SYDNEY GRAMMAR SCHOOL

CANDIDATE NUMBER

2022 Trial HSC Examination

Form VI Mathematics Standard 2

Wednesday 10th August 2022

8:40am

General Instructions

- Reading time — 10 minutes
- Working time — 2 hours 30 minutes
- Attempt all questions.
- Write using black pen.
- Calculators approved by NESA may be used.
- A loose reference sheet is provided separate to this paper.

Total Marks: 100

Section I (15 marks) Questions 1 – 15

- This section is multiple-choice. Each question is worth 1 mark.
- Record your answers on the provided answer sheet.

Section II (85 marks) Questions 16 – 43

- Relevant mathematical reasoning and calculations are required.
- Answer the questions in this paper in the spaces provided.

Collection

- Write your candidate number on this page and on the multiple choice sheet.
- Place everything inside this question booklet.

Checklist

- Reference sheet
- Multiple-choice answer sheet
- Candidature: 15 pupils

Writer: BR

Section I

15 marks
Attempt Questions 1-15
Allow about 25 minutes for this section
Use the multiple-choice answer sheet for Questions 1-15

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1. The volume of a pyramid has the formula $V = \frac{1}{3}Ah$, where A is the area of the base and h is the perpendicular height. Which of the following is the correct formula for A?

   (A) $A = \frac{1}{3}Vh$

   (B) $A = \frac{3}{Vh}$

   (C) $A = 3Vh$

   (D) $A = \frac{3V}{h}$

2. Stephanie's cookbook sells for \$29.00 per copy. She earns a royalty of 12% of the selling price of the book. How much money will Stephanie receive if 7200 books are sold in total?

   (A) \$11 232

   (B) \$13 824

   (C) \$25 056

   (D) \$38 880

3. Which of the following is a linear function?

   (A) $y = -\frac{1}{x}$

   (B) $y = 11 - x$

   (C) $y = 2x^2 + 7$

   (D) $y = 3^x$

4. A spanning tree contains four edges. How many vertices are in the network?

   (A) 2

   (B) 3

   (C) 4

   (D) 5

5. What speed is equivalent to 70 km/h?

   (A) 1·2 m/s

   (B) 19·4 m/s

   (C) 252 m/s

   (D) 1167 m/s

6. What is the scale 1 cm to 5 m equivalent to?

   (A) 1 : 5

   (B) 1 : 50

   (C) 1 : 500

   (D) 1 : 5000

7. A school's gardening program is run by 25 students, 5 teachers and 8 parents. A stratified sample of 8 people is selected to attend an environmental conference. How many teachers will attend the conference?

   (A) 0

   (B) 1

   (C) 2

   (D) 5

8. A jar contains five red lollies and three green lollies. Danielle removes two lollies from the jar at random. What is the probability that the two lollies are different colours?

   (A) $\frac{15}{56}$

   (B) $\frac{13}{28}$

   (C) $\frac{15}{32}$

   (D) $\frac{15}{28}$

9. A dividend of 24 cents per share is paid on shares with a market value of \$3.25 each. What is the dividend yield?

   (A) 3·25%

   (B) 7·38%

   (C) 13·54%

   (D) 24%

10. The table below gives the monthly repayments for a reducing balance loan of \$1000 for various terms and interest rates.

Monthly repayments per \$1000 borrowed						
Interest rate (% p.a.)	Term (years)					
	5	10	15	20	25	30
4.5	\$18.64	\$10.36	\$7.65	\$6.33	\$5.56	\$5.07
5.0	\$18.87	\$10.61	\$7.91	\$6.60	\$5.85	\$5.37
5.5	\$19.10	\$10.85	\$8.17	\$6.88	\$6.14	\$5.68
6.0	\$19.33	\$11.10	\$8.44	\$7.16	\$6.44	\$6.00
7.0	\$19.80	\$11.61	\$8.99	\$7.75	\$7.07	\$6.65
8.0	\$20.28	\$12.13	\$9.56	\$8.36	\$7.72	\$7.34

   What is the monthly repayment on a \$450 000 loan at 6% p.a. over 15 years?

   (A) \$3222

   (B) \$3798

   (C) \$4045.50

   (D) \$4995

11. What is the best description for the relationship between a person's age and their life expectancy?

   (A) strong positive correlation

   (B) weak positive correlation

   (C) weak negative correlation

   (D) strong negative correlation

12. Maya was exercising, checked her pulse and counted 32 beats in 10 seconds. How could Maya's pulse be calculated in beats/minute?

   (A) $32 \div 10 \div 60$

   (B) $32 \times 10 \div 60$

   (C) $32 \div 10 \times 60$

   (D) $32 \times 10 \times 60$

13. What is the minimum value of $y = 2x^2 - 10x + 7$?

    (A) -10

    (B) $-5{\cdot}5$

    (C) -5

    (D) $2{\cdot}5$

14. The data for a large population is normally distributed. Which of the following statements is correct?

    (A) The mean, the mode and the median are all approximately equal.

    (B) The mean and the mode are approximately equal but the median could be quite different.

    (C) The mean and the median are approximately equal but the mode could be quite different.

    (D) The mean, the mode and the median could all be quite different.

15. Picnic Point is 4·5 km west and 6·4 km north of Padstow Bay. What is the bearing of Padstow Bay from Picnic Point?

    (A) 125° T

    (B) 145° T

    (C) 305° T

    (D) 325° T

End of Section I

The paper continues in the next section

Section II

85 marks
Attempt Questions 16-43
Allow about 2 hours and 5 minutes for this section

QUESTION SIXTEEN (1 mark) **Marks**

The area of a trapezium has the formula $A = \frac{h}{2}(a+b)$. Change the subject to h. [1]

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QUESTION SEVENTEEN (2 marks) **Marks**

Alan earned \$5409.25 simple interest from an investment of \$9835 over 5 years. What was the interest rate per annum? [2]

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QUESTION EIGHTEEN (1 mark) **Marks**

A train ticket from Sydney to Melbourne costs \$109 including 10% GST. What is the price of the ticket before GST is added? [1]

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QUESTION NINETEEN (5 marks) **Marks**

The number of peas in each pod of a large sample of a particular species of pea are normally distributed and shown in the table below.

Number of peas/pod	**Number of pods**
2	10
3	16
4	38
5	71
6	80
7	73
8	35
9	19
10	8
11	0
12	1

(a) Determine the mean of the distribution. Give your answer correct to the nearest number of peas/pod. 1

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(b) Find the standard deviation. Give your answer correct to three significant figures. 1

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(c) Determine by calculation if 12 peas/pod is an outlier. 3

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QUESTION TWENTY (6 marks) **Marks**

Zoe borrowed \$875 000 to purchase her first home. The bank lent her the money at 5·2% p.a. reducible interest and fortnightly repayments of \$3444.65.

(a) Complete the table below showing the progress of Zoe's loan for the first 6 fortnights. 4

Fortnights (n)	**Principal** (P)	**Interest** (I)	**Amount owing** ($P+I$)	**Balance** ($P+I-R$)
1	\$875 000	\$1750	\$876 750	\$873 305.35
2	\$873 305.35	\$1746.61	\$875 051.96	\$871 607.31
3				
4				
5				
6				

(b) How much has she paid off the principal after six repayments? 1

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(c) How much interest did she pay in the first 12 weeks? 1

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QUESTION TWENTY-ONE (1 mark) **Marks**

Convert 27 500 000 kW to MW. 1

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QUESTION TWENTY-TWO (2 marks) **Marks**

A golfer's scores for the first nine holes of a golf course are:

4 3 5 6 4 3 8 6 6

(a) Calculate the range of the data set. 1

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(b) Find the median of the data set. 1

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QUESTION TWENTY-THREE (2 marks) **Marks**

A car depreciates in value from \$78 000 to \$41 000 in 3 years. Use the declining-balance formula to calculate the annual percentage rate of depreciation. 2

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QUESTION TWENTY-FOUR (1 mark) **Marks**

A six-sided die is rolled. What is the probability that the result is not a 6? 1

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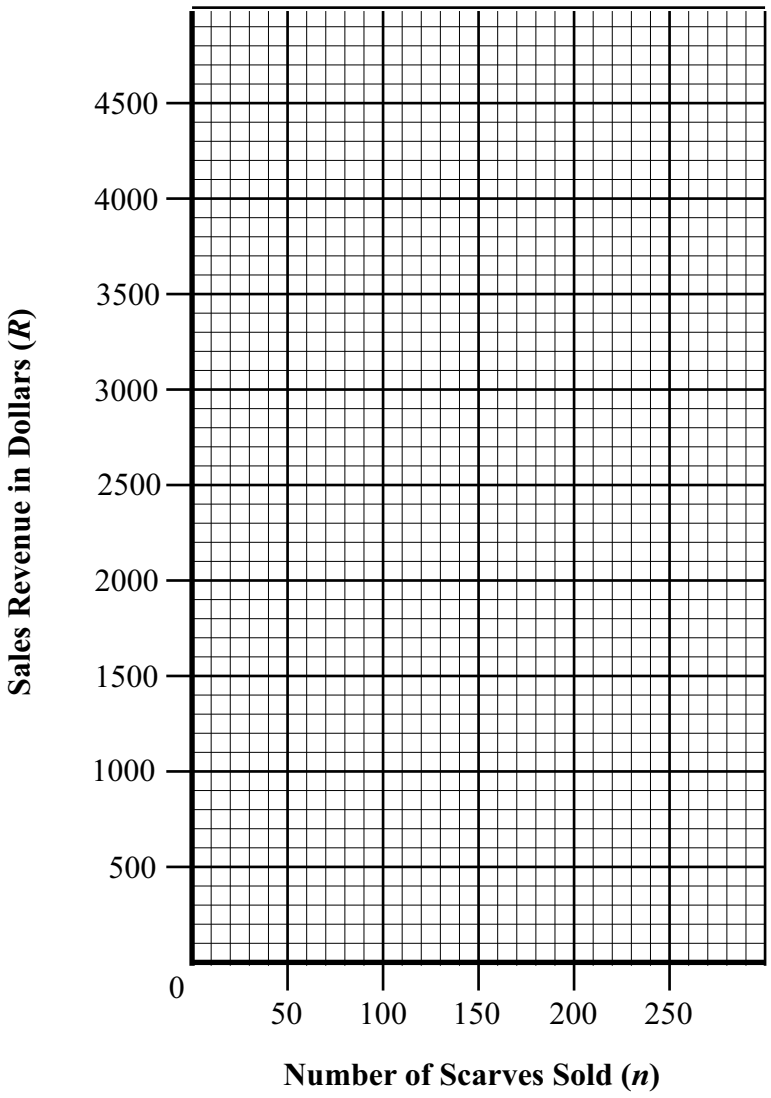
QUESTION TWENTY-FIVE (4 marks) **Marks**

The Silky Scarf Company sells scarves for \$18 each. Sales revenue may be modelled using the equation $R = 18n$, where R is the sales revenue in dollars and n is the number of scarves sold.

(a) Complete the table of values below for $R = 18n$. 1

n	0	50	100	150	200	250
R						

(b) Draw the straight-line graph of $R = 18n$ on the grid provided below. 2



(c) From the graph, find the number of scarves sold when the revenue is \$2070. 1

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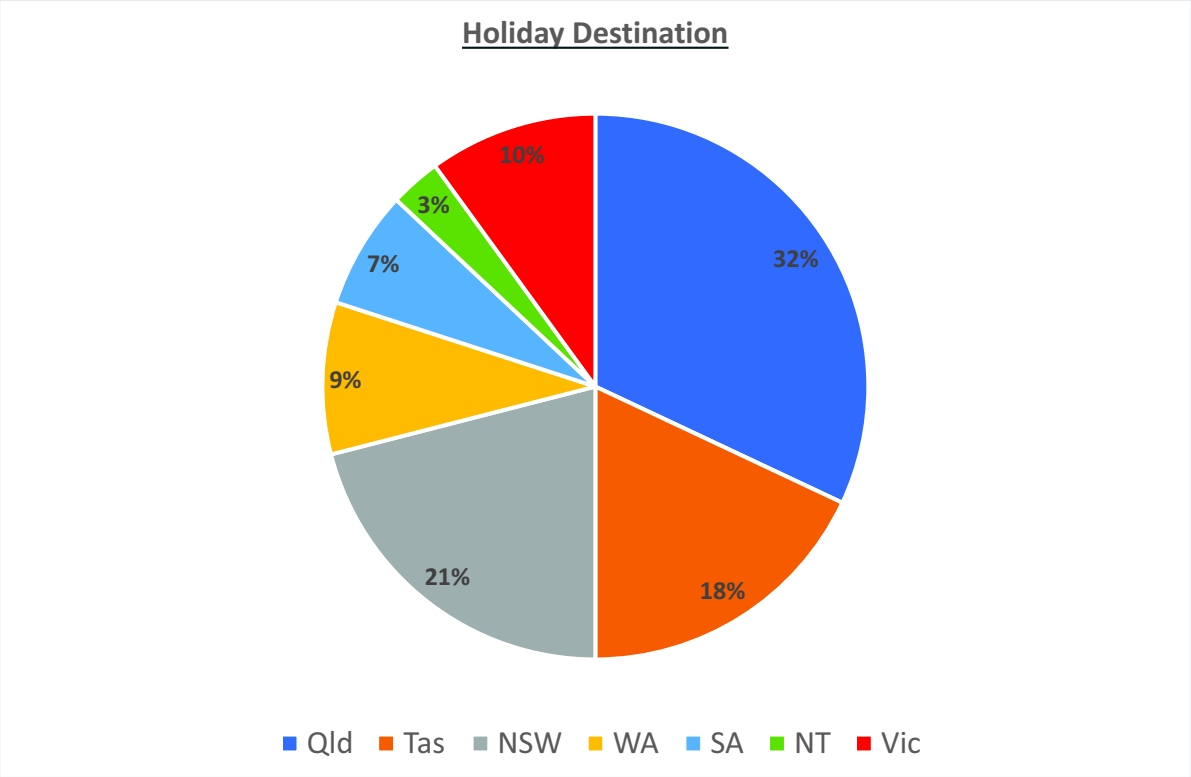
QUESTION TWENTY-SIX (1 mark) **Marks**

A group of people were surveyed about their favourite Australian state or territory to visit. The results are shown in the sector graph below. [1]



If 2475 tourists chose WA, what was the total number of people who participated in the survey?

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QUESTION TWENTY-SEVEN (2 marks) **Marks**

Tokyo is one hour behind Sydney time and six hours ahead of Athens time. If it is 11 am in Sydney, what is the time in Athens? [2]

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QUESTION TWENTY-EIGHT (5 marks) **Marks**

A company wanted to investigate the strength of the relationship between the amount of money spent on advertising each week and the number of visitors the company's website receives each week. Data was collected over a 15 week period.

(a) Pearson's correlation coefficient for the data set is $r = 0{\cdot}9$. Describe the strength and direction of this linear correlation. 1

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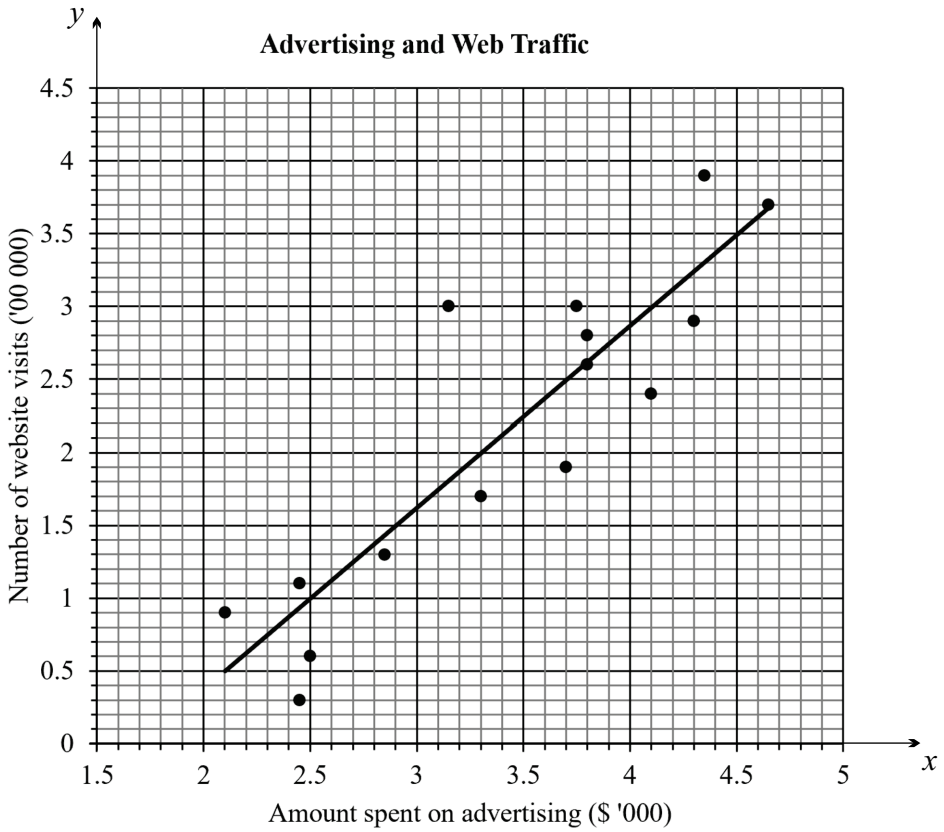
(b) The graph below shows a scatterplot and the regression line for the data. 2



Use the graph to calculate the equation of the regression line.

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QUESTION TWENTY-EIGHT (Continued)

(c) Use the equation of the regression line from part (b) to predict the number of visitors the website will receive for a week in which \$3000 was spent on advertising. 1

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(d) Explain why the model is not useful for predicting the number of visitors for weeks in which \$1500 was spent on advertising. 1

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QUESTION TWENTY-NINE (2 marks) **Marks**

What is the gradient and y-intercept of the line $y = 7 - x$? 2

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QUESTION THIRTY (6 marks) **Marks**

Sam has a household fridge that uses energy at a rate of 738 kWh per year. She is thinking of buying a bar fridge to store extra bottles of wine. The cost of the bar fridge is \$420 and it has an energy consumption rate of 313 kWh per year.

(a) If energy is charged at the rate of \$0.32/kWh, what is the energy cost of running the bar fridge for one year? 2

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(b) What would be the percentage increase in energy costs to run both fridges compared to running only the household fridge? Give your answer correct to the nearest percent. 2

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(c) What would be the total cost of buying the bar fridge and running it for five years? 2

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QUESTION THIRTY-ONE (2 marks) **Marks**

The rates for car stamp duty in NSW are shown in the table below. 2

Vehicle value	**Rate**
\$0 – \$44 999	\$3 for every \$100 (or part of \$100)
\$45 000 and over	\$1350 plus \$5 for every \$100 (or part of \$100) over \$45 000

Calculate the stamp duty on a car valued at \$58 700.

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QUESTION THIRTY-TWO (2 marks) **Marks**

Tim scored 53 in a test for which the scores were normally distributed with a mean of 65 and a standard deviation of 12. What percentage of students scored higher than Tim? 2

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QUESTION THIRTY-THREE (2 marks) **Marks**

Calculate the total cost of purchasing 3000 mining shares with a market price of \$5.85 if brokerage is 2·5%. 2

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QUESTION THIRTY-FOUR (6 marks) **Marks**

A bushwalker starts at point A and walks 8 km in the direction due east to point B. At B he turns and walks on a bearing of 155° T for 3 km to C.

(a) Draw a diagram illustrating the situation above. 1

(b) Find the value of $\angle ABC$. 1

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(c) Calculate the distance AC. Give your answer correct to one decimal place. 2

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QUESTION THIRTY-FOUR (Continued)

(d) Calculate the bearing of C from A. Give your answer correct to the nearest degree. 2

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QUESTION THIRTY-FIVE (3 marks) **Marks**

The time taken to build a StrongBuild house is inversely proportional to the number of people working on the task. A team of six people can build the house in 30 days. The schedule requires that the house be built in 18 days. How many people are required to have the house built in 18 days? 3

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QUESTION THIRTY-SIX (2 marks) **Marks**

Earth is a sphere with a diameter of approximately 12 683 km. Four-fifths of the Earth's surface is covered by water. Calculate the area of the Earth's surface that is covered by water. Give your answer correct to the nearest thousand square kilometres. 2

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QUESTION THIRTY-SEVEN (2 marks) **Marks**

Christie, who was driving a van moving at 110 km/h, spotted a hazard on the road. She took 2 seconds to react before applying the brakes and finally stopped after travelling 79·3 m under braking. Calculate the van's stopping distance. Give your answer correct to the nearest ten centimetres. 2

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QUESTION THIRTY-EIGHT (6 marks) **Marks**

Tim owns a Holden Commodore that runs on ULP and has a fuel consumption of 8·9 L/100 km. When converted to run on liquid petroleum gas (LPG), the fuel consumption is 12·3 L/100 km. Tim averages driving 18 000 km per year.

(a) Calculate the annual cost for each type of fuel (assuming that the car only runs on one type of fuel for a year) if the average price of ULP is 195.9 c/L and LPG is 101.6 c/L. 2

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(b) How much does Tim save in fuel costs for the year by converting his car to LPG? 1

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(c) How much does he save per month? 1

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(d) The cost of converting the car to LPG is $2600. How many months would Tim take to break even? 1

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(e) What distance would Tim travel before reaching the break-even point? 1

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QUESTION THIRTY-NINE (6 marks) **Marks**

Consider the following activity table.

Activity	**Duration (days)**	**Prerequisites**
A	12	None
B	?	None
C	?	A
D	13	A, B
E	10	D
F	?	C, E
G	?	D

The critical path is A, D, E, F. The critical time for the project is 46 days.

(a) Draw an activity chart for this activity table, with weights for activities A, D and E only. 2

(b) Find the weight of activity F. 1

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(c) The float time of activity G is 17 days. Find the weight of activity G. 1

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QUESTION THIRTY-NINE (Continued)

(d) The float time of activity C is 14 days. Find the weight of activity C. 1

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(e) What is the longest possible duration of activity B? 1

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QUESTION FORTY (2 marks) **Marks**

The distanced travelled by a bicycle varies directly with the number of revolutions made by the pedals. Form a variation equation and find the constant of variation given that the bicycle travels 55 metres for 20 revolutions of the pedals. 2

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QUESTION FORTY-ONE (3 marks) **Marks**

The thickness T in centimetres of a tree trunk grows according to the function

$$T = 16(1{\cdot}11)^n$$

where n is the time in years after the first measurement.

(a) What is the dependent variable in the function? 1

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(b) Calculate the thickness of the tree trunk after 6 years. Give your answer correct to the nearest centimetre. 2

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QUESTION FORTY-TWO (2 marks) **Marks**

Calculate the amount that must be invested at $3{\cdot}2\%$ p.a. interest compounding quarterly to have \$10 000 at the end of 7 years. 2

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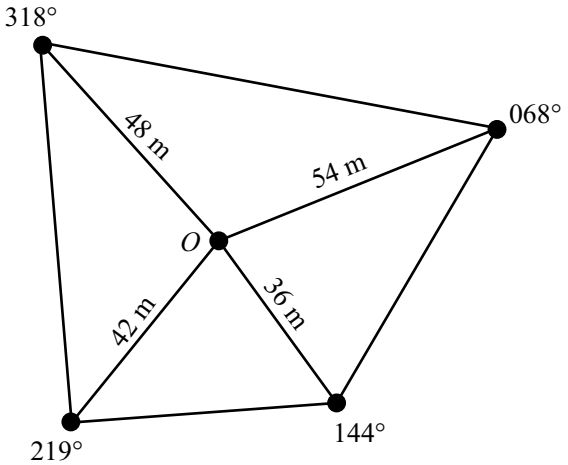
QUESTION FORTY-THREE (6 marks) **Marks**



The information from a compass radial survey of a field is shown in the diagram above.

(a) Find the perimeter of the field. Give your answer correct to the nearest metre. 3

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(b) Find the area of the field. Give your answer correct to the nearest square metre. 3

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END OF PAPER

Extra writing space

If you use this space, clearly indicate which question you are answering.

SYDNEY GRAMMAR SCHOOL

SOLUTION
CANDIDATE NUMBER

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- Reference sheet
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- Candidature: 15 pupils

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Section I

15 marks
Attempt Questions 1-15
Allow about 25 minutes for this section
Use the multiple-choice answer sheet for Questions 1-15

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1. The volume of a pyramid has the formula $V = \frac{1}{3}Ah$, where A is the area of the base and h is the perpendicular height. Which of the following is the correct formula for A?

   (A) $A = \frac{1}{3}Vh$

   (B) $A = \frac{3}{Vh}$

   (C) $A = 3Vh$

   (D) $A = \frac{3V}{h}$

$3V = Ah$

$A = \frac{3V}{h}$

2. Stephanie's cookbook sells for \$29.00 per copy. She earns a royalty of 12% of the selling price of the book. How much money will Stephanie receive if 7200 books are sold in total?

   (A) \$11 232

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$(29)(0.12)(7200)$

3. Which of the following is a linear function?

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5. What speed is equivalent to 70 km/h?

   (A) 1·2 m/s

   (B) 19·4 m/s

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   (D) 1167 m/s

$$\frac{70 \times 1000}{60^2}$$

6. What is the scale 1 cm to 5 m equivalent to?

   (A) 1 : 5

   (B) 1 : 50

   (C) 1 : 500

   (D) 1 : 5000

7. A school's gardening program is run by 25 students, 5 teachers and 8 parents. A stratified sample of 8 people is selected to attend an environmental conference. How many teachers will attend the conference?

   (A) 0

   (B) 1

   (C) 2

   (D) 5

$$\frac{5}{25+5+8} \times 8$$

8. A jar contains five red lollies and three green lollies. Danielle removes two lollies from the jar at random. What is the probability that the two lollies are different colours?

   (A) $\frac{15}{56}$

   (B) $\frac{13}{28}$

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$$P(RG) + P(GR)$$
$$= \frac{5}{8} \cdot \frac{3}{7} + \frac{3}{8} \cdot \frac{5}{7}$$

9. A dividend of 24 cents per share is paid on shares with a market value of \$3.25 each. What is the dividend yield?

   (A) 3·25%

   (B) 7·38%

   (C) 13·54%

   (D) 24%

$\frac{24}{325} \times 100$

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450×8.44

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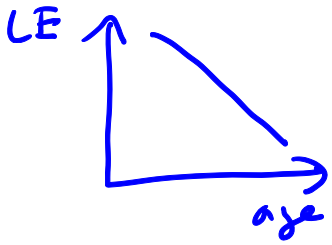

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   (B) $32 \times 10 \div 60$

   (C) $32 \div 10 \times 60$

   (D) $32 \times 10 \times 60$

13. What is the minimum value of $y = 2x^2 - 10x + 7$?

(A) -10

(B) $-5{\cdot}5$

(C) -5

(D) $2{\cdot}5$

x	1	2	3	4
y	-1	-5	-5	-1

$x = 2{\cdot}5$, $y = -5{\cdot}5$

14. The data for a large population is normally distributed. Which of the following statements is correct?

(A) The mean, the mode and the median are all approximately equal.

(B) The mean and the mode are approximately equal but the median could be quite different.

(C) The mean and the median are approximately equal but the mode could be quite different.

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(B) 145° T

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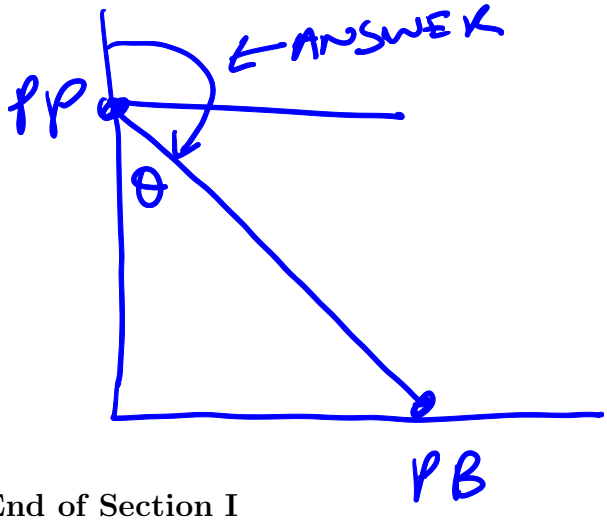


End of Section I

$\tan\theta = \frac{4{\cdot}5}{6{\cdot}4}$

$\theta \doteq 35°$

The paper continues in the next section

$\therefore \quad (180° - 35°)\text{T}$

Section II

85 marks
Attempt Questions 16-43
Allow about 2 hours and 5 minutes for this section

QUESTION SIXTEEN (1 mark) **Marks**

The area of a trapezium has the formula $A = \frac{h}{2}(a+b)$. Change the subject to h. [1]

$2A = h(a+b)$

$h(a+b) = 2A$

$h = \frac{2A}{a+b}$ ✓

QUESTION SEVENTEEN (2 marks) **Marks**

Alan earned \$5409.25 simple interest from an investment of \$9835 over 5 years. What was the interest rate per annum? [2]

$I = PRn$

$5409.25 = (9835)(5)n$ ✓

$n = 0.11$

$= 11\%$ p.a. ✓

QUESTION EIGHTEEN (1 mark) **Marks**

A train ticket from Sydney to Melbourne costs \$109 including 10% GST. What is the price of the ticket before GST is added? [1]

$1.1x = 109$

$x = \$99.09$ ✓

QUESTION NINETEEN (5 marks) **Marks**

The number of peas in each pod of a large sample of a particular species of pea are normally distributed and shown in the table below.

Number of peas/pod	Number of pods
2	10
3	16
4	38
5	71
6	80
7	73
8	35
9	19
10	8
11	0
12	1

(a) Determine the mean of the distribution. Give your answer correct to the nearest number of peas/pod. [1]

6 ✓

(b) Find the standard deviation. Give your answer correct to three significant figures. [1]

1·75 ✓

(c) Determine by calculation if 12 peas/pod is an outlier. [3]

$Q_1 = 5$ $Q_3 = 7$

$\therefore IQR = 2$ ✓

$Q_3 + 1.5 \times IQR$

$= 7 + 1.5 \times 2$

$= 10$ ✓

$\therefore$ 12 is an outlier. ✓

QUESTION TWENTY (6 marks) **Marks**

Zoe borrowed \$875 000 to purchase her first home. The bank lent her the money at 5·2% p.a. reducible interest and fortnightly repayments of \$3444.65.

(a) Complete the table below showing the progress of Zoe's loan for the first 6 fortnights. 4

Fortnights (n)	**Principal** (P)	**Interest** (I)	**Amount owing** ($P+I$)	**Balance** ($P+I-R$)
1	\$875 000	\$1750	\$876 750	\$873 305.35
2	\$873 305.35	\$1746.61	\$875 051.96	\$871 607.31
3	871 607·31	1743·21	873 350·52	869 905·87
4	869 905·87	1739·81	871 645·68	868 201·03
5	868 201·03	1736·40	869 937·43	866 492·78
6	866 492·78	1732·99	868 225·77	864 781·12

(b) How much has she paid off the principal after six repayments? 1

875 000 − 864 781·12
= \$10 218·88

(c) How much interest did she pay in the first 12 weeks? 1

6 × 3444·65 − 10 218·88
= \$10 449·02

[OK add (I) column]

QUESTION TWENTY-ONE (1 mark) **Marks**

Convert 27 500 000 kW to MW. 1

$\frac{27\,500\,000}{1\,000\,000} \times 1000$
= 27 500 MW

QUESTION TWENTY-TWO (2 marks) **Marks**

A golfer's scores for the first nine holes of a golf course are:

~~4 3 5 6 4 3 8 6 6~~

3 3 4 4 5 6 6 6 8

(a) Calculate the range of the data set. [1]

$8 - 3 = 5$ ✓

(b) Find the median of the data set. [1]

5 ✓

QUESTION TWENTY-THREE (2 marks) **Marks**

A car depreciates in value from \$78 000 to \$41 000 in 3 years. Use the declining-balance formula to calculate the annual percentage rate of depreciation. [2]

$41\,000 = 78\,000(1-r)^3$ ✓

$(1-r)^3 = 0.5256\ldots$

$1 - r = 0.80704\ldots$

$r \doteq 19.3\%$ p.a. ✓

QUESTION TWENTY-FOUR (1 mark) **Marks**

A six-sided die is rolled. What is the probability that the result is not a 6? [1]

$\frac{5}{6}$ ✓

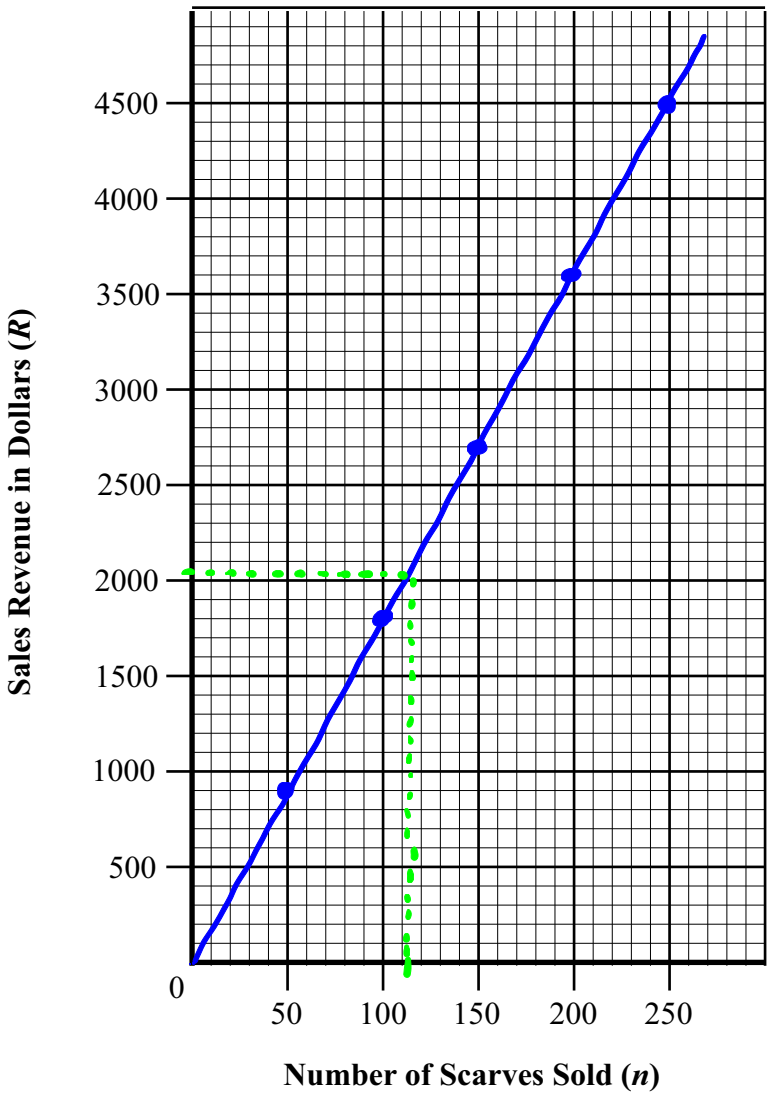
QUESTION TWENTY-FIVE (4 marks) **Marks**

The Silky Scarf Company sells scarves for \$18 each. Sales revenue may be modelled using the equation $R = 18n$, where R is the sales revenue in dollars and n is the number of scarves sold.

(a) Complete the table of values below for $R = 18n$. 1

n	0	50	100	150	200	250
R	0	900	1800	2700	3600	4500

(b) Draw the straight-line graph of $R = 18n$ on the grid provided below. 2



(c) From the graph, find the number of scarves sold when the revenue is \$2070. 1

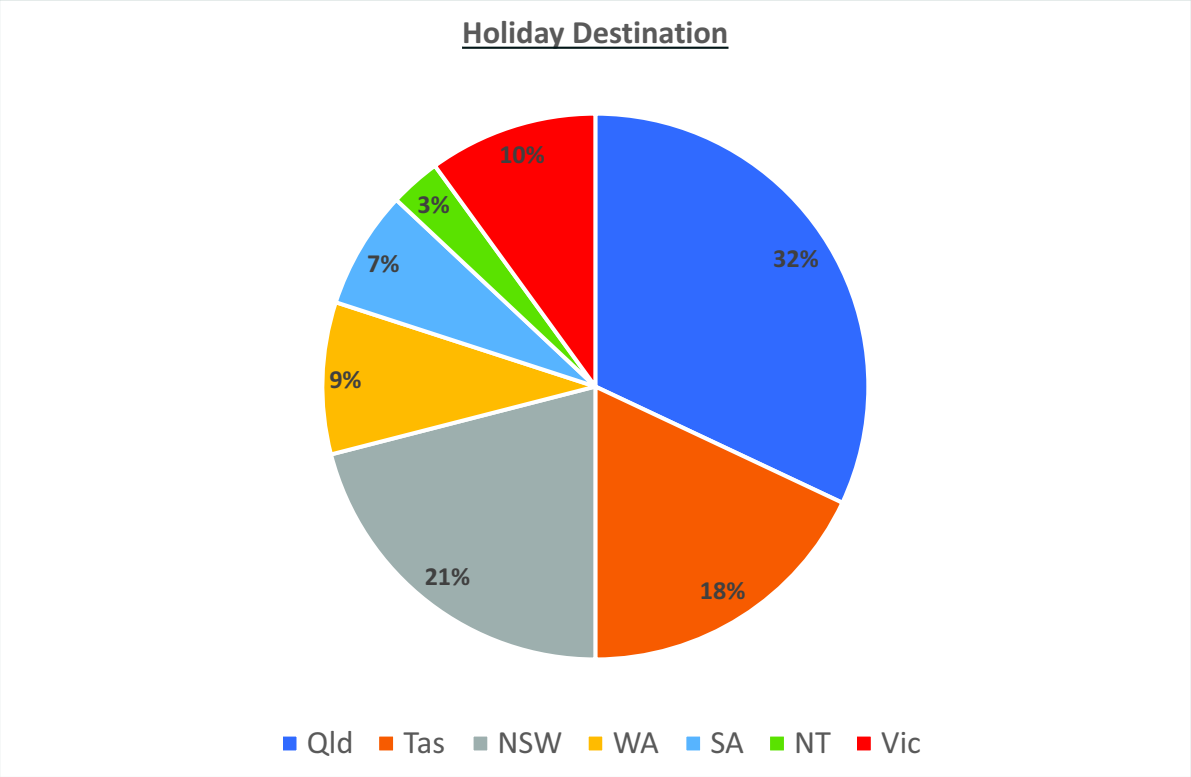
.....

115

.....

QUESTION TWENTY-SIX (1 mark) **Marks**

A group of people were surveyed about their favourite Australian state or territory to visit. The results are shown in the sector graph below. [1]



If 2475 tourists chose WA, what was the total number of people who participated in the survey?

$0.09n = 2475$

$n = 27500$ people ✓

QUESTION TWENTY-SEVEN (2 marks) **Marks**

Tokyo is one hour behind Sydney time and six hours ahead of Athens time. If it is 11 am in Sydney, what is the time in Athens? [2]

A T S

4am 10am 11am ✓

It is 4am in Athens ✓

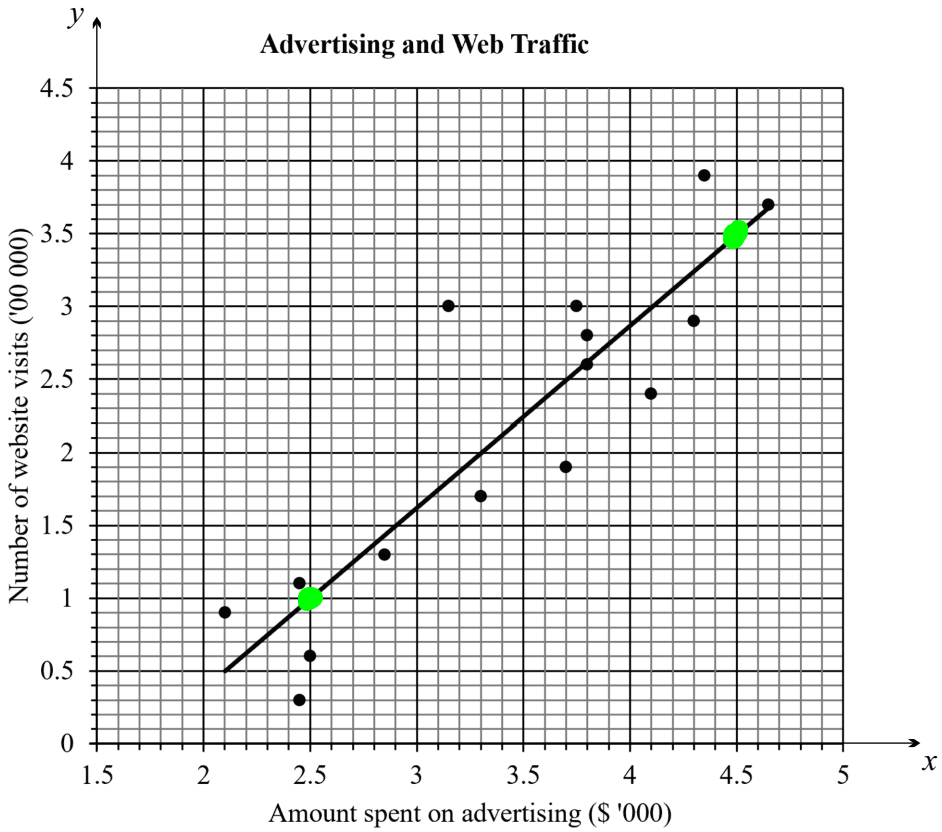
QUESTION TWENTY-EIGHT (5 marks) **Marks**

A company wanted to investigate the strength of the relationship between the amount of money spent on advertising each week and the number of visitors the company's website receives each week. Data was collected over a 15 week period.

(a) Pearson's correlation coefficient for the data set is $r = 0{\cdot}9$. Describe the strength and direction of this linear correlation. [1]

strong positive ✓

(b) The graph below shows a scatterplot and the regression line for the data. [2]



Use the graph to calculate the equation of the regression line.

$m = \dfrac{3{\cdot}5 - 1}{4{\cdot}5 - 2{\cdot}5}$

$= 1{\cdot}25$ ✓

$\therefore y = 1{\cdot}25x + b$

$(2{\cdot}5, 1) \Rightarrow 1 = 1{\cdot}25(2{\cdot}5) + b$

$b = -2{\cdot}125$

$\therefore y = 1{\cdot}25x - 2{\cdot}125$ ✓

QUESTION TWENTY-EIGHT (Continued)

(c) Use the equation of the regression line from part (b) to predict the number of visitors the website will receive for a week in which \$3000 was spent on advertising. [1]

$y = 1.25x - 2.125$

$x = 3, \quad y = 1.25(3) - 2.125$

$= 1.625$

∴ Will recieve 162 500 visitors. ✓

(d) Explain why the model is not useful for predicting the number of visitors for weeks in which \$1500 was spent on advertising. [1]

As the model will give a negative amount of visitors. ✓

QUESTION TWENTY-NINE (2 marks) **Marks**

What is the gradient and y-intercept of the line $y = 7 - x$? [2]

$m = -1$ ✓ y-intercept is $(0, 7)$ ✓

QUESTION THIRTY (6 marks) **Marks**

Sam has a household fridge that uses energy at a rate of 738 kWh per year. She is thinking of buying a bar fridge to store extra bottles of wine. The cost of the bar fridge is \$420 and it has an energy consumption rate of 313 kWh per year.

(a) If energy is charged at the rate of \$0.32/kWh, what is the energy cost of running the bar fridge for one year? 2

$0.32(313) = \$100.16$ ✓ ✓

(b) What would be the percentage increase in energy costs to run both fridges compared to running only the household fridge? Give your answer correct to the nearest percent. 2

$0.32(738) = \$236.16$ ✓

$\therefore$ Both fridges $= \$336.32$

$\frac{336.32 - 236.16}{236.16} \times 100\%$

$\doteq 42\%$ ✓

(c) What would be the total cost of buying the bar fridge and running it for five years? 2

$420 + 5(100.16)$ ✓

$= \$920.80$ ✓

QUESTION THIRTY-ONE (2 marks) **Marks** 2

The rates for car stamp duty in NSW are shown in the table below.

Vehicle value	**Rate**
\$0 – \$44 999	\$3 for every \$100 (or part of \$100)
\$45 000 and over	\$1350 plus \$5 for every \$100 (or part of \$100) over \$45 000

Calculate the stamp duty on a car valued at \$58 700.

$1350 + 5\left(\frac{58700 - 45000}{100}\right)$ ✓

$= \$2035$ ✓

QUESTION THIRTY-TWO (2 marks) **Marks** 2

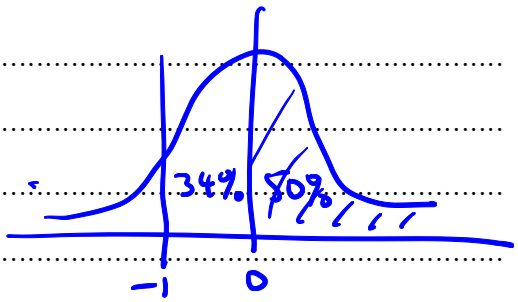
Tim scored 53 in a test for which the scores were normally distributed with a mean of 65 and a standard deviation of 12. What percentage of students scored higher than Tim?

$z = \frac{53 - 65}{12}$

$= -1$ ✓

$\therefore 50 + 34$

$= 84\%$ ✓



QUESTION THIRTY-THREE (2 marks) **Marks** 2

Calculate the total cost of purchasing 3000 mining shares with a market price of \$5.85 if brokerage is 2·5%.

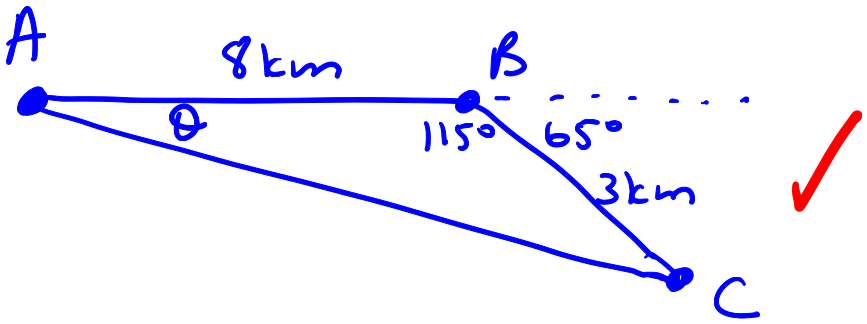
$3000(5.85)(1.025)$ ✓

$= \$17\,988.75$ ✓

QUESTION THIRTY-FOUR (6 marks) **Marks**

A bushwalker starts at point A and walks 8 km in the direction due east to point B. At B he turns and walks on a bearing of 155° T for 3 km to C.

(a) Draw a diagram illustrating the situation above. 1



(b) Find the value of $\angle ABC$. 1

$\angle ABC = 115°$ ✓

(c) Calculate the distance AC. Give your answer correct to one decimal place. 2

$AC^2 = 8^2 + 3^2 - 2(8)(3)\cos 115°$ ✓

$\therefore AC \doteq 9.7$ km ✓

QUESTION THIRTY-FOUR (Continued)

(d) Calculate the bearing of C from A. Give your answer correct to the nearest degree. 2

$\frac{\sin\theta}{3} = \frac{\sin 115^\circ}{9.7}$ ✓

$\theta \doteq 16^\circ$ ✓

$\therefore$ Bearing is $106^\circ T$ ✓

QUESTION THIRTY-FIVE (3 marks) **Marks**

The time taken to build a StrongBuild house is inversely proportional to the number of people working on the task. A team of six people can build the house in 30 days. The schedule requires that the house be built in 18 days. How many people are required to have the house built in 18 days? 3

$T = \frac{k}{n}$ ✓

$30 = \frac{k}{6}$

$\therefore k = 180$ ✓

$\therefore T = \frac{180}{n}$

$T = 18$, $18 = \frac{180}{n}$

$n = \frac{180}{18}$

$= 10$ people ✓

QUESTION THIRTY-SIX (2 marks) **Marks**

Earth is a sphere with a diameter of approximately 12 683 km. Four-fifths of the Earth's surface is covered by water. Calculate the area of the Earth's surface that is covered by water. Give your answer correct to the nearest thousand square kilometres. [2]

$A = 4\pi\left(\frac{12\,683}{2}\right)^2 \times \frac{4}{5}$ ✓

$\doteq 404\,281\,000 \text{ km}^2$ ✓

QUESTION THIRTY-SEVEN (2 marks) **Marks**

Christie, who was driving a van moving at 110 km/h, spotted a hazard on the road. She took 2 seconds to react before applying the brakes and finally stopped after travelling 79·3 m under braking. Calculate the van's stopping distance. Give your answer correct to the nearest ten centimetres. [2]

$s = \frac{d}{t}$

$d = st$

$= 110\left(\frac{2}{60^2}\right)$

$= 0.061 \text{ km}$

$\doteq 61.1 \text{ m}$ ✓

$\therefore$ Stopping distance $= 61.1 + 79.3$

$= 140.4 \text{ m}$ ✓

QUESTION THIRTY-EIGHT (6 marks) **Marks**

Tim owns a Holden Commodore that runs on ULP and has a fuel consumption of 8·9 L/100 km. When converted to run on liquid petroleum gas (LPG), the fuel consumption is 12·3 L/100 km. Tim averages driving 18 000 km per year.

(a) Calculate the annual cost for each type of fuel (assuming that the car only runs on one type of fuel for a year) if the average price of ULP is 195.9 c/L and LPG is 101.6 c/L. [2]

ULP

$8.9 \times \frac{18000}{100} \times 195.9 = \$3138.32$ ✓

LPG

$12.3 \times \frac{18000}{100} \times 101.6 = \$2249.42$ ✓

(b) How much does Tim save in fuel costs for the year by converting his car to LPG? [1]

$3138.32 - 2249.42$

$= \$888.90$ ✓

(c) How much does he save per month? [1]

$\frac{888.90}{12} = \$74.08$ ✓

(d) The cost of converting the car to LPG is \$2600. How many months would Tim take to break even? [1]

$\frac{2600}{74.08} = 35.097\ldots$

∴ It would take 36 months ✓

(e) What distance would Tim travel before reaching the break-even point? [1]

$\frac{18000}{12} \times 36 = 54000\text{ km}$ ✓

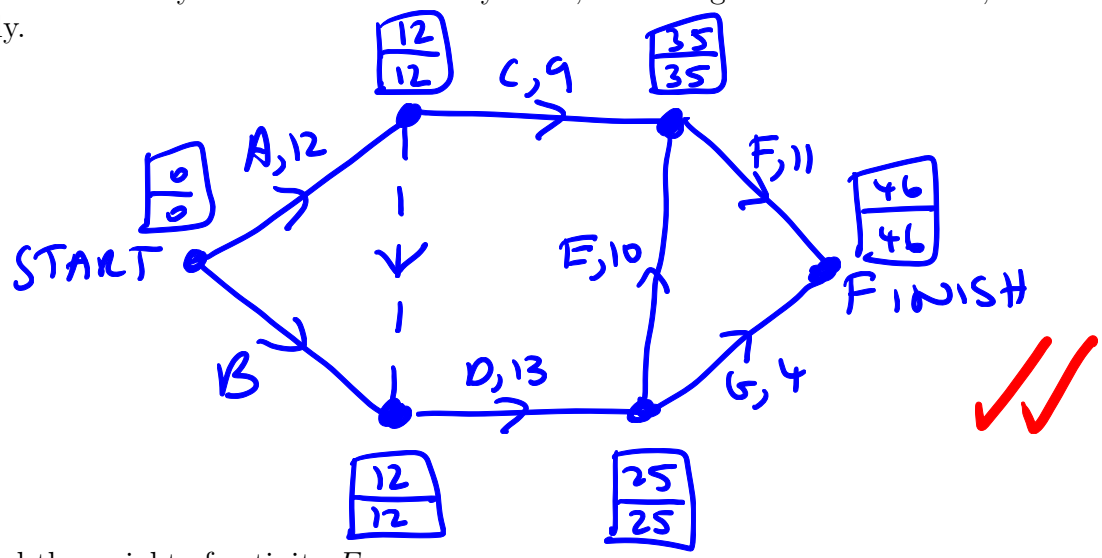
QUESTION THIRTY-NINE (6 marks) **Marks**

Consider the following activity table.

Activity	Duration (days)	Prerequisites
A	12	None
B	?	None
C	?	A
D	13	A, B
E	10	D
F	?	C, E
G	?	D

The critical path is A, D, E, F. The critical time for the project is 46 days.

(a) Draw an activity chart for this activity table, with weights for activities A, D and E only. [2]



(b) Find the weight of activity F. [1]

$46 - 12 - 10 - 13 = 11$ ✓

(c) The float time of activity G is 17 days. Find the weight of activity G. [1]

$25 + 17 = 42$

$46 - 42 = 4$

$\therefore$ weight of 4 days ✓

QUESTION THIRTY-NINE (Continued)

(d) The float time of activity C is 14 days. Find the weight of activity C. 1

$12 + 14 = 26$

$35 - 26 = 9$

$\therefore$ weight of 9 days ✓

(e) What is the longest possible duration of activity B? 1

12 days ✓

[OR 11 if argue only one critical path]

QUESTION FORTY (2 marks) **Marks**

The distanced travelled by a bicycle varies directly with the number of revolutions made by the pedals. Form a variation equation and find the constant of variation given that the bicycle travels 55 metres for 20 revolutions of the pedals. 2

$D = kr$ ✓

$55 = k(20)$

$k = \frac{55}{20}$

$= 2.75$ ✓

QUESTION FORTY-ONE (3 marks) **Marks**

The thickness T in centimetres of a tree trunk grows according to the function

$$T = 16(1{\cdot}11)^n$$

where n is the time in years after the first measurement.

(a) What is the dependent variable in the function? 1

T ✓

(b) Calculate the thickness of the tree trunk after 6 years. Give your answer correct to the nearest centimetre. 2

$16(1{\cdot}11)^6 \doteq 30$ cm ✓ ✓

QUESTION FORTY-TWO (2 marks) **Marks**

Calculate the amount that must be invested at 3·2% p.a. interest compounding quarterly to have \$10 000 at the end of 7 years. 2

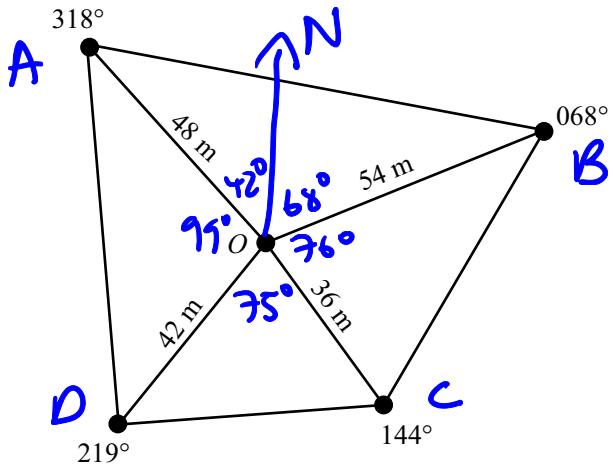
$FV = PV(1+r)^n$

$10\,000 = PV\left(1 + \frac{0{\cdot}032}{4}\right)^{7\times 4}$ ✓

$PV = \frac{10\,000}{(1{\cdot}008)^{28}}$

$= \$8000{\cdot}28$ ✓

QUESTION FORTY-THREE (6 marks) **Marks**



✓angles
✓one side correct

The information from a compass radial survey of a field is shown in the diagram above.

(a) Find the perimeter of the field. Give your answer correct to the nearest metre. 3

$AB^2 = 48^2 + 54^2 - 2(48)(54)\cos 110°$

$AB = 83.62$

$BC^2 = 54^2 + 36^2 - 2(54)(36)\cos 76°$

$BC = 57.20$

$DC^2 = 36^2 + 42^2 - 2(36)(42)\cos 75°$

$DC = 47.72$

$AD^2 = 48^2 + 42^2 - 2(48)(42)\cos 99°$

$AD = 68.55$

∴ Perimeter is approximately 257m ✓

(b) Find the area of the field. Give your answer correct to the nearest square metre. 3

$A = \frac{1}{2}(48)(54)\sin 110° + \frac{1}{2}(54)(36)\sin 76°$ ✓

$+ \frac{1}{2}(36)(42)\sin 75° + \frac{1}{2}(48)(42)\sin 99°$ ✓

$\doteq 3887\ m^2$ ✓

END OF PAPER

Extra writing space

If you use this space, clearly indicate which question you are answering.