



SHORE

2010

Trial HSC Examination

General Mathematics

General Instructions

- Reading time – 5 minutes
- Working time – 2.5 hours
- Write using black or blue pen
- Calculators may be used
- A formulae sheet is provided at the back of this paper
- Write your examination number on the front cover of each booklet to be handed in
- If you do not attempt a question, submit a blank booklet marked with your examination number and “N/A”

Student Number:

Set:

Total marks – 100

Section I Pages 5 – 13

22 marks

- Attempt Questions 1 – 22
- Allow about 30 minutes for this section

Section II Pages 14 – 25

78 marks

- Attempt Questions 23 – 28
- Allow about 2 hours for this section

DO NOT REMOVE THIS PAPER FROM
THE EXAMINATION ROOM

Section I

22 marks

Attempt Questions 1-22

Allow about 30 minutes for this section

Use the multiple-choice answer sheet for Questions 1-22.

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample: $2 + 4 =$ (A) 2 (B) 6 (C) 8 (D) 9
A ☐ B ☒ C ☐ D ☐

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A ☐ B ☒ C ☐ D ☐

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word **correct** and drawing an arrow as follows.

A ☒ B ☒ C ☐ D ☐
correct

1. Which fraction is equal to a probability of 20%?

- (A) $\frac{1}{20}$
(B) $\frac{1}{5}$
(C) $\frac{1}{4}$
(D) $\frac{1}{2}$

2. The results of a Mathematics task are represented in the stem-and-leaf plot below.

2	3 8
3	3 4 6 9
4	2 3 5 7 9
5	0 4 5
6	1 7

What is the median for this set of scores?

- (A) 4
- (B) 8.5
- (C) 35
- (D) 44
3. If $a = \frac{6b+2}{3b}$ and $b = 3$, find the value of a (correct to 2 decimal places).
- (A) 1.97
- (B) 2.22
- (C) 4.00
- (D) 20.00
4. A bag contains 3 **yellow** and 5 **blue** marbles. Two marbles were selected at random and not replaced. Both selected marbles were **blue**.

If a third marble is now selected, what is the probability that it is blue?

- (A) $\frac{5}{28}$
- (B) $\frac{3}{8}$
- (C) $\frac{1}{2}$
- (D) $\frac{5}{8}$

5. Julian's average heart beat is 58 beats/minute.

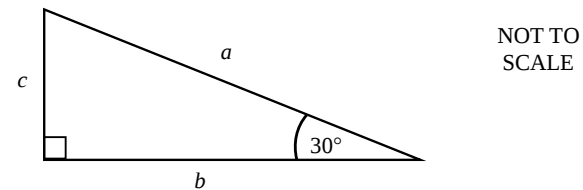
Which of the following gives his number of heart beats in a week, when expressed in scientific notation, correct to 3 significant figures?

- (A) 5.84×10^5
- (B) 5.840×10^5
- (C) 5.846×10^5
- (D) 5.85×10^5

6. Simplify $5x^3 \div 25x$.

- (A) $5x^2$
- (B) $\frac{5}{x^2}$
- (C) $\frac{1}{5x^2}$
- (D) $\frac{x^2}{5}$

7. What is the correct expression for $\cos 30^\circ$ in this triangle?



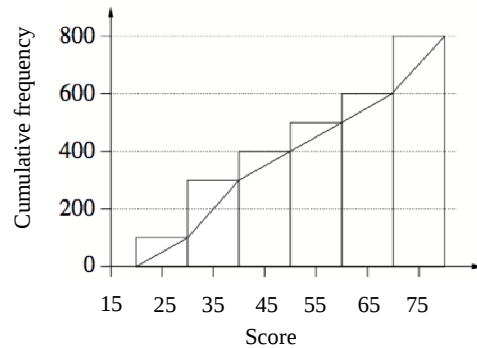
- (A) $\frac{b}{a}$
- (B) $\frac{b}{c}$
- (C) $\frac{c}{b}$
- (D) $\frac{c}{a}$

8. Simon's gross income last year was \$40 000. He had allowable tax deductions of \$3000. Simon paid 1.5% of his taxable income for the Medicare levy.

How much was Simon's Medicare levy?

- (A) \$450
(B) \$555
(C) \$600
(D) \$645

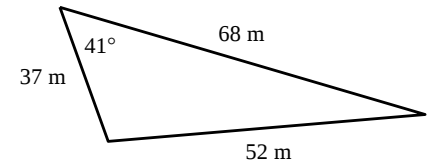
9. A set of data is represented by the following cumulative frequency histogram and ogive.



What is the best approximation for the interquartile range for this set of data?

- (A) 25
(B) 30
(C) 35
(D) 40

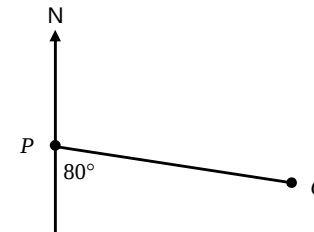
10. What is the area of this triangle, to the nearest square metre?



NOT
TO
SCALE

- (A) 825 m²
(B) 962 m²
(C) 1085 m²
(D) 1160 m²

11. What is the bearing of P from Q?



- (A) 080°
(B) 100°
(C) 260°
(D) 280°

12. Which expression is equivalent to $4x^2(x^2 + 6) + 2x^2$?

- (A) $4x^4 + 2x^2 + 6$
(B) $4x^4 + 26x^2$
(C) $5x^4 + 36x^2$
(D) $24x^4 + 2x^2$

13. A charity organisation wishes to select a president and vice-president from a group of 8 members.

The number of ways in which the president and vice-president can be chosen is:

- (A) 16
- (B) 28
- (C) 56
- (D) 64

14. Sixty fish were caught, tagged, and then released into a lake as part of an attempt to estimate the number of fish in the lake. Four weeks later twenty fish were netted, of which five were tagged.

Which is the best estimate for the fish population of the lake?

- (A) 100
- (B) 240
- (C) 300
- (D) 1200

15. Angus purchased a video camera for \$770 whilst on holiday in Australia. This price included 10% GST. When he left Australia, he received a refund of the GST.

What was Angus' refund?

- (A) \$70
- (B) \$77
- (C) \$693
- (D) \$700

16. Michael sets up an annuity in which he invests \$1200 at the end of each year for 15 years. The interest is paid annually at a rate of 4% per annum.

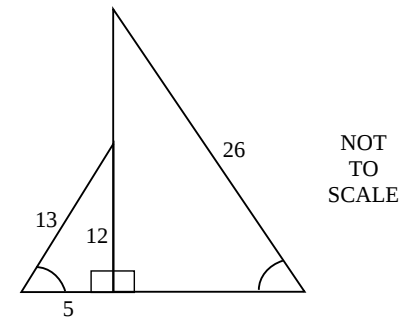
What is the future value of this annuity, correct to the nearest dollar?

- (A) \$1334
- (B) \$24 028
- (C) \$34 000
- (D) \$124 235

17. In an electrical circuit, current varies inversely with resistance. What is the effect on the current when the resistance is halved?

- (A) The current is halved.
- (B) The current is exactly the same.
- (C) The current is doubled.
- (D) The current is square-rooted.

18. An area of land is divided into triangular paddocks. These paddocks are similar to each other. Some dimensions of the paddocks, in metres, are shown on the diagram.



What is the total area of both paddocks?

- (A) 90 m^2
- (B) 120 m^2
- (C) 150 m^2
- (D) 180 m^2

19. What is the formula for k as the subject of $8h = 3g + 4k^2$?

(A) $k = \pm \frac{\sqrt{8h+3g}}{2}$

(B) $k = \pm \sqrt{\frac{8h+3g}{2}}$

(C) $k = \pm \frac{\sqrt{8h-3g}}{2}$

(D) $k = \pm \sqrt{\frac{8h-3g}{2}}$

20. Two groups of males were surveyed about their weekly wages. The results are shown in the box-and-whisker plots.



Which of the following statements is true about the males surveyed?

- (A) The same percentage of males in each group earned more than \$150 per week.
 (B) Approximately 25% of males under 21 earned less than \$100 per week.
 (C) Approximately 50% of males 21 years and older earned more than \$100 per week.
 (D) Approximately 75% of males in each group earned between \$100 and \$200 per week.

21. This set of data is arranged in order from smallest to largest.

5, 7, 12, y , 14, 19, 29

The range is 10 more than the value of y .

Which of the following is true?

- (A) The median is 13 and the interquartile range is 7.
 (B) The median is 13 and the interquartile range is 12.
 (C) The median is 14 and the interquartile range is 7.
 (D) The median is 14 and the interquartile range is 12.

22. A die has faces numbered 1 to 6. The die is biased so that the number 1 will appear more often than each of the other numbers. The numbers 2 to 6 are equally likely to occur.

The die was rolled 1400 times and it was noted that the 1 appeared 400 times.

Which of the following statements is true?

- (A) The probability of rolling an even number is expected to be equal to the probability of rolling an odd number.
 (B) The probability of rolling the number 1 is expected to be $\frac{1}{7}$
 (C) The number 1 is expected to appear two times as often as any other number.
 (D) The number 1 is expected to appear four times as often as any other number.

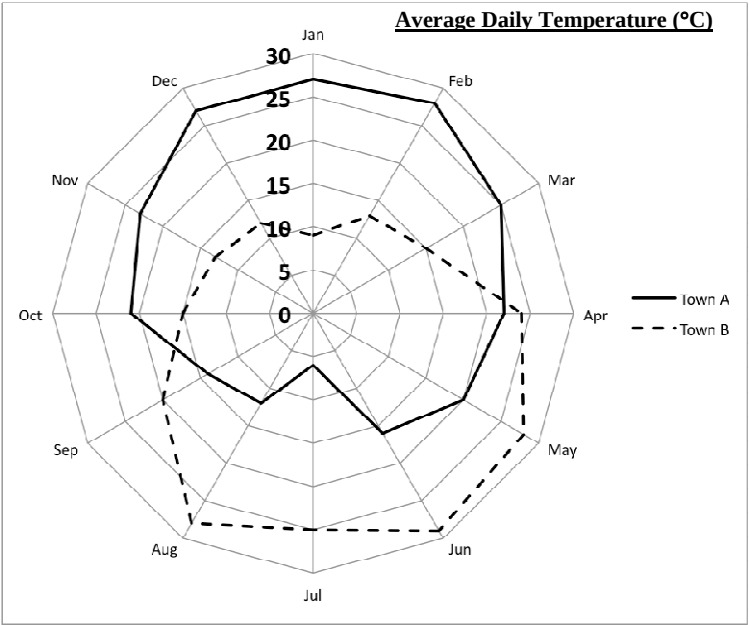
Section II

78 marks
Attempt Questions 23 – 28
Allow about 2 hours for this section

Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.
All necessary working should be shown in every question.

Question 23 (13 marks) Use a SEPARATE writing booklet. **Marks**

- (a) This radar chart was used to display the average daily temperatures each month for two different towns.



- (i) What is the average daily temperature of Town A for September? **1**
- (ii) In which months is the average daily temperature in Town A higher than in Town B? **1**
- (iii) In which month do the average daily temperatures have the smallest difference? **1**

Question 23 continues

Question 23 (continued) **Marks**

- (b) Solve for x : $\frac{5x+1}{2} = 4x-7$ **3**
- (c) Alex works as a data entry clerk, and is paid \$15.80 per hour.
- (i) If he works 36 hours a week, calculate his fortnightly gross pay. **1**
- (ii) Alex is paid an annual leave loading of $17\frac{1}{2}\%$ of 4 weeks' gross pay. Calculate his annual leave loading. **1**
- (d) Number plates in Aloveria consist of 3 capital letters and 2 digits from 0 to 9. An example of an Aloverian number plate is shown below (repetition of letters and numbers is allowed):
- A C Z 2 0**
- (i) How many different number plates are possible? **1**
- (ii) It is decided that to avoid confusion, the letters 'O' and 'I' will not be used. How many different number plates are now available? **1**
- (e) Sam and Tom are competing for a position on the school golfing team. They are asked to submit the scores for their last 8 rounds of golf to the team selectors. An incomplete table of scores is shown below.

									Mean	S.D.
Sam	90	92	86	79	80	81	84	80	84	4.61
Tom	84	85	A	87	84	86	82	88	84	3.5

- (i) Find the missing score, A, for Tom. **2**
- (ii) If the selectors are looking for the more consistent golfer, who should they select? Justify your answer. **1**

End of Question 23

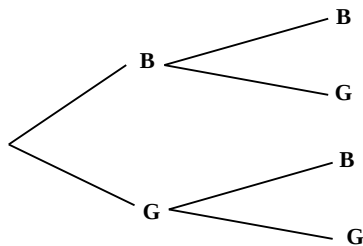
Marks

Question 24 (13 marks) Use a **SEPARATE** writing booklet.

- (a) A test for a medical disease does not always produce an accurate result. A positive test indicates that the patient has the disease. Two hundred people were tested. A table is being used to record the results.

	Test Results	
	Accurate	Not accurate
With disease	27	A
Without disease	148	22

- (i) What is the value of **A**? **1**
- (ii) What fraction of the 200 people had the disease? **1**
- (iii) What is the probability that a patient with the disease has it detected by the test? **2**
- (b) On a shelf there are 7 mugs. Four are brown, and three are green. Two mugs are selected at random.
- (i) Copy and complete the probability tree diagram, including the probability on each branch. **2**



- (ii) What is the probability that one mug is green and one mug is brown? **2**
- (iii) Calculate the probability that at least one of the selected mugs is green. **2**

Question 24 continues

Marks

Question 24 (continued)

- (c) Harry wishes to design a cat litter tray. He knows that the surface area of the floor of the tray must be 0.2 square metres.
- (i) What could be the dimensions of the floor of the tray? **1**
- (ii) Harry wants to design the tray so that it can hold a minimum of 5 litres of cat litter. What should be the minimum depth of the tray? (1000 L = 1 m³). **2**

End of Question 24

Question 25 (13 marks) Use a **SEPARATE** writing booklet.

- (a) Joe is planning his annual budget for 2011.

His expected income is:

- \$185 a week from his job as a part time waiter
- Interest earned from his investment of \$4000 in an account that pays interest at 5% p.a.

His planned expenses are:

- \$25 each week on his bus ticket
- \$14 each week on coffee
- \$68 each month on entertainment.

Joe will save his remaining income. He uses the spreadsheet below for his budget.

	A	B	C	D	E	F
2						
3						
4						
5						
6						
7						
8						
9						
10						

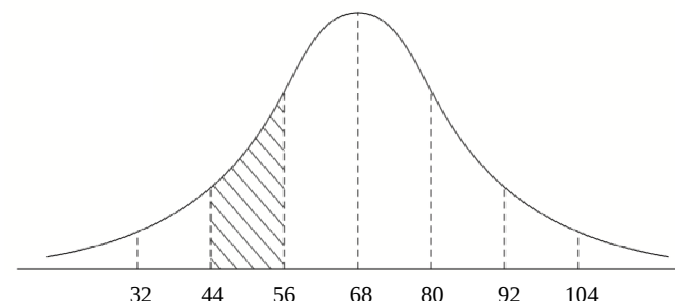
Joe's Annual Budget 2011					
INCOME			EXPENSES		
Wages		\$9,620	Bus ticket		\$ (Y)
Interest on investment		\$ (X)	Coffee		\$728
			Entertainment		\$ (Z)

- (i) Determine the values of (X), (Y) and (Z). (Assume there are exactly 52 weeks in a year.) 3
- (ii) At the beginning of 2011, Joe starts saving. He wants to buy a surround sound home theatre system costing \$7100. At the end of 2011, will he have enough money saved to buy the home theatre system if he keeps to budget? Justify your answer with suitable calculations. 2

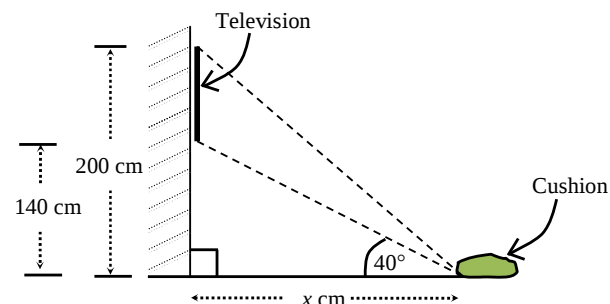
Question 25 continues

Question 25 (continued)

- (b) The normal distribution shown has a mean of 68 and a standard deviation of 12.



- (i) Philip has a raw score in the shaded region. What could his z-score be? 1
- (ii) What percentage of the data lies in the shaded region? 2
- (iii) David has a z-score of 0.5. What was his mark? 1
- (c) A television is mounted on a wall as shown below, from the side. The television is mounted so that the bottom of it is 140 cm above the floor, at an angle of elevation of 40° from the cushion on the floor from where it is viewed.



- (i) What is the horizontal distance, x , from the cushion to the wall? Answer correct to the nearest centimetre. 2
- (ii) What is the angle of elevation from the cushion to the top of the television? Give your answer correct to the nearest degree. 2

End of Question 25

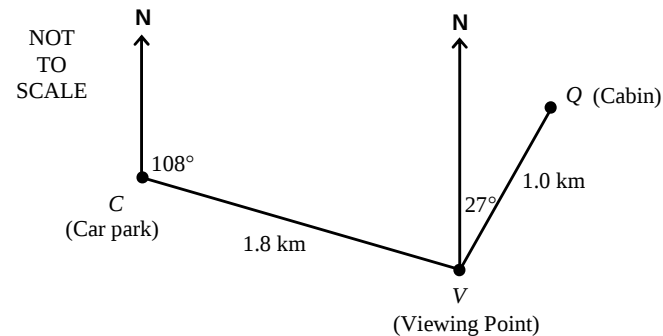
Question 26 (13 marks) Use a **SEPARATE** writing booklet.

- (a) Two unbiased dice are thrown. The dice each have six faces. The faces are numbered 1, 2, 3, 4, 5, and 6.
- (i) What is the probability that both show a 2? 1
- (ii) Ashford plays a game with the two dice. It costs nothing to play. 3
- When the dice are thrown:
- Ashford wins \$10 if both dice show a 2.
 - He wins \$5 if there is only one 2.
 - He loses \$5 if neither of them shows a 2.
- What is his financial expectation from this game?
- (b) Jake purchased a new car for \$25 000. It depreciated in value by \$1800 per year for the first three years. 1
- (i) Show that the value of the car at the end of the third year is \$19 600. 2
- (ii) Calculate the rate of depreciation per year as a percentage. 2
- (iii) After the end of the third year, Jake changed the method of depreciation to the declining balance method at the rate of 20% per annum. 2
- Calculate the value of the car seven years after it was purchased.

Question 26 continues

Question 26 (continued)

- (c) Randle walks 1.8 kilometres from a car park (C), on a bearing of 108° , to reach a viewing platform (V). On a bearing of 027° from the viewing platform, Randle can see a cabin (Q), exactly 1 kilometre away. 2



- (i) Find the distance from the cabin (Q), to the car park (C). 2
- (ii) Calculate the bearing of the cabin (Q), from the car park (C); correct to the nearest degree. 2

End of Question 26

Question 27 (13 marks) Use a **SEPARATE** writing booklet.

Marks

- (a) Zach decides to borrow \$220 000 over a period of 15 years at a rate of 7.5% per annum.

MONTHLY REPAYMENT TABLE						
Principal and interest per \$1000 borrowed						
Interest rate (pa)	Term of loan – years					
	5	10	15	20	25	30
6.5%	19.57	11.35	8.71	7.46	6.75	6.32
7.0%	19.80	11.61	8.99	7.75	7.07	6.65
7.5%	20.04	11.87	9.27	8.06	7.39	6.99
8.0%	20.28	12.13	9.56	8.36	7.72	7.34

- (i) Using the Monthly Repayment Table, calculate Zach's monthly repayment. **1**
- (ii) How much interest does he pay over the 15 years? **2**
- (iii) If Zach chose to borrow \$220 000 over a period of 20 years at 7% p.a., Would he pay more or less interest on the loan? Justify your answer with appropriate mathematical calculations. **2**
- (b) The time taken for an asset to double in value when it appreciates at a rate of 6.5% can be found by solving the equation $(1.065)^n = 2$.
- (i) Find the solution to this equation, correct to the nearest whole number. **2**
- (ii) Another asset depreciates at a rate of 12%. Write an equation that can be used to find the amount of time that it will take for this asset to halve in value. **2**

Question 27 continues

Question 27 (continued)

Marks

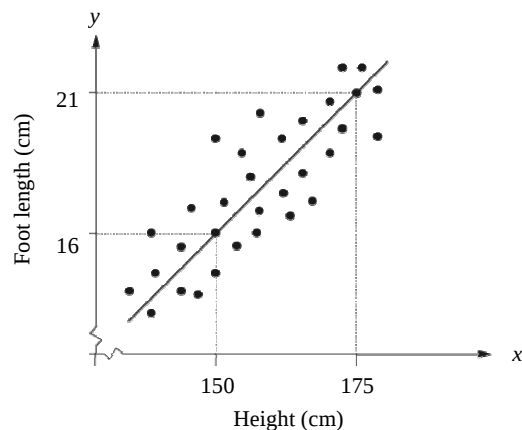
- (c) A school hires a hall for the School Dance. The cost of hiring the hall is \$800. Each person attending the dance is then charged \$20.
- (i) Write an equation for the profit made on the School Dance in terms of the number of people attending. **1**
- (ii) Draw a graph of the equation **on the graph paper provided**. Place this page **inside your booklet for Question 27**. **2**
- Use the horizontal axis to represent the number of people attending and the vertical axis to represent the profit.
- (iii) How many people must attend the dance for the School to cover the cost of hiring the hall? **1**

End of Question 27

Question 28 (13 marks) Use a **SEPARATE** writing booklet.

Marks

- (a) A fitness rating, F , is calculated by dividing a person's weight, w , in kilograms by the square root of the person's resting pulse rate, p , in beats per minute.
- (i) Josh weighs 76 kg and has a pulse rate of 84 bpm. Calculate Josh's fitness rating, correct to one decimal place.
- (ii) Josh hopes to improve his fitness rating to 8.5. What pulse rate must he aim for to achieve his desired fitness rating, correct to one decimal place.
- (b) Each boy in a Year 12 class had his height and foot length measured and recorded. The results were graphed and a line of best fit drawn.



- (i) Why does the value of the y -intercept have no meaning in this situation?
- (ii) Jack is 5 cm taller than his classmate Harry. Use the line of best fit shown to estimate the difference in their foot lengths.

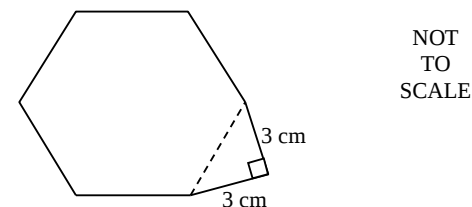
Question 28 continues

Question 28 (continued)

Marks

- (c) This shape is made up of a right-angled triangle and a regular hexagon.

3

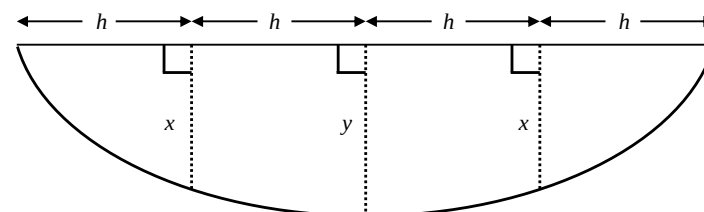


The area of a regular hexagon can be estimated using the formula $A = 2.598H^2$ where H is the side-length of the regular hexagon.

Calculate the **total area** of the shape using this formula.

- (d) A man-made waterway has the cross section shown.

The area of the cross-section is 800 m^2 .



- (i) Find a simplified expression in terms of x , y , and h for the area of the cross section of the waterway using TWO applications of Simpson's rule.
- (ii) What volume of water (in m^3) is contained by the section of waterway, which is 2 kilometres long, if water completely fills the section?
- (iii) The waterway is 100 metres wide. If the value of x increases by 1 metre, by how much will y change?

2

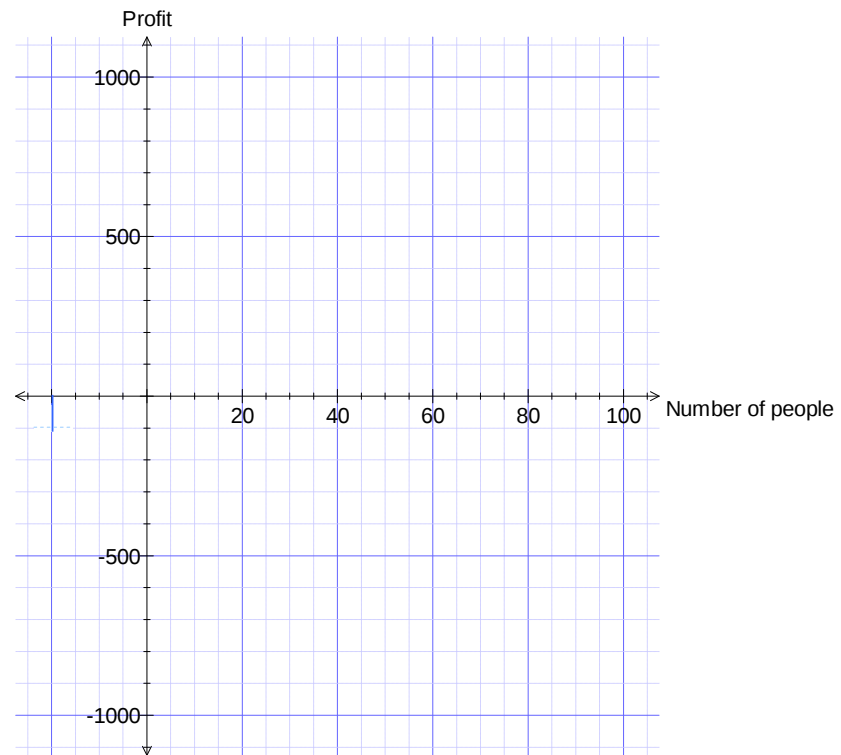
1

2

End of Exam

Section II

Question 27 (c) (ii).



HSC General Mathematics TRIAL 2010

1 B	5 D	9 C	13 C	17 C	21 D
2 D	6 D	10 A	14 B	18 C	22 C
3 B	7 A	11 D	15 A	19 C	
4 C	8 B	12 B	16 B	20 A	

Q23 (a) (i) 14°

(ii) Oct, Nov, Dec, Jan, Feb, Mar
(b) (in) April

$$\frac{5x+1}{2} = 4x-7$$

$$5x+1 = 8x-14$$

$$3x = 15$$

$$\underline{x = 5}$$

(c) (i) $36 \times 15.80 = \$568.80$

$$568.80 \times 2 = \$1137.60$$

(ii) $2 \times 1137.60 \times 0.175 = \398.16

(d) (i) $26 \times 26 \times 26 \times 10 \times 10 = 1757600$

(ii) $24 \times 24 \times 24 \times 10 \times 10 = 1382400$

(e) (i) $84 \times 8 = 672$

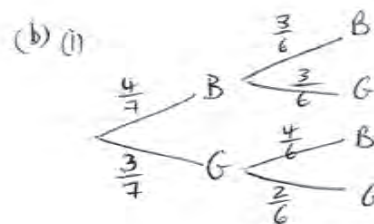
$$672 - (84 + 85 + 87 + 84 + 86 + 82 + 88) = \underline{76} \quad 2$$

(ii) Tom, because his standard deviation is lower.

Q24 (a) (i) A = 3

(ii) $\frac{30}{200} = \frac{3}{20}$

(iii) $\frac{27}{30} = \frac{9}{10}$



(b) (ii) $\frac{4}{7} \times \frac{3}{6} + \frac{3}{7} \times \frac{4}{6} = \frac{12}{42} + \frac{12}{42}$

$$= \frac{24}{42}$$

$$= \frac{4}{7}$$

(ii) $P(B) = \frac{4}{7} \times \frac{3}{6} = \frac{2}{7}$

$$P(\text{at least 1 G}) = 1 - \frac{2}{7}$$

$$= \frac{5}{7}$$

(d) (i) $0.5 \text{ m} \times 0.4 \text{ m}$

(ii) $V = Ah$

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

$$= \frac{0.005}{0.2}$$

$$= 0.025 \text{ m}$$

$$= \underline{2.5 \text{ cm}}$$

$$\left[\begin{aligned} 5L &= 5000 \text{ cm}^3 \\ &= 0.005 \text{ m}^3 \end{aligned} \right]$$

Q.25 (a)(i) $X = PRN$
 $= 4000 \times 0.05 \times 1$
 $= \$200$

$Y = 25 \times 52$
 $= \$1300$

$Z = 68 \times 12$
 $= \$816$

ii) Total income = $9620 + 200$
 $= \$9820$

Total expenditure = $1300 + 728 + 816$
 $= \$2844$

Savings = $9820 - 2844$
 $= \$6976$ He will not have enough

(b) (i) Between -1 and -2

(ii) $\frac{95 - 68}{2} = \underline{13.5\%}$ of scores

(iii) $Z = \frac{x - \bar{x}}{12}$

$0.5 = \frac{x - 68}{12}$

$x = 12 \times 0.5 + 68$
 $= \underline{74}$

(c)(i) $\tan 40^\circ = \frac{140}{x}$

$x = \frac{140}{\tan 40^\circ}$
 $= 166.845...$
 $= \underline{167 \text{ cm}}$

(ii) $\tan \theta = \frac{200}{167}$

$\theta = \tan^{-1} \left(\frac{200}{167} \right)$
 $= 50^\circ 8' 17.227''$
 $= \underline{50^\circ}$

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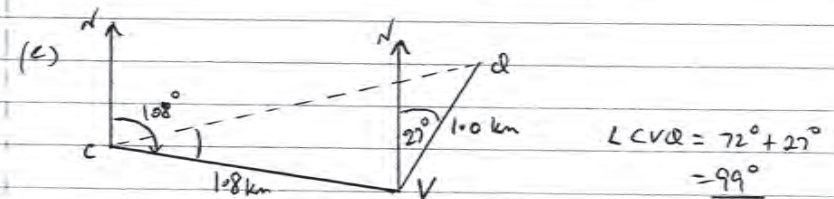
Q.26 (a) (i) $P(2,2) = \underline{\frac{1}{36}}$ 1

(ii) Financial expectation = $\frac{1}{36} \times \$10 + \frac{10}{36} \times \$5 - \frac{25}{36} \times \5
 $= \underline{-\$1.81}$ (nearest cent) 3

(b) (i) Value after 3 years = $\$25000 - 3 \times \1800
 $= \$25000 - \5400
 $= \underline{\$19600}$ 1

(ii) Rate of Depreciation = $\frac{1800}{25000} \times 100\%$
 $= \underline{7.2\%}$ 2

(iii) Value after 7 years = $\$19600 (0.80)^4$
 $= \underline{\$8028.16}$ 2



(i) $CQ^2 = 1.8^2 + 1.0^2 - 2 \times 1.8 \times 1.0 \cos 99^\circ$
 $= 4.80316...$
 $CQ = 2.1916...$
 $\therefore$ Distance from Cabin to car park is 2.2 km (2sf). 2

(ii) $\frac{\sin \angle QCV}{1.0} = \frac{\sin 99^\circ}{2.2}$
 $\sin \angle QCV = 0.4489$
 $\angle QCV = 26.676...$
 $= \underline{27^\circ}$ (nearest degree)

$\therefore$ Bearing of cabin from car park is 081° 2

Q.27

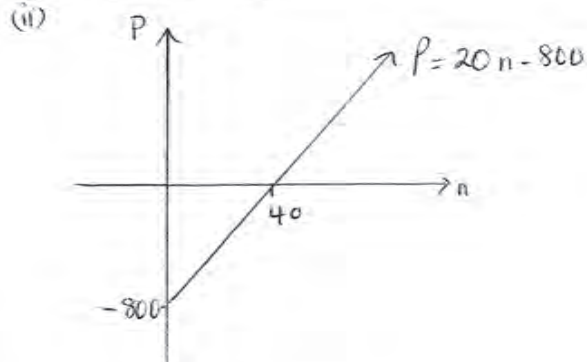
- (a) (i) $9.27 \times 220 = \$2039.40$
 (ii) $15 \times 12 \times 2039.40 = \367092
 $367092 - 220000 = \$147092$
 (iii) $7.75 \times 220 \times 12 \times 20 = 409200$
 $409200 - 220000 = \$189200$

he would pay more interest
 if he chose 20 years at 7%.

- (b) (i) Try $n = 10$ $(1.065)^{10} = 1.877...$
 Try $n = 12$ $(1.065)^{12} = 2.129...$
 Try $n = 11$ $(1.065)^{11} = 1.999...$
 $n = 12$ would ensure it doubles in value.

(ii) $(0.88)^n = \frac{1}{2}$

(c) (i) $P = 20n - 800$



- (iii) From the graph, x-intercept is
 at $n = 40$
 So, 40 people must attend

Q.28

(a) (i) $F = \frac{W}{\sqrt{P}}$
 $= \frac{76}{\sqrt{84}}$
 $= 8.292...$
 $= 8.3$

(ii) $F = \frac{W}{\sqrt{P}}$
 $\sqrt{P} = \frac{W}{F}$
 $P = \left(\frac{W}{F}\right)^2$
 $= \left(\frac{76}{8.5}\right)^2$
 $= 79.94$
 $= 80 \text{ bpm}$

- (b) (i) no one has zero height, and scale
 does not go to zero.
 (ii) 25cm height is 5cm of foot length.
 5cm height is 1cm foot length.
 $\therefore$ 1cm difference

(c) $H^2 = 3^2 + 3^2$
 $H = \sqrt{18}$
 $A = 2.598 \times (\sqrt{18})^2$
 $= 46.764 \text{ cm}^2$
 $A \Delta = \frac{1}{2}bh$
 $= \frac{1}{2} \times 3 \times 3$
 $= 4.5 \text{ cm}^2$
 Total area $= 46.764 + 4.5$
 $= 51.624 \text{ cm}^2$

(d) (i) $A = \frac{1}{3} \{d_f + 4d_m + d_l\}$
 $= \frac{1}{3} \{0 + 4 + y\} + \frac{1}{3} \{y + 4x + 0\}$
 $= \frac{1}{3} \{8x + 2y\}$

(ii) $800 \times 2000 = 1600000 \text{ m}^3$

(iii) $800 = \frac{25}{3} (8x + 2y)$

If x increases by 1, it adds $8 \times 1 = 8$. So y must
 decrease by 4 (since $4 \times 2 = 8$)