac{\text{actual figure}}{\text{deseasonalised figure}}$

Core – Recursion and financial modelling

first-order linear recurrence relation	$u_0 = a, \quad u_{n+1} = bu_n + c$
effective rate of interest for a compound interest loan or investment	$r_{\text{effective}} = \left[\left(1 + \frac{r}{100n} \right)^n - 1 \right] \times 100\%$

Module 1 – Matrices

determinant of a 2×2 matrix	$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}, \quad \det A = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$
inverse of a 2×2 matrix	$A^{-1} = \frac{1}{\det A} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}, \quad \text{where } \det A \neq 0$
recurrence relation	$S_0 = \text{intital state}, \quad S_{n+1} = TS_n + B$

Module 2 – Networks and decision mathematics

Euler's formula	$v + f = e + 2$
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Module 3 – Geometry and measurement

area of a triangle	$A = \frac{1}{2}bc \sin(\theta^\circ)$
Heron's formula	$A = \sqrt{s(s-a)(s-b)(s-c)}$, where $s = \frac{1}{2}(a+b+c)$
sine rule	$\frac{a}{\sin(A)} = \frac{b}{\sin(B)} = \frac{c}{\sin(C)}$
cosine rule	$a^2 = b^2 + c^2 - 2bc \cos(A)$
circumference of a circle	$2\pi r$
length of an arc	$r \times \frac{\pi}{180} \times \theta^\circ$
area of a circle	πr^2
area of a sector	$\pi r^2 \times \frac{\theta^\circ}{360}$
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 prism	area of base \times height
volume of a pyramid	$\frac{1}{3} \times$ area of base \times height

Module 4 – Graphs and relations

gradient (slope) of a straight line	$m = \frac{y_2 - y_1}{x_2 - x_1}$
equation of a straight line	$y = mx + c$

END OF FORMULA SHEET

VCE Further Mathematics Units 3&4

Written Examination 1

Multiple-choice Answer Sheet

Student's Name: _____

Teacher's Name: _____

Instructions

Use a **pencil** for **all** entries. If you make a mistake, **erase** the incorrect answer – **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
---	---	---	---	---

Use pencil only

Core: Data analysis
ONE ANSWER PER LINE

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

Core: Recursion and financial modelling
ONE ANSWER PER LINE

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
14	A	B	C	D	E
15	A	B	C	D	E
16	A	B	C	D	E

17	A	B	C	D	E
18	A	B	C	D	E
19	A	B	C	D	E
20	A	B	C	D	E
21	A	B	C	D	E
22	A	B	C	D	E
23	A	B	C	D	E
24	A	B	C	D	E

Continues over page

Answer TWO modules. Show modules answered by shading the appropriate box and writing the name of the module in the box provided.

Use pencil only

Module:

- Matrices
- Networks and decision mathematics
- Geometry and measurement
- Graphs and relations

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- Matrices
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Module:

ONE ANSWER PER LINE

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

ONE ANSWER PER LINE

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