

Attach your candidate label here

GENERAL MATHEMATICS

MTG315123

Section **A** Mathematical and Statistical Models

Pages: 12

Questions: 6

Information Sheet: 1

Preparation time for this exam: 15 minutes

Suggested working time: 36 minutes

Instructions:

- Answer **all** questions and **all** items within each question.
- Write your answers in the spaces provided in this exam paper.
 - A spare diagram has been provided at the end of this section. Indicate using the box provided if you have used the spare diagram.
- TASC approved calculators are allowed.
- The exam is **three (3) hours** in length. The suggested working time for this section is **approximately 36 minutes**.
- The General Mathematics Information Sheet can be used throughout the exam.
- All answers must be written in **English**.
- You **must** make sure your answers address the listed criterion.

Marker use	
C3	/ 36

Guide to Exam Structure

	Parts	Questions available	Questions to answer	Suggested working time	Marks available
Section A		6	6	36 minutes	36 marks
Section B		4	4	36 minutes	36 marks
Section C		4	4	36 minutes	36 marks
Section D		4	4	36 minutes	36 marks
Section E	Part 1	5	5	36 minutes	36 marks
	OR				
	Part 2	5	5	36 minutes	36 marks
Totals		28	23	180 minutes (3 hours)	180 marks

Criterion

You **must** make sure your answers address:

- Criterion 3 apply mathematical and statistical models to investigate, represent and analyse real-world situations and solve problems.

Question 1

Marker use

Write next to each question whether the sequence is arithmetic, geometric or neither.

- a) $t_n = 2n + 7$
- b) $t_n = n^2 - 2$
- c) $t_{n+1} = 2 \times t_n, t_1 = 5$
- d) $t_n = 3 \times 6^{n-1}$

Total
Q1
/4

Question 2

The graph below displays the profit for the first five months of a new small business.

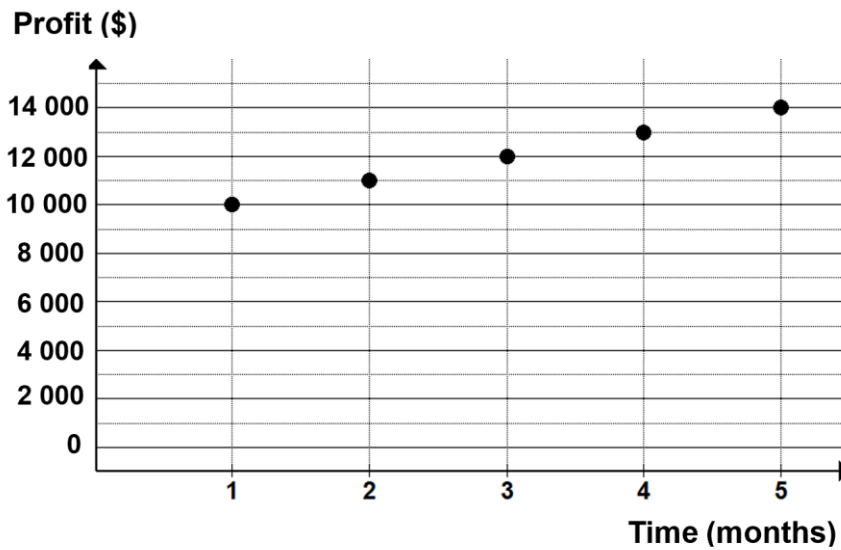


Figure 1

- a) Find a sequence, U_n , that represents these values.

.....

.....

.....

.....

/2

- b) Find the sum, S_5 , of these first 5 terms.

.....

.....

.....

.....

/2

Total
Q2
/4

Question 3

Marker use

Write expressions for each of the following sequences. Assume each sequence is called t_n and starts with t_1 .

- a) A sequence starts with 10, then 8 is added each time to generate the next term.

/1

.....

- b) A sequence starts with 5, then each successive term is multiplied by 2.

/1

.....

- c) A sequence starts with 10, each successive term is found by multiplying by 3, then subtracting 5.

/1

.....

- d) A sequence starts with 10 and 15, then each successive term is found by adding the two previous terms.

/1

.....

Total
Q3
/4

Question 4

Marker use

The table below shows the price of gold (in \$US/gram) over the last 15 years.

Years (Y) since 2010	Price (P) (\$US/g)
1	1100
3	1250
5	1200
7	1300
9	1500
11	1800
13	2000
15	3200

Table 1

- a) Use your calculator to find a linear regression for this data in the form

$$P = aY + b.$$

/2

Give your values for a and b to **two (2)** decimal places.

.....
.....
.....

- b) Explain what your value of a means in terms of the price of gold.

/2

.....
.....
.....

- c) State the value of r and interpret this value in terms of the data.

/2

.....
.....
.....
.....

Question 4 continues

Question 4 continued

A graph of the residual values is shown below.

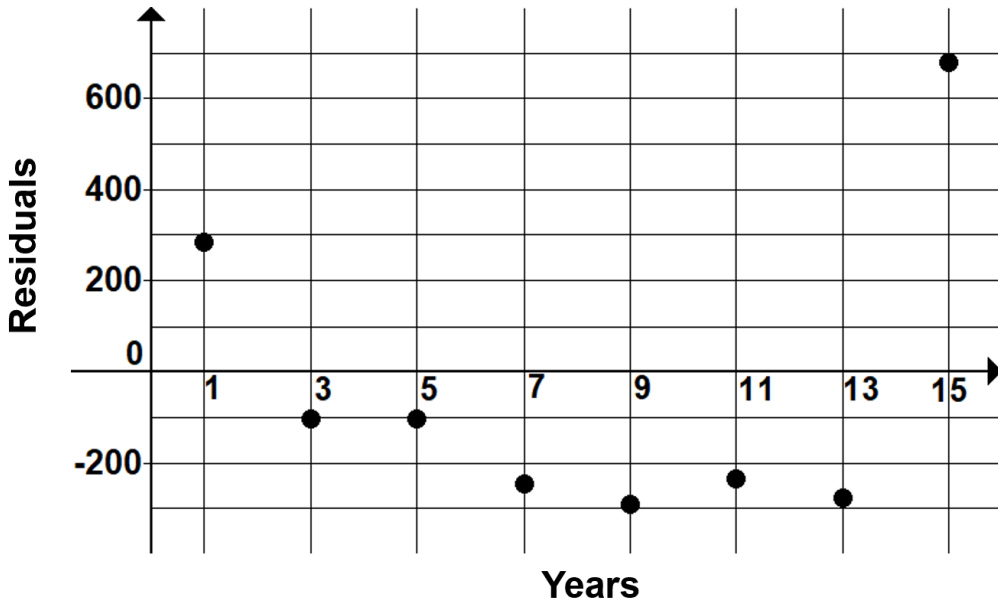


Figure 2

d) Explain what the point (9, -290.5) on the graph signifies.

/2

.....

.....

.....

e) Based on the residual plot and other statistics, do you think a linear equation is appropriate for modelling the price of gold over the last 15 years? Give reasons for your answer.

/4

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Total
Q4
/12

Question 5

Marker use

A man puts \$10 000 in a trust fund that earns 4% p.a. interest calculated yearly.

Each year he withdraws the interest and gives it to his grandchild.

a) What is this type of investment called?

/1

.....
.....

b) How much does the grandchild receive each year? Show algebraic working.

/1

.....
.....
.....
.....

c) The man now decides to use up the \$10 000 over 20 years, by giving the grandchild a larger amount each year. How much is he able to give now?

/2

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

Total
Q5
/4

Question 6

Erin wants to depreciate the value of her computer for tax purposes. It originally cost her \$2 500. She is offered two options:

1. Reduce the value by 20% of the purchase price each year.
2. Reduce the value by 20% of its current value each year.

Erin thinks these percentages are a little odd, so she draws a table of the value of the computer using each method.

a) Complete the table below.

Time (years)	Method 1 Value (\$)	Method 2 Value (\$)
0 (original value)	2 500	2 500
1		
2		
3		
4		
5		

Table 2

Spare diagram used (X)

.....

.....

.....

.....

/4

Question 6 continued

Marker use

b) Which method is better for tax purposes? Explain your answer.

/2

.....

.....

.....

.....

c) After **three (3)** years, Erin decides to sell her computer to buy a better one. Explain which method she should use now.

/2

.....

.....

.....

.....

Total
Q6
/8

Spare Diagrams

Question 6 a)

Time (years)	Method 1 Value (\$)	Method 2 Value (\$)
0 (original value)	2 500	2 500
1		
2		
3		
4		
5		

Table 2

End of Section A

Blank Page



This exam paper and any materials associated with this exam
(including answer booklets, cover sheets, rough note paper, or information sheets)
remain the property of Tasmanian Assessment, Standards and Certification.

External Assessment 2025

GENERAL MATHEMATICS

MTG315123

Section **B** Bivariate Data Analysis

Pages: 16

Questions: 4

Information Sheet: 1

Suggested working time: 36 minutes

Instructions:

- Answer **all** questions and **all** items within each question.
- Write your answers in the spaces provided in this exam paper.
 - Spare diagrams have been provided at the end of this section. Indicate using the box provided if you have used the spare diagram.
- TASC approved calculators are allowed.
- The exam is **three (3) hours** in length. The suggested working time for this section is **approximately 36 minutes**.
- The General Mathematics Information Sheet can be used throughout the exam.
- All answers must be written in **English**.
- You **must** make sure your answers address the listed criterion.

Marker use

C5

/ 36

Blank Page

Guide to Exam Structure

	Parts	Questions available	Questions to answer	Suggested working time	Marks available
Section A		6	6	36 minutes	36 marks
Section B		4	4	36 minutes	36 marks
Section C		4	4	36 minutes	36 marks
Section D		4	4	36 minutes	36 marks
Section E	Part 1 OR	5	5	36 minutes	36 marks
	Part 2	5	5	36 minutes	36 marks
Totals		28	23	180 minutes (3 hours)	180 marks

Criterion

You **must** make sure your answers address:

- Criterion 5 interpret concepts and apply mathematical techniques to solve problems involving bivariate data analysis and time series analysis using the statistical investigation process.

Question 7

Below are the record times by age range for women completing a 5 km parkrun. The parkrun has been held weekly for over 10 years, with anybody welcome to compete each week.

Age Range (years)	Midpoint Age (x) (years)	Time (y) (seconds)	xy	x ²
20-24	22	1028	22616	484
25-29	27	1081		729
30-34	32	977	31264	1024
35-39	37	1034	38258	1369
40-44	42	1166	48972	1764
45-49	47	1186	55742	2209
50-54	52	1167	60684	2704
55-59	57	1169	66633	3249
Totals (Σ)		8808	353356	13532

Table 3

- a) Calculate the **two (2)** missing values in the table above.

/2

.....

.....

- b) Use the regression formula from your Information Sheet, with $n = 8$, to show that $a = 5.181$ and $b = 896.4$.

/3

Hence write the regression equation using the variable T (time) and A (age).

.....

.....

.....

.....

.....

.....

.....

Question 7 continued

Marker use

c) Using the regression equation, predict the time for a runner of age 32.

/2

.....
.....

d) Predict the age of a runner who completes the course in a time of 900 seconds.
Show algebraic working.

/2

.....
.....
.....

e) The value of r^2 is 0.6124.
Comment on the reliability of the predictions in parts c) and d).

/3

.....
.....
.....
.....
.....
.....

Total
Q7
/12

Question 8

Marker use

The world-famous rock band LoudNoise has approached a government and said they will play 12 concerts a year in their city, so long as the government builds a new rock arena first.

The government surveys 200 local people about the issue and the results can be summarised as follows:

	In favour of LoudNoise	Against LoudNoise	Totals
In favour of a rock arena	105	5	110
Against a rock arena	60	30	90
Totals	165	35	200

Table 4

a) What percentage of those surveyed are in favour of LoudNoise playing 12 concerts, regardless of whether they are in favour of the rock arena being built?

/1

.....
.....

b) What percentage of those surveyed are in favour of a rock arena, whether LoudNoise plays 12 concerts or not?

/1

.....
.....

Question 8 continues

Question 8 continued

- c) Complete the percentages in the table below. Round your percentages to the nearest whole number.

	In favour of LoudNoise	Against LoudNoise
In favour of a rock arena		
Against a rock arena		
Total	100%	100%

Table 5

Spare diagram used (X)

- d) Draw a segmented column chart below to represent the information from part c).

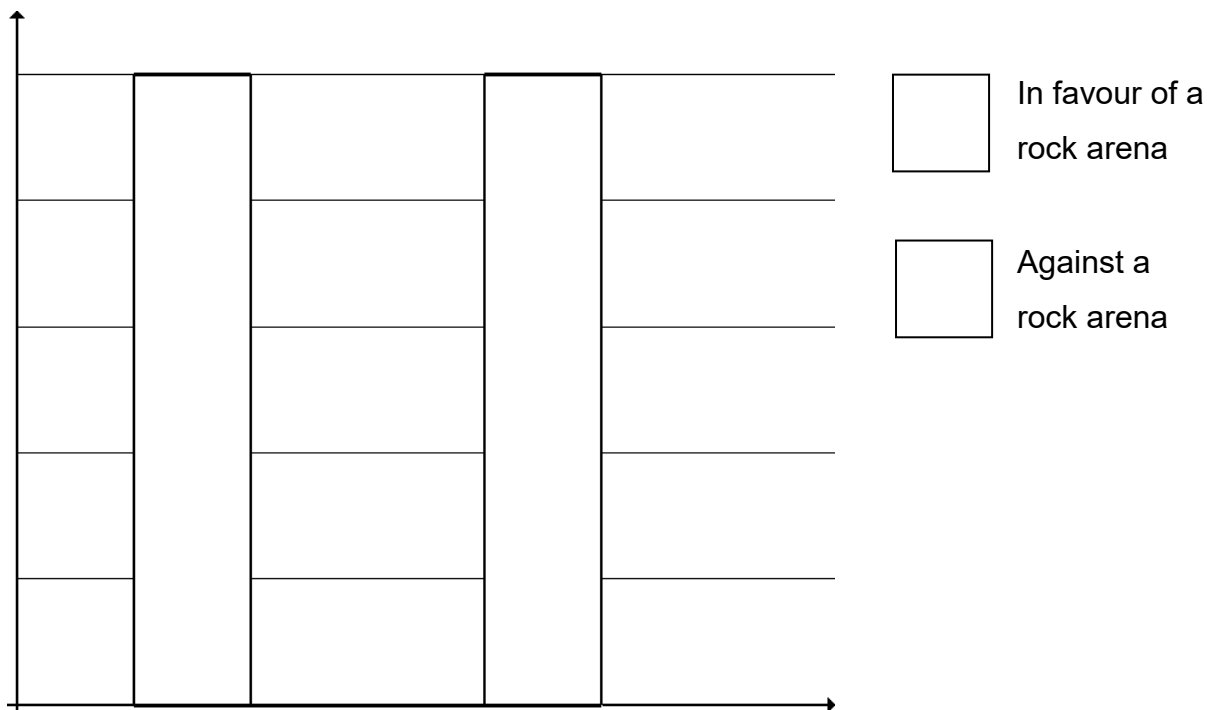


Figure 3

Spare diagram used (X)

/2

/2

Total
Q8
/6

Question 9

Three months later, a new survey is undertaken and the new raw data, two-way table and segmented column chart are shown below:

	In favour of LoudNoise	Against LoudNoise	Totals
In favour of a rock arena	55	5	60
Against a rock arena	65	75	140
Totals	120	80	200

Table 6

	In favour of LoudNoise	Against LoudNoise
In favour of a rock arena	46%	6%
Against a rock arena	54%	94%
Total	100%	100%

Table 7

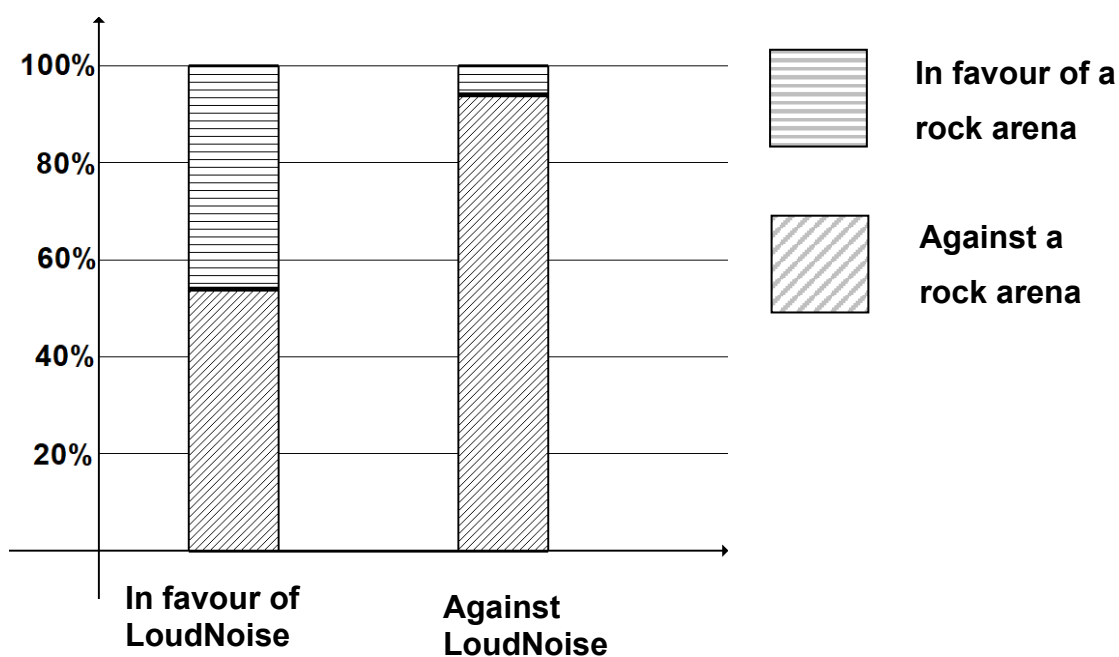


Figure 4

Question 9 continued

Marker use

- a) **Based only on the data in Table 6, 7 and Figure 4**, is there an association between whether people are in favour of LoudNoise playing concerts and the rock arena being built? Explain your answer.

/3

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- b) Explain, **using the data in Table 6, 7 and Figure 4**, whether **you** think the government should build the rock arena.

/3

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**Total
Q9
/6**

Question 10

The number of student cars parked in a college carpark varies during the year, as some students gain their licence.

	February	June	October
2021	65	114	137
2022	72	105	138
2023	61	95	141
2024	58	106	129

Table 8

A graph is produced of the data.

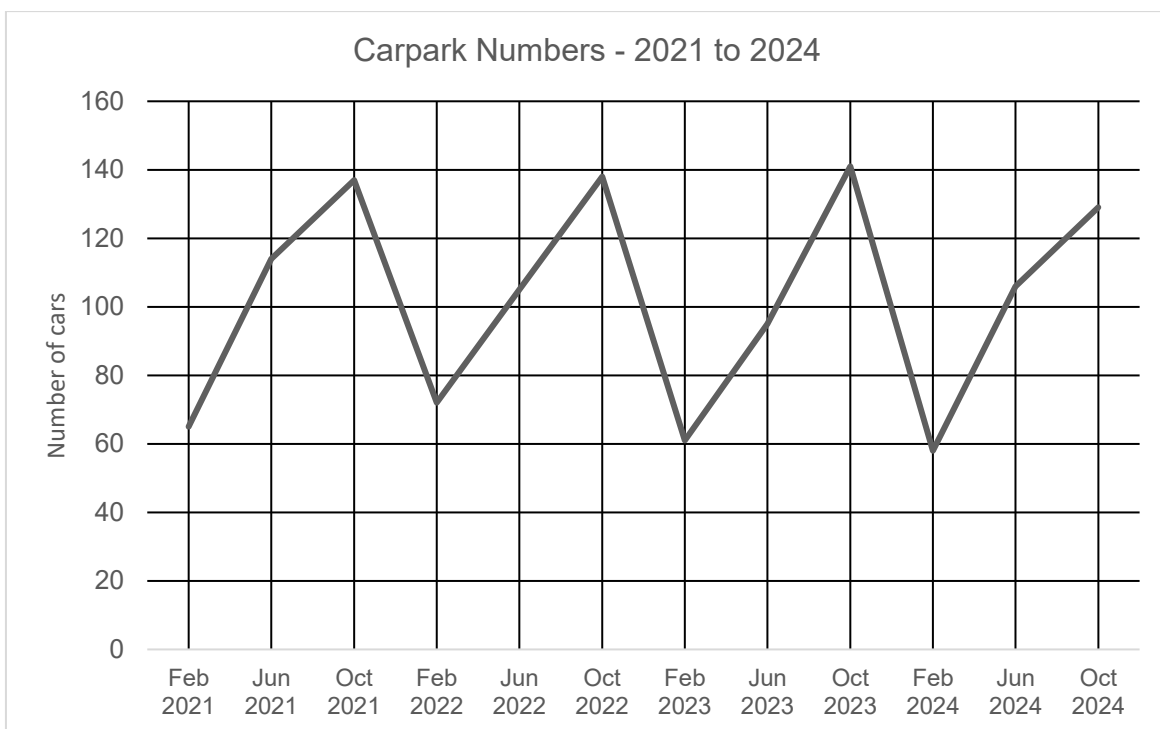


Figure 5

Question 10 continued

Marker use

a) What features of the data make it appropriate to analyse by deseasonalising it?

/2

.....

.....

.....

The table below shows the deseasonalised data.

	February	June	October	Averages
2021	65	114	137	105.3
2022	72	105	138	
2023	61	95	141	99
2024	58	106	129	97.7

Table 9

Spare diagram used (X)

b) Calculate the missing average value in Table 9.

/2

.....

.....

.....

Question 10 continued

c) Calculate the **two (2)** missing values in Table 10.

	February	June	October
2021	0.617	1.082	1.301
2022	0.686	1.000	1.314
2023	0.616		1.424
2024	0.594	1.085	1.321
Index Value		1.032	1.340

Table 10

Spare diagram used (X)

/3

d) Using the original value of 137 for October 2021, find the deasonalised value for October 2021.

	Deseasonalised data		
	February	June	October
2021	103.5	110.5	
2022	114.6	101.8	103.0
2023	97.1	92.1	105.2
2024	92.3	102.7	96.3

Table 11

Spare diagram used (X)

/1

Question 10 continues

Question 10 continued

Pictured below is the original, along with the deseasonalised data.

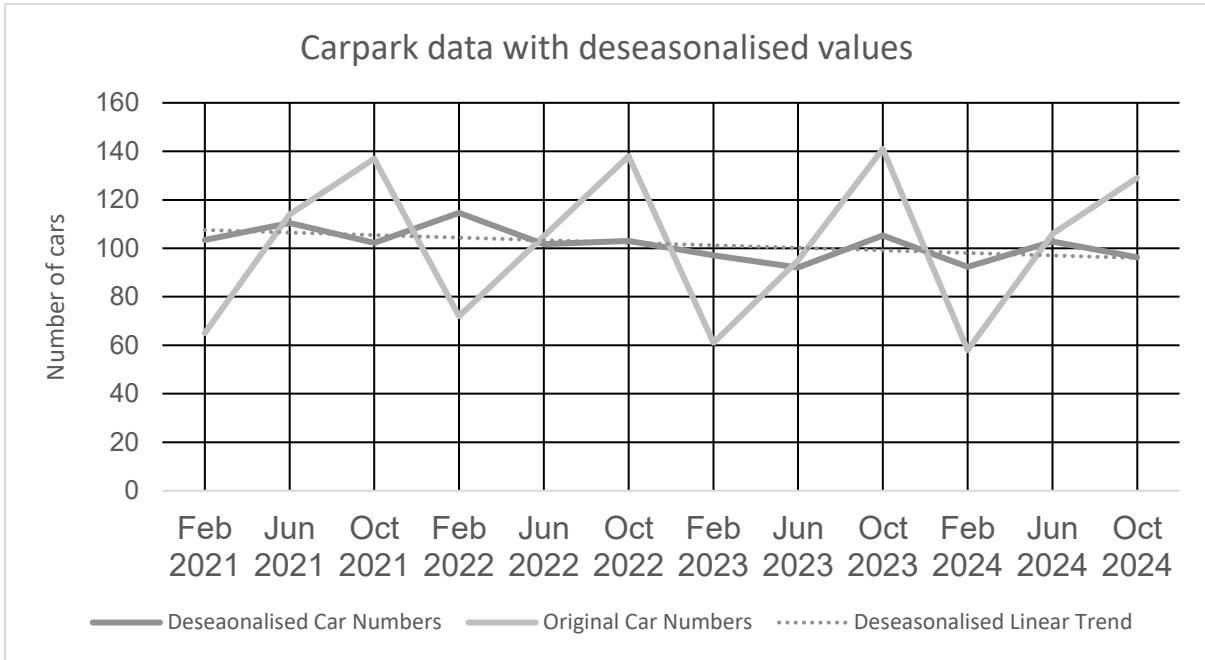


Figure 6

- e) The deseasonalised linear trend line has an equation of $C = -1.05t + 108.6$, where C is the number of cars and t is the time period.

/1

Note: February 2021 is considered to be $t = 1$.

What trend is suggested by the deseasonalised linear trend line?

.....

.....

.....

- f) Use the deseasonalised linear trend line to predict the actual number of cars in the carpark in February 2026.

/3

.....

.....

.....

.....

.....

Total
Q10
/12

Spare Diagrams

Question 8 c)

	In favour of LoudNoise	Against LoudNoise
In favour of a rock arena		
Against a rock arena		
Total	100%	100%

Table 5

Question 8 d)

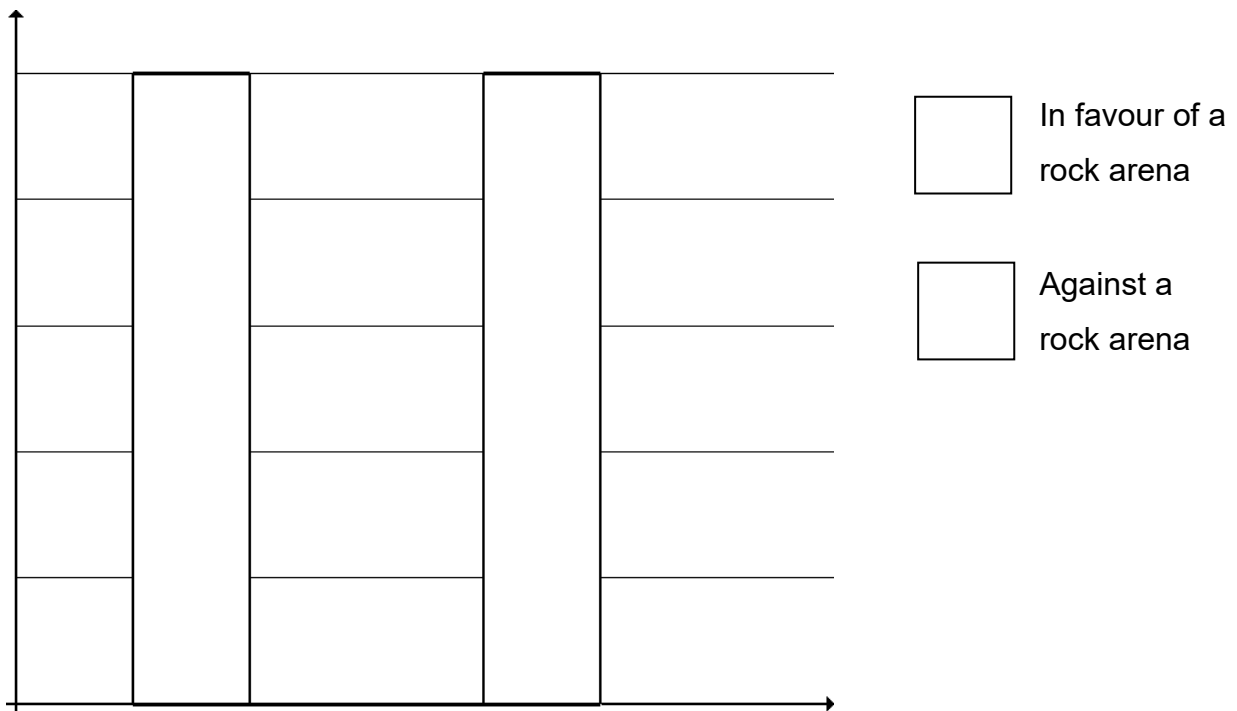


Figure 3

Spare Diagrams

Question 10 b)

	February	June	October	Averages
2021	65	114	137	105.3
2022	72	105	138	
2023	61	95	141	99
2024	58	106	129	97.7

Table 9

Question 10 c)

	February	June	October
2021	0.617	1.082	1.301
2022	0.686	1.000	1.314
2023	0.616		1.424
2024	0.594	1.085	1.321
Index Value		1.032	1.340

Table 10

Question 10 d)

	Deseasonalised data		
	February	June	October
2021	103.5	110.5	
2022	114.6	101.8	103.0
2023	97.1	92.1	105.2
2024	92.3	102.7	96.3

Table 11

End of Section B



TASMANIAN
ASSESSMENT, STANDARDS
& CERTIFICATION

This exam paper and any materials associated with this exam
(including answer booklets, cover sheets, rough note paper, or information sheets)
remain the property of Tasmanian Assessment, Standards and Certification.

External Assessment 2025

GENERAL MATHEMATICS

MTG315123

Section **C** Growth and Decay in Sequences

Pages: 12

Questions: 4

Information Sheet: 1

Suggested working time: 36 minutes

Instructions:

- Answer **all** questions and **all** items within each question.
- Write your answers in the spaces provided in this exam paper.
 - Spare diagrams have been provided at the end of this section. Indicate using the box provided if you have used the spare diagram.
- TASC approved calculators are allowed.
- The exam is **three (3) hours** in length. The suggested working time for this section is **approximately 36 minutes**.
- The General Mathematics Information Sheet can be used throughout the exam.
- All answers must be written in **English**.
- You **must** make sure your answers address the listed criterion.

Marker use

C6

/ 36

Guide to Exam Structure

	Parts	Questions available	Questions to answer	Suggested working time	Marks available
Section A		6	6	36 minutes	36 marks
Section B		4	4	36 minutes	36 marks
Section C		4	4	36 minutes	36 marks
Section D		4	4	36 minutes	36 marks
Section E	Part 1	5	5	36 minutes	36 marks
	OR				
	Part 2	5	5	36 minutes	36 marks
Totals		28	23	180 minutes (3 hours)	180 marks

Criterion

You **must** make sure your answers address:

- Criterion 6 interpret concepts and apply mathematical techniques to model patterns and solve problems involving growth and decay in sequences.

Question 11

Marker use

a) The first four terms of a sequence are:

a_1	a_2	a_3	a_4
20	50	80	110

Table 12

Explain, using the values, why this sequence is arithmetic.

.....

.....

.....

/2

b) A sequence is given by $b_n = 3 \times 2^{n-1}$.

Write the first four terms of b_n .

.....

.....

.....

/2

c) A sequence begins with $a = 3$, then the next term is generated by multiplying the previous term by 2 and subtracting 1.

Complete the table below for the values of the first 5 terms:

c_1	c_2	c_3	c_4	c_5
3	5			

Table 13

/2

Spare diagram used (X)

Total
Q11
/6

Question 12

Marker use

Ron performs as a busker every week at a local market. He finds that his earnings are decreasing by 10% each week from the week before.

- a) He earns \$100 in the first week, so that $t_1 = 100$.

The first four terms are given by:

Week	1	2	3	4
Term	t_1	t_2	t_3	t_4
Earnings	\$100	\$90	\$81	\$72.90

Table 14

Write down t_5 and t_6 .

.....

.....

/2

- b) Write an explicit formula for the geometric sequence.

.....

.....

/1

- c) Ron wants to calculate his total earnings since he began busking.

He finds:

Week	1	2	3	4
Term	S_1	S_2	S_3	S_4
Total Earnings	\$100	\$190	\$271	\$343.90

Table 15

Find the total earnings for the first 40 weeks (S_{40}).

.....

.....

/2

Question 12 continues

Question 12 continued

Marker use

- d) If Ron continues to busk forever, his total earnings will never exceed a certain amount. Use a formula to find this amount and explain why this maximum amount exists.

/3

.....

.....

.....

.....

.....

.....

.....

**Total
Q12
/8**

Question 13

Marker use

It is known that the 6th term of an increasing sequence is 100 and the 8th term is 144.

Term	6		8
Value	100		144

Table 16

a) Assuming the sequence is arithmetic, called A_n , find A_7 and hence find the first term.

/2

.....

.....

.....

.....

.....

.....

b) Assuming the sequence is geometric, called G_n , find G_7 in this case, and hence find the first term, given the value of r is positive.

/3

.....

.....

.....

.....

.....

.....

Question 13 continues

Question 13 continued

Marker use

A partially completed graph of both sequences is shown below:

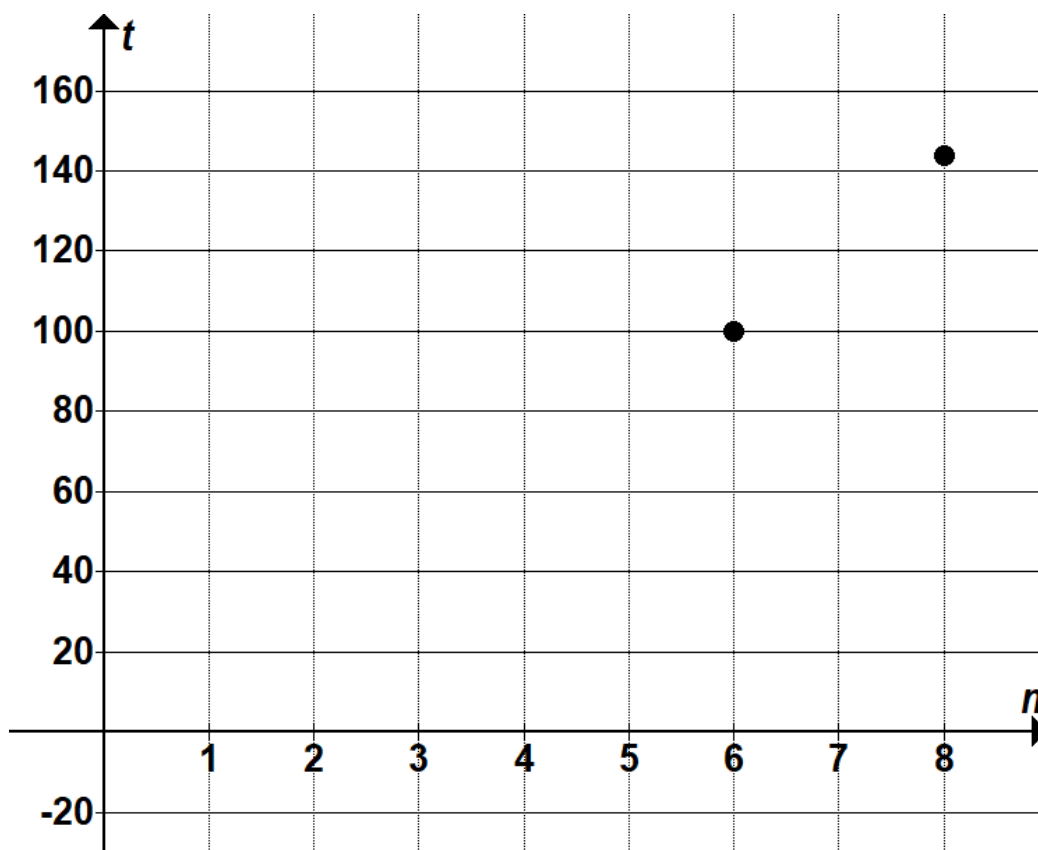


Figure 7

Spare diagram used (X)

c) Mark on the graph the first 8 terms of A_n and G_n .

/4

.....

.....

d) Identify each graph as either linear or exponential, and as growth or decay.

/2

.....

.....

Total
Q13
/11

Question 14

Marker use

The number of members of a national sports club is currently 20 000. Each year 5% of members leave and another 3 000 join the club.

- a) Write this situation as a difference equation, where C_n is the number of club members after n years, and assume $C_1 = 20\,000$.

/2

.....
.....

The club president is concerned that membership will not increase beyond a certain number.

- b) Show that this value is 60 000 and state what it is called.

/3

.....
.....
.....
.....

The president does not want membership to grow this large, as there are not the facilities for this number of members.

They will implement a cap of 1 000 new members per year, assuming 5% will continue to leave the club.

- c) If C_1 is again 20 000, write the new difference equation for this situation.

/1

.....
.....

- d) What will happen to the club membership now?

/2

.....
.....
.....

Question 14 continues

Question 14 continued

Marker use

- e) With the current membership of 20 000 and the cap of 1 000 new members each year, what would the percentage of members leaving each year need to reduce to, so that membership rises to 30 000?

/3

.....

.....

.....

.....

.....

.....

**Total
Q14
/11**

Spare Diagrams

Question 11 c)

c_1	c_2	c_3	c_4	c_5
3	5			

Table 13

Question 13 c)

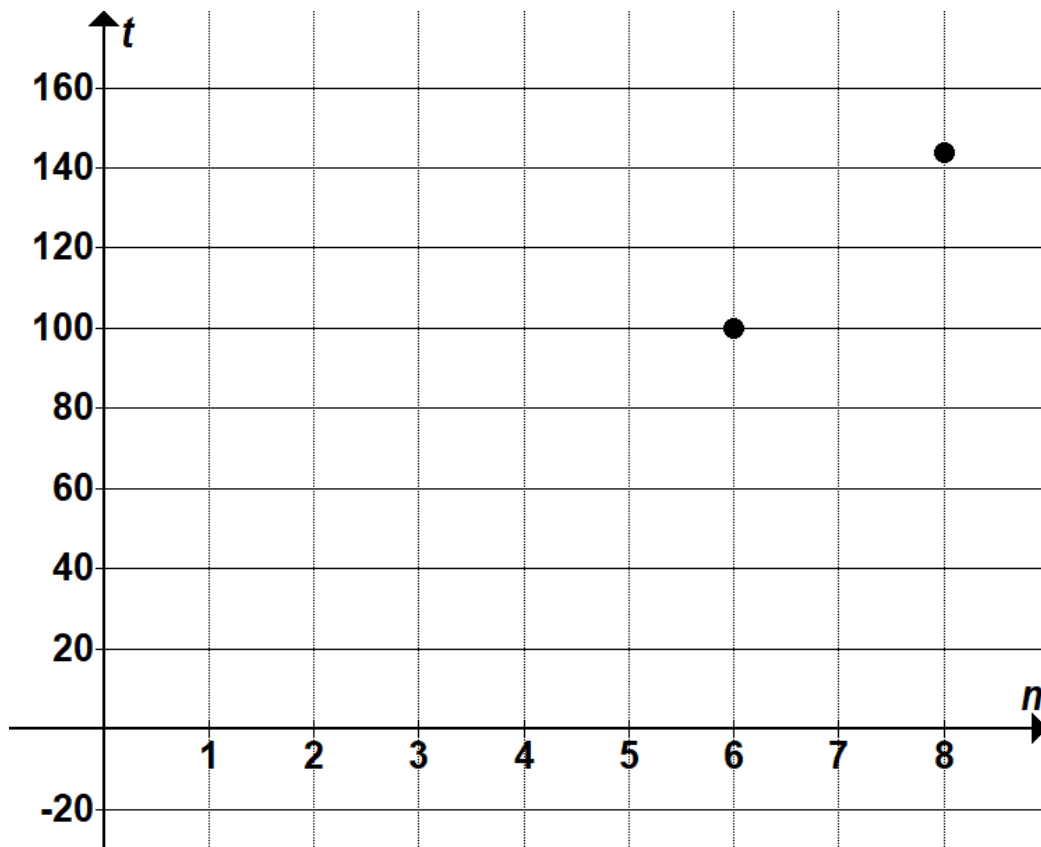


Figure 7

End of Section C
Blank Page



TASMANIAN
ASSESSMENT, STANDARDS
& CERTIFICATION

This exam paper and any materials associated with this exam
(including answer booklets, cover sheets, rough note paper, or information sheets)
remain the property of Tasmanian Assessment, Standards and Certification.

External Assessment 2025

GENERAL MATHEMATICS

MTG315123

Section **D** Finance

Pages: 12

Questions: 4

Information Sheet: 1

Suggested working time: 36 minutes

Instructions:

- Answer **all** questions and **all** items within each question.
- Write your answers in the spaces provided in this exam paper.
 - A spare diagram has been provided at the end of this section. Indicate using the box provided if you have used the spare diagram.
- TASC approved calculators are allowed.
- The exam is **three (3) hours** in length. The suggested working time for this section is **approximately 36 minutes**.
- The General Mathematics Information Sheet can be used throughout the exam.
- All answers must be written in **English**.
- You **must** make sure your answers address the listed criterion.

Marker use	
C7	/ 36

Guide to Exam Structure

	Parts	Questions available	Questions to answer	Suggested working time	Marks available
Section A		6	6	36 minutes	36 marks
Section B		4	4	36 minutes	36 marks
Section C		4	4	36 minutes	36 marks
Section D		4	4	36 minutes	36 marks
Section E	Part 1	5	5	36 minutes	36 marks
	OR				
	Part 2	5	5	36 minutes	36 marks
Totals		28	23	180 minutes (3 hours)	180 marks

Criterion

You **must** make sure your answers address:

- Criterion 7 interpret concepts and apply mathematical techniques to solve problems involving standard financial models.

Question 15

Marker use

The banks below are offering the following interest rates:

- Bank A: 6.15% p.a. compounding monthly
- Bank B: 6.25% p.a. compounding quarterly
- Bank C: 6.50% p.a. compounding annually.

a) Use the effective interest rate formula to decide which bank offers the best rate.

/3

.....

.....

.....

.....

.....

.....

b) Gary decides to invest with Bank B. He has \$12 000 to invest and would like it to grow to \$15 000. How long will this take, to the nearest quarter?

/2

.....

.....

.....

.....

.....

**Total
Q15
/5**

Question 16

Marker use

Freda is 25 years old and has just begun full-time employment. Currently, she is renting and considering buying a home.

She could buy a \$600 000 home, with a 20-year, 4.1% p.a. loan, compounding monthly. The payments are calculated monthly.

a) What type of annuity would this be – advance or arrears? Explain your answer.

/2

.....
.....
.....

b) Use a suitable formula to show that Freda’s monthly repayments will be \$3 667.58.

/2

.....
.....
.....
.....
.....

Freda instead considers continuing to rent for the next 20 years and putting the savings each month into an investment account paying 4.1% p.a., compounding monthly. She pays \$2 800 per month in rent, so she will be investing \$867.58 per month.

/2

c) What type of annuity would this be – advance or arrears? Explain your answer.

.....
.....
.....

Question 16 continues

Question 16 continued

Marker use

d) Show that Freda will have saved \$322 907.03 by the end of the 20 years.

/2

.....

.....

.....

.....

.....

e) Freda will save approximately half the value of the house over 20 years if she chooses this option rather than getting a home loan. Explain why.

/2

.....

.....

.....

.....

.....

.....

**Total
Q16
/10**

Question 17

Marker use

Josh wants to save up to buy a \$60 000 car in 10 years' time. He deposits \$1 000 per quarter into a savings account that pays 8% p.a. compounding quarterly.

a) Find the amount in the fund after **five (5)** years.

/3

.....

.....

.....

.....

.....

.....

Josh believes the savings account should have a balance of \$30 000 after 5 years, so he decides to check the calculations himself.

b) Using either:

/2

- the difference equation $t_{n+1} = 1.02(t_n + 1000)$, $t_0 = 0$,

OR

- the annuity formula $F = \frac{1000(1+0.02)[(1+0.02)^n-1]}{0.02}$

Find the value of the fund **from the beginning**, after the first **two (2)** quarters.

.....

.....

.....

.....

Question 17 continues

Question 17 continued

Marker use

c) Complete the table to find the value of the savings account after **four (4)** quarters.

Quarter	Value at start (\$)	Value after Deposit (\$)	Interest Earned (\$)	Value at end (\$)
1	0	1 000	20	1 020
2	1 020			
3				
4				

Table 17

Spare diagram used (X)

.....

.....

.....

After the 10 years, Josh is ready to buy the car. Unfortunately, the cost of the car has increased by 1.5% p.a. each year due to inflation.

d) Find out how much the car costs now and how much extra Josh will have to pay to buy it.

.....

.....

.....

.....

.....

.....

/3

/3

Total
Q17
/11

Question 18

Marker use

John bought a new home in 2020. He took out a home loan for \$500 000 over 25 years, with monthly repayments and an interest rate of 4.5% p.a., calculated monthly.

a) Calculate the monthly repayments on the loan.

/2

.....
.....
.....
.....
.....

b) Calculate how much is remaining on the loan after **five (5)** years.

/2

.....
.....
.....
.....

After 5 years, the bank lowers the interest rate by 0.5% to 4% p.a.

c) How much lower would John's repayments be each month if he wanted the loan to continue for the remaining 20 years?

/3

.....
.....
.....
.....
.....

Question 18 continues

Question 18 continued

Marker use

d) John decides instead to keep his monthly repayments the same as in part a). How much time will he save in repaying the loan, to the nearest month?

/ 3

.....

.....

.....

.....

.....

.....

**Total
Q18
/ 10**

Spare Diagrams

Question 17 c)

Quarter	Value at start (\$)	Value after Deposit (\$)	Interest Earned (\$)	Value at end (\$)
1	0	1 000	20	1 020
2	1 020			
3				
4				

Table 17

End of Section D
Blank Page



TASMANIAN
ASSESSMENT, STANDARDS
& CERTIFICATION

This exam paper and any materials associated with this exam
(including answer booklets, cover sheets, rough note paper, or information sheets)
remain the property of Tasmanian Assessment, Standards and Certification.

GENERAL MATHEMATICS

MTG315123

Section **E** Networks **or** Trigonometry

Pages: 28

Questions: 5 / 5

Information Sheet: 1

Suggested working time: 36 minutes

Instructions:

- There are **two (2)** parts to this section. Answer **all** questions in **one (1)** part. Either:
 - **Part 1** – networks and decision mathematics
- OR**
- **Part 2** – trigonometry and Earth geometry – Part 2 commences on page 16.
- Write your answers in the spaces provided in this exam paper.
 - Spare diagrams have been provided at the end of each part. Indicate using the box provided if you have used the spare diagram.
- TASC approved calculators are allowed.
- The exam is **three (3) hours** in length. The suggested working time for this section is **approximately 36 minutes**.
- The General Mathematics Information Sheet can be used throughout the exam.
- All answers must be written in **English**.
- You **must** make sure your answers address the listed criterion.

Marker use	
C8	/ 36

Guide to Exam Structure

	Parts	Questions available	Questions to answer	Suggested working time	Marks available
Section A		6	6	36 minutes	36 marks
Section B		4	4	36 minutes	36 marks
Section C		4	4	36 minutes	36 marks
Section D		4	4	36 minutes	36 marks
Section E	Part 1	5	5	36 minutes	36 marks
	OR Part 2	5	5	36 minutes	36 marks
Totals		28	23	180 minutes (3 hours)	180 marks

Criterion

You **must** make sure your answers address:

- Criterion 8 interpret concepts and apply mathematical techniques to represent, analyse and solve practical problems in the two-dimensional plane.

Part 1 – Networks

- Either answer **all** questions in this part **OR all** questions in Part 2.

Question 19

Below are the plans for a small Unit and the adjacency matrix for it.

	A	B	C	D	E	F
A	0	0	1	0	1	0
B	0	0	0	1	0	0
C	1	0	0		1	0
D	0	1		0	0	1
E	1	0	1	0	0	
F	0	0	0	1		0

Figure 8: adjacency matrix.

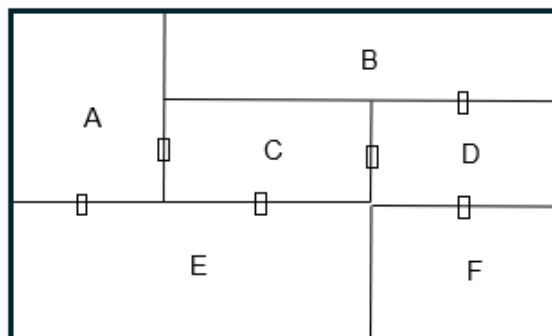


Figure 9: plans for small Unit.

- Complete the missing values in the adjacency matrix (Figure 8).
- Draw a network from the adjacency matrix and Unit plan above.

/1

/2

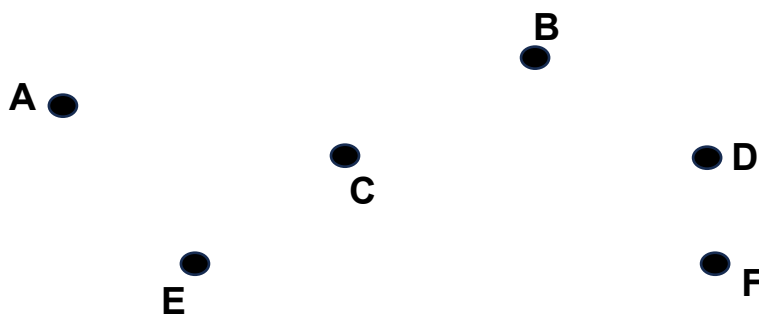


Figure 10

Spare diagram used (X)

- An Open Trail is a walk where no edge is repeated and which starts and ends at different vertices. An Open Trail is **not** possible for the network in part b).

/2

Add an extra door to the Unit plan in Figure 9 so that an Open Trail is now possible. Describe this Open Trail.

.....

Total
Q19
/5

Question 20

Marker use

The network below shows the roads connecting towns in a municipality. The numbers between the towns indicate the lengths of the corresponding roads (in km).

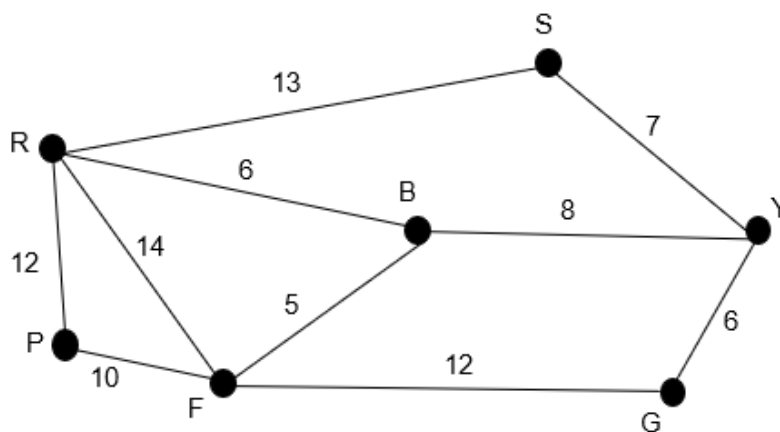


Figure 11

- a) Make **three (3)** attempts to find the shortest path from R to Y. For each attempt, give the path and the distance travelled.

/3

Attempt 1:

.....

.....

Attempt 2:

.....

.....

Attempt 3:

.....

.....

Question 20 continues

Question 20 continued

Marker use

- b) Currently all the roads in the municipality are gravel. The Council wants to upgrade some of the roads, but only the roads required so that a minimum connection of the towns is possible. Show how this can be done and calculate the minimum distance required (in km).

/3

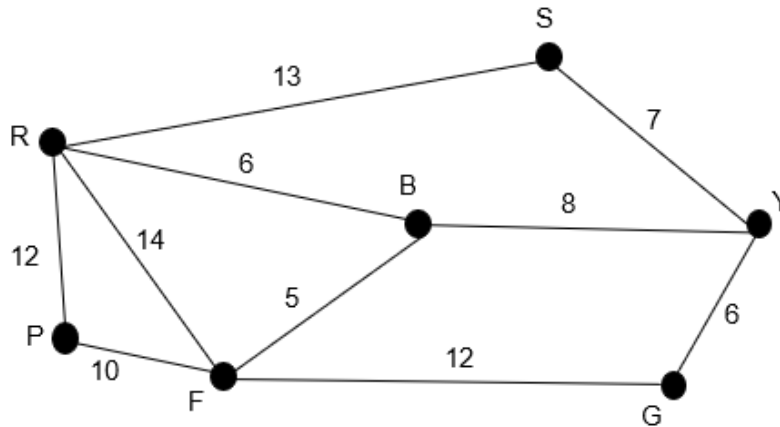


Figure 12

Spare diagram used (X)

.....

.....

Total
Q20
/6

Question 21

The same Council is researching evacuation plans for the municipality, with cars entering the area at point R and leaving at point Y.

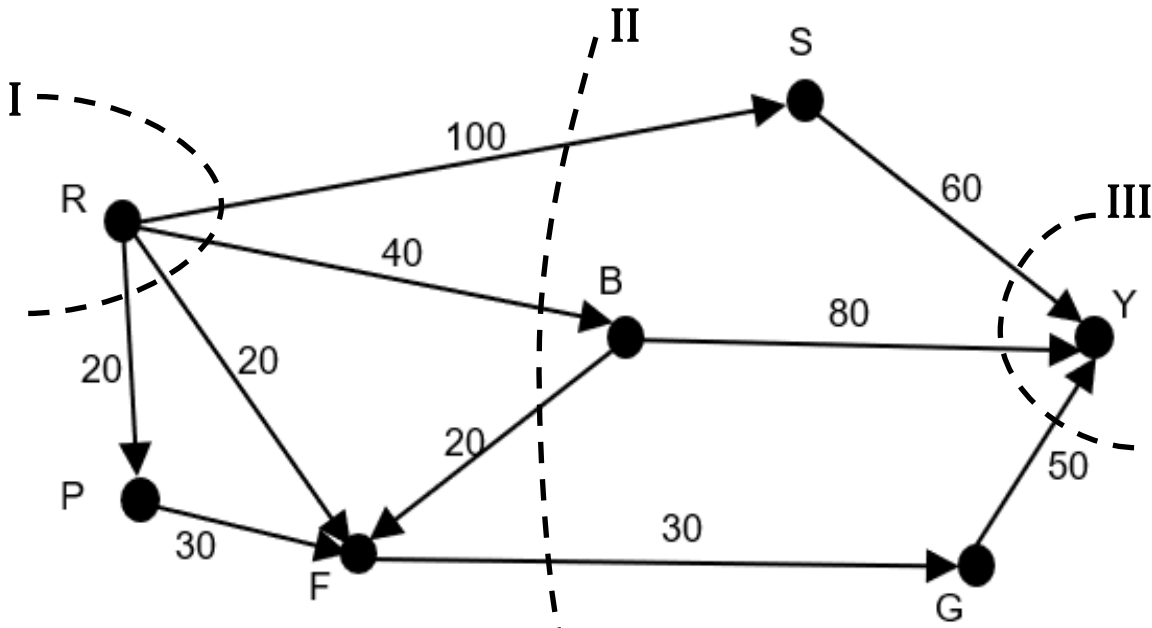


Figure 13

Spare diagram used (X)

The numbers in Figure 13 now represent the number of cars that can travel along the road in hundreds of cars per hour.

a) Mark on Figure 13 the values of the three cuts shown.

.....

.....

.....

/2

c) By adding **three (3)** more cuts to the network, find the maximum flow.

.....

.....

.....

.....

.....

/3

Question 21 continues

Question 21 continued

Marker use

- c) The road from F to G is to be upgraded. What is the maximum worthwhile improvement for this road, in hundreds of cars per hour?

/2

.....

.....

.....

.....

**Total
Q21
/7**

Question 22

The activities table (Table 18) and the corresponding precedence graph (Figure 14) for a construction project are provided below.

a) Task H does not have its immediate predecessors written in the table. Add these in.

Activity	Immediate Predecessors
A	-
B	-
C	A, B
D	B
E	A, B
F	C
G	E, F
H	
I	E, F

Table 18

b) The graph requires a dummy edge to be added. Draw this edge on Figure 14, labelling it X.

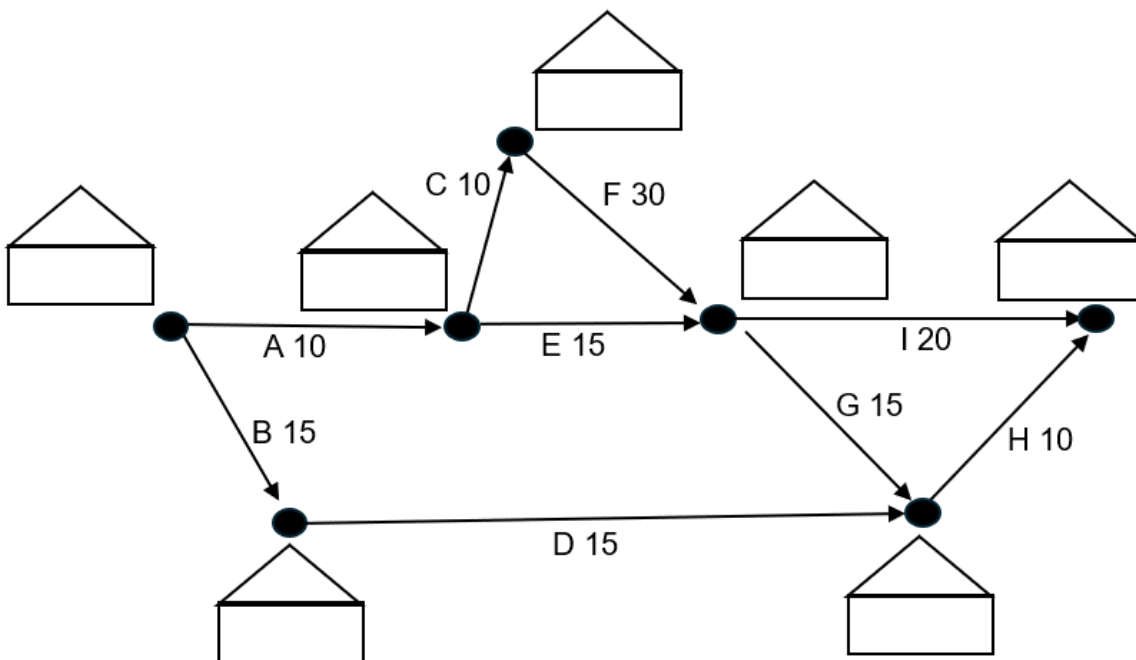


Figure 14

Spare diagram used (X)

/1

/1

Question 22 continues

Question 22 continued

Marker use

- c) The graph (Figure 14) also includes the time for each task to be completed in days. Use this graph to calculate the minimum completion time for the project.

/4

.....

.....

.....

- d) List the critical path for this network and the completion time for the project in days.

/3

.....

.....

.....

.....

.....

- e) Calculate the float time in days for Task D.

/1

.....

.....

**Total
Q22
/10**

Question 23

Doris, Ed, Frank and Gretel (D, E, F and G) compete in a Rubik's cube competition.

There are **four (4)** events, solving different sized Rubik's cubes in the minimum time (in seconds).

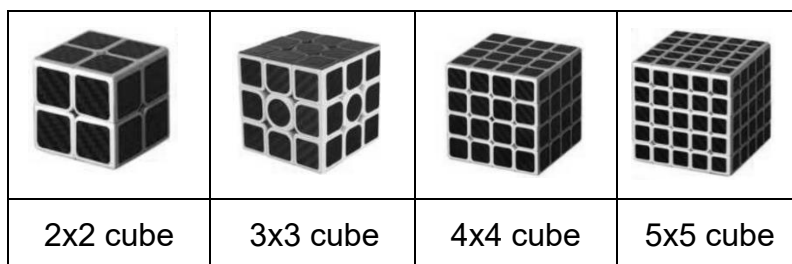


Figure 15

Only **one (1)** person can compete in each event. Their favourites are represented in the bipartite graph below:

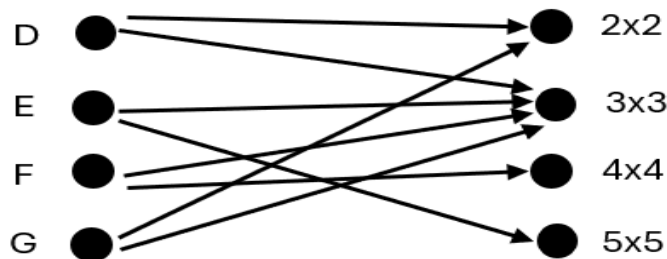


Figure 16

a) Give **one (1)** possible assignment of each person to an event.

.....

.....

/2

Since there is more than **one (1)** possible assignment, they decide they should use the Hungarian Algorithm to assign themselves to each event.

They put their best times (in seconds) for each event in a matrix:

	2x2	3x3	4x4	5x5
D	3	4	12	16
E	6	5	8	12
F	4	4	9	11
G	8	12	14	19

Table 19

Question 23 continues

Question 23 continued

Marker use

b) Complete row reduction (Table 20), then column reduction (Table 21) for the matrix.

Table 20

Table 21

Spare diagram used (X)

/2

c) Complete the Hungarian step (Table 22), then check the process is complete.

Table 22

Spare diagram used (X)

/2

d) What is the best assignment for the team and what is the minimum time?

- | | |
|-----|-------|
| D ● | ● 2x2 |
| E ● | ● 3x3 |
| F ● | ● 4x4 |
| G ● | ● 5x5 |

Figure 17

Spare diagram used (X)

/2

.....

 Minimum time:

**Total
Q23
/8**

Spare Diagrams

Question 19 b)

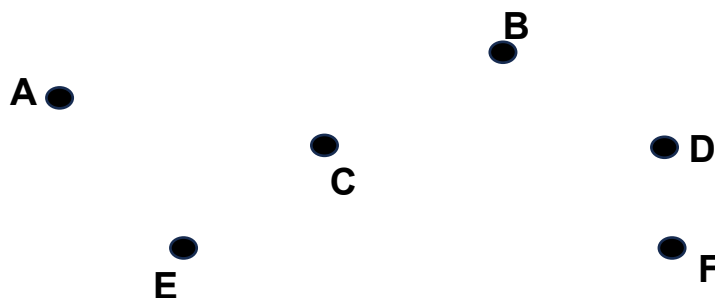


Figure 10

Question 20 b)

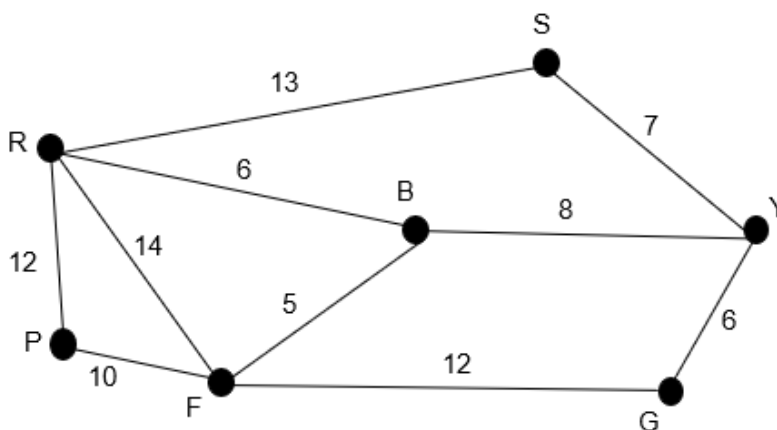


Figure 12

Question 21 b)

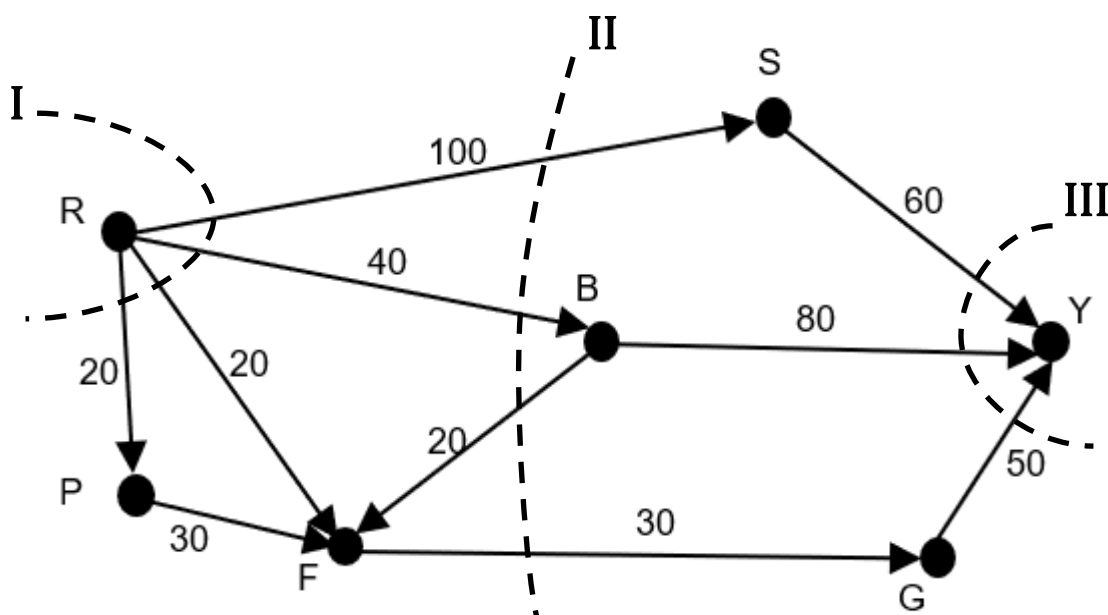


Figure 13

Spare Diagrams

Question 22 b)

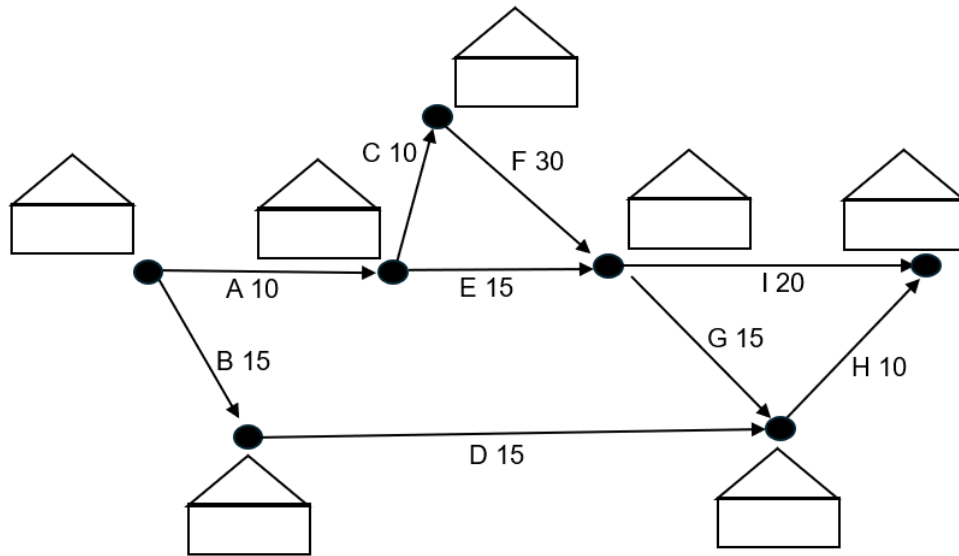


Figure 14

Question 23 b)

Table 20

Table 21

Question 23 c)

Table 22

Spare Diagrams

Question 23 d)

D	●	●	2x2
E	●	●	3x3
F	●	●	4x4
G	●	●	5x5

Figure 17

Exam continues over the page

Blank Page

Part 2 – Trigonometry

- Either answer **all** questions in this part **OR** all questions in Part 1.

Question 24

A block of land is composed of a right-angled triangle connected to another triangle, as pictured below.

A surveyor wants to calculate the area of the property in square metres (m^2).

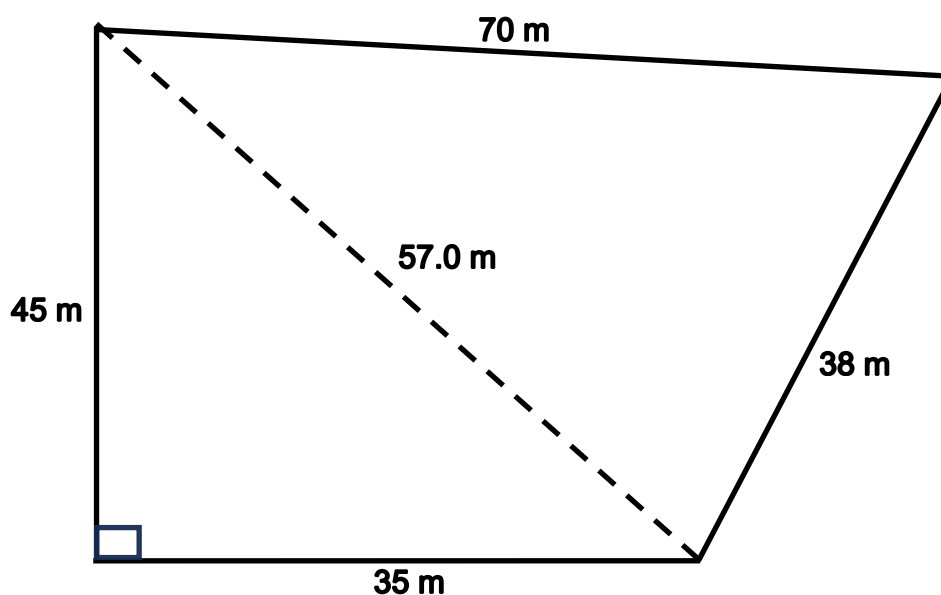


Figure 18

- a) Show algebraically, using the lower triangle, that the central distance is 57.0 m, correct to **one (1)** decimal place.

/1

.....
.....

- b) Find the area of the right-angled triangle.

/1

.....
.....

Question 24 continues

Question 24 continued

Marker use

- c) Find the area of the second triangle using an appropriate formula, correct to **one (1)** decimal place. Hence, give the total area for the block of land.

/ 3

.....

.....

.....

.....

.....

.....

.....

.....

.....

**Total
Q24
/ 5**

Question 25

Marker use

Two boats head out from a Port at the same time.

- Boat A heads on a bearing of N65°E at a speed of 3 km/h.
- Boat B heads on a bearing of S86°E at a speed of 4 km/h.

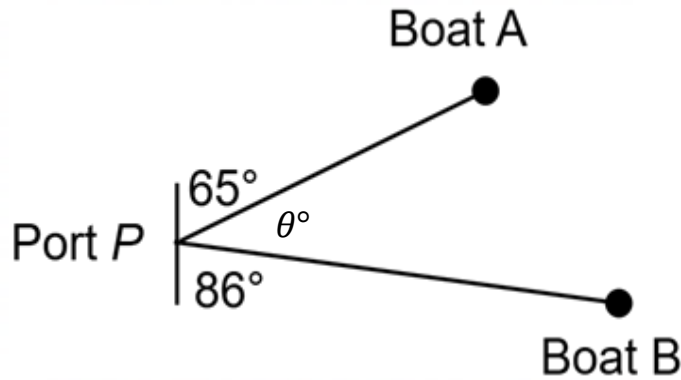


Figure 19

a) After two hours, how far has each boat travelled?

.....
.....

/₁

b) Find the angle θ .

.....
.....

/₁

After two hours, a passenger on Boat A falls seriously ill. They need immediate medical treatment either back at Port or at Boat B.

c) What bearing would Boat A need to sail on to return to Port? Give your answer as a true bearing.

.....
.....

/₁

d) Find the distance from Boat A to Boat B at its current location.

.....
.....
.....

/₂

Question 25 continues

Question 25 continued

Marker use

e) Boat A decides to sail to Boat B. Give the bearing they will need to travel on, as a true bearing, correct to the nearest minute.

/4

.....

.....

.....

.....

.....

.....

**Total
Q25
/9**

Question 26

Marker use

Ally and Bob are 100 m apart and a large tree is directly between them.

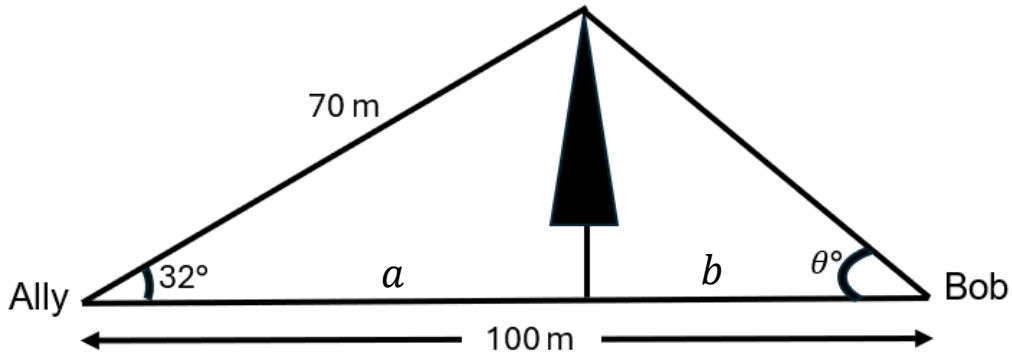


Figure 20

Ally is testing out some new apps on her phone. She discovers that she is 70 m from the top of the tree, and that the angle of elevation from the ground to the top of the tree is 32° for her.

- a) Find the height of the tree in metres, correct to **two (2)** decimal places.

.....

/1

- b) Find the distances that both Ally and Bob are from the base of the tree, a and b .

.....

/2

- c) Use this information to find the angle of elevation from the ground to the top of the tree for Bob, θ° , correct to the nearest minute.

.....

/2

Total
 Q26
 /5

Question 27

Marker use

Sally is in Melbourne and makes a very last-minute decision to attend the Women’s Euro Football Final.

- a) First, she travels from Melbourne to Dubai, a distance of 11 637 km, at a speed of 903 km/h.

/1

Find the time taken for this first flight.

.....
.....

- b) Given that she left Melbourne at 6 am on Monday, find the time zone in Dubai (25.20°N, 55.27°E) and her arrival time.

/3

.....
.....
.....

After a two-hour stopover, she then travels from Dubai to London (51.51°N, 0.13°W), a distance of 5 494 km, travelling at a speed of 870 km/h.

- c) Find the total time taken for her whole journey and her arrival time in London.

The game starts at 9 pm Monday in London, will she make it?

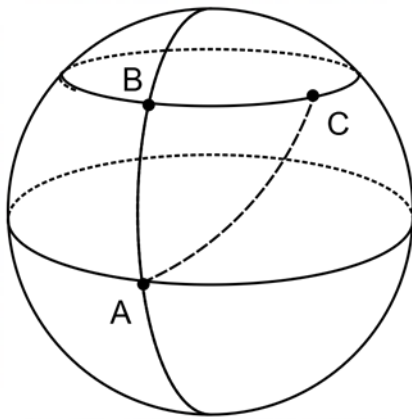
/4

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

**Total
Q27
/8**

Question 28

Marker use



Point A	8°N, 27°E
Point B	23°N, 27°E
Point C	23°N, 85°E

Figure 21

- a) Barry is at Point A and catches a plane that travels **due North** to Point B. Find the distance travelled.

/2

.....

.....

.....

.....

- b) Barry then catches a plane that travels **due East** to Point C. Find the distance travelled.

/2

.....

.....

.....

.....

Question 28 continues

Question 28 continued

Marker use

- c) Michelle instead catches a plane that travels directly from Point A to Point C. Find the distance travelled.

/3

.....

.....

.....

.....

.....

- d) How much shorter is Michelle's journey compared to Barry's?

/2

.....

.....

.....

.....

**Total
Q28
/9**

End of Exam

Blank Page

Blank Page

Blank Page

Blank Page



TASMANIAN
ASSESSMENT, STANDARDS
& CERTIFICATION

This exam paper and any materials associated with this exam
(including answer booklets, cover sheets, rough note paper, or information sheets)
remain the property of Tasmanian Assessment, Standards and Certification.