

2005

TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

General Instructions

- Reading time: 5 minutes
- Working time: $2\frac{1}{2}$ hours
- Write using blue or black pen.
- Calculators may be used.
- Use Multiple Choice Answer Sheet provided.
- A separate Formula Sheet is provided.

Total Marks: 100

Section I (Pages 3-11)

Total Marks: 22

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

Section II (Pages 12-20)

Total Marks: 78

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

Committee

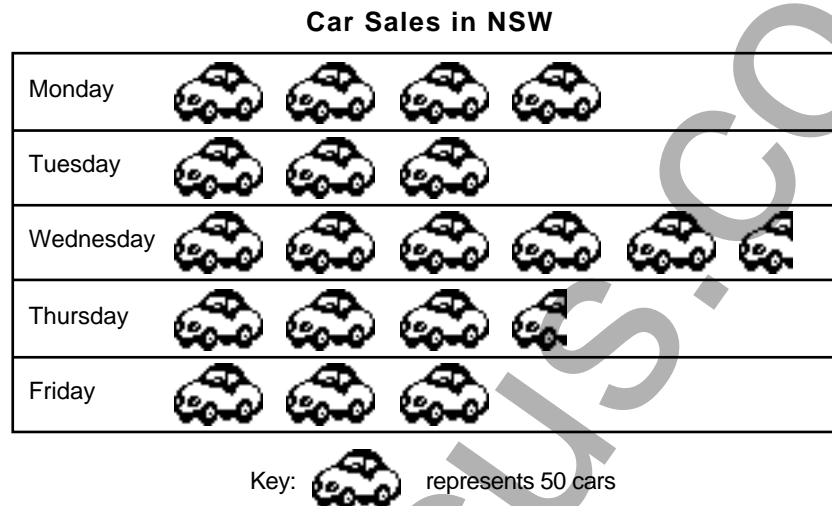
Patrick Curteis	Kambala, Rose Bay
Tim Hildebrandt	St Leo's College, Wahroonga
Lynne Knapman	PLC Sydney, Croydon
Julie McDougal	St Clare's College, Waverley
Bill Waddell	St Patrick's Marist College, Dundas (Convenor)

Section I
Total Marks: 22

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

Use the Multiple Choice Answer Sheet provided.

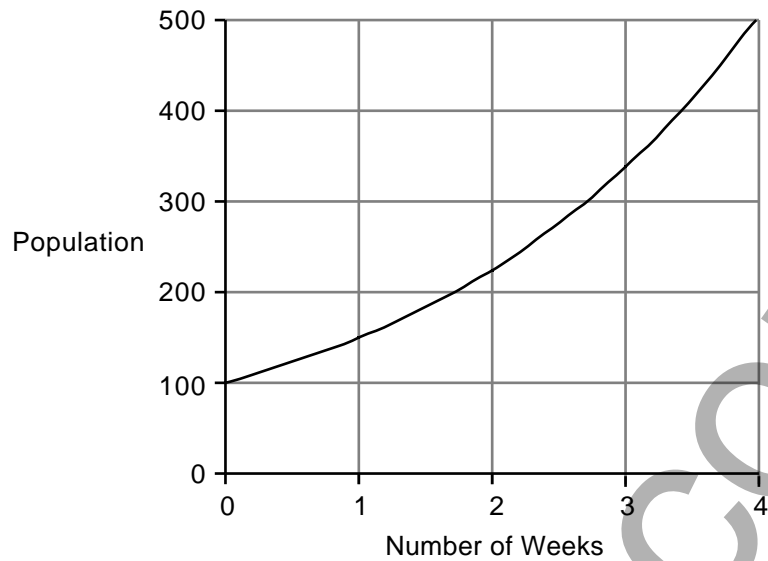
- 1 The following diagram gives details of the number of sales of a specific type of car across NSW in a given week.



How many more cars were sold on Wednesday than Thursday?

- (A) 2
(B) 4
(C) 50
(D) 100
- 2 Samantha and Eric are playing a board game. In their turn, each player rolls a single die. Samantha needs a six to finish the game and win. The chance of Samantha rolling a six could best be described as:
- (A) impossible
(B) unlikely
(C) even
(D) probable

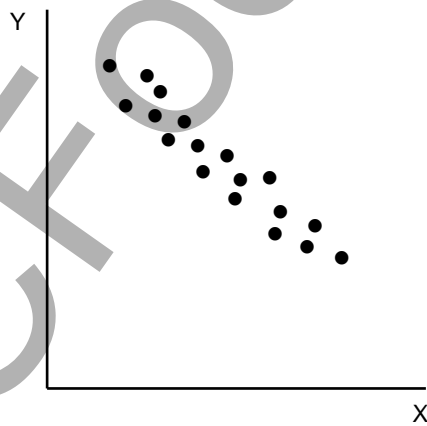
- 3 The graph below shows the number of rabbits in a colony.



During which week will the population of the colony double its original size?

- (A) 1st week
- (B) 2nd week
- (C) 3rd week
- (D) 4th week

4



What type of correlation is shown in the scatterplot above?

- (A) Weak positive correlation
- (B) Strong positive correlation
- (C) Weak negative correlation
- (D) Strong negative correlation

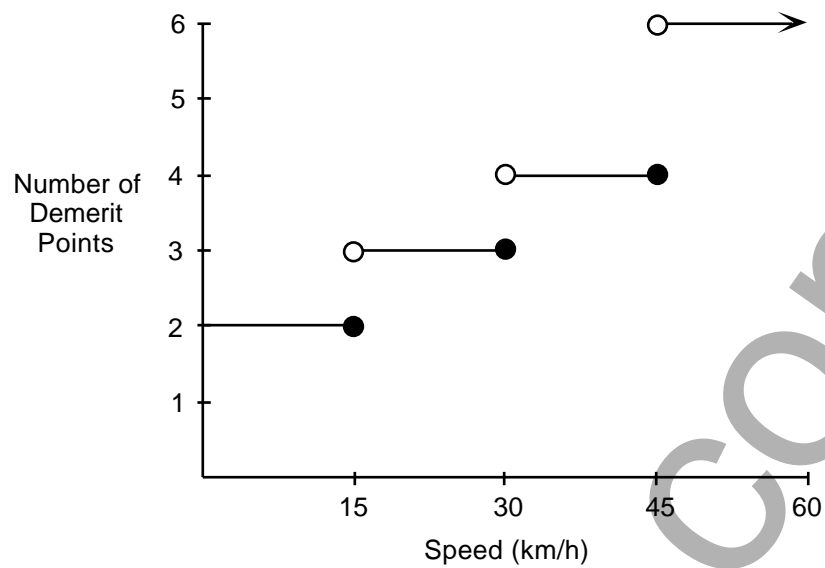
- 5 A true bearing of 135° is equivalent to a compass bearing of:
- (A) NE
 - (B) NW
 - (C) SE
 - (D) SW
- 6 Light travels at 9 449 000 000 000 km in a year. In scientific notation, this number would be expressed as:
- (A) 9.449×10^{12}
 - (B) 9.449×10^9
 - (C) 9.449×10^{-9}
 - (D) 9.449×10^{-12}
- 7 John surveys 15% of the students in his school. He decides to make a stratified sample by surveying a random group from each year. The number of students in each year group is shown below:

Year	7	8	9	10	11	12
Number of Students	175	200	205	180	165	155

How many Year 8 students should he choose?

- (A) 15
- (B) 27
- (C) 30
- (D) 162

- 8 The graph below shows the relationship between the number of demerit points and the amount by which the speed limit is exceeded when a motorist incurs a traffic fine.



A police radar recorded that Lauren was travelling at 95 km/h in an 80 km/h zone. How many demerit points would she gain?

- (A) 2
(B) 3
(C) 4
(D) 6
- 9 When a normal die is rolled 120 times, how many times would you expect a number less than 3 to be rolled?
- (A) 20
(B) 40
(C) 60
(D) 80

- 10 The table below shows the monthly repayment required to pay off a reducing balance loan ranging from \$100 000 to \$160 000 at an interest rate of 7.49% p.a. over varying durations.

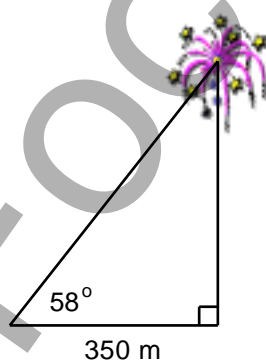
Monthly Loan Repayments (7.49% p.a.)

Principal	Duration of Loan					
	10 years	12 years	14 years	16 years	18 years	20 years
100000	1186.50	1054.69	962.58	895.25	844.38	804.98
110000	1305.15	1160.15	1058.84	984.78	928.82	885.48
120000	1423.80	1265.62	1155.10	1074.30	1013.25	965.98
130000	1542.44	1371.09	1251.36	1163.83	1097.69	1046.48
140000	1661.09	1476.56	1347.62	1253.35	1182.13	1126.97
150000	1779.74	1582.03	1443.88	1342.88	1266.57	1207.47
160000	1898.39	1687.50	1540.13	1432.40	1351.01	1287.97

The total amount repaid on a loan of \$110 000 over 16 years at 7.49% p.a. is:

- (A) \$984.78
 (B) \$15 756.48
 (C) \$79 077.76
 (D) \$189 077.76

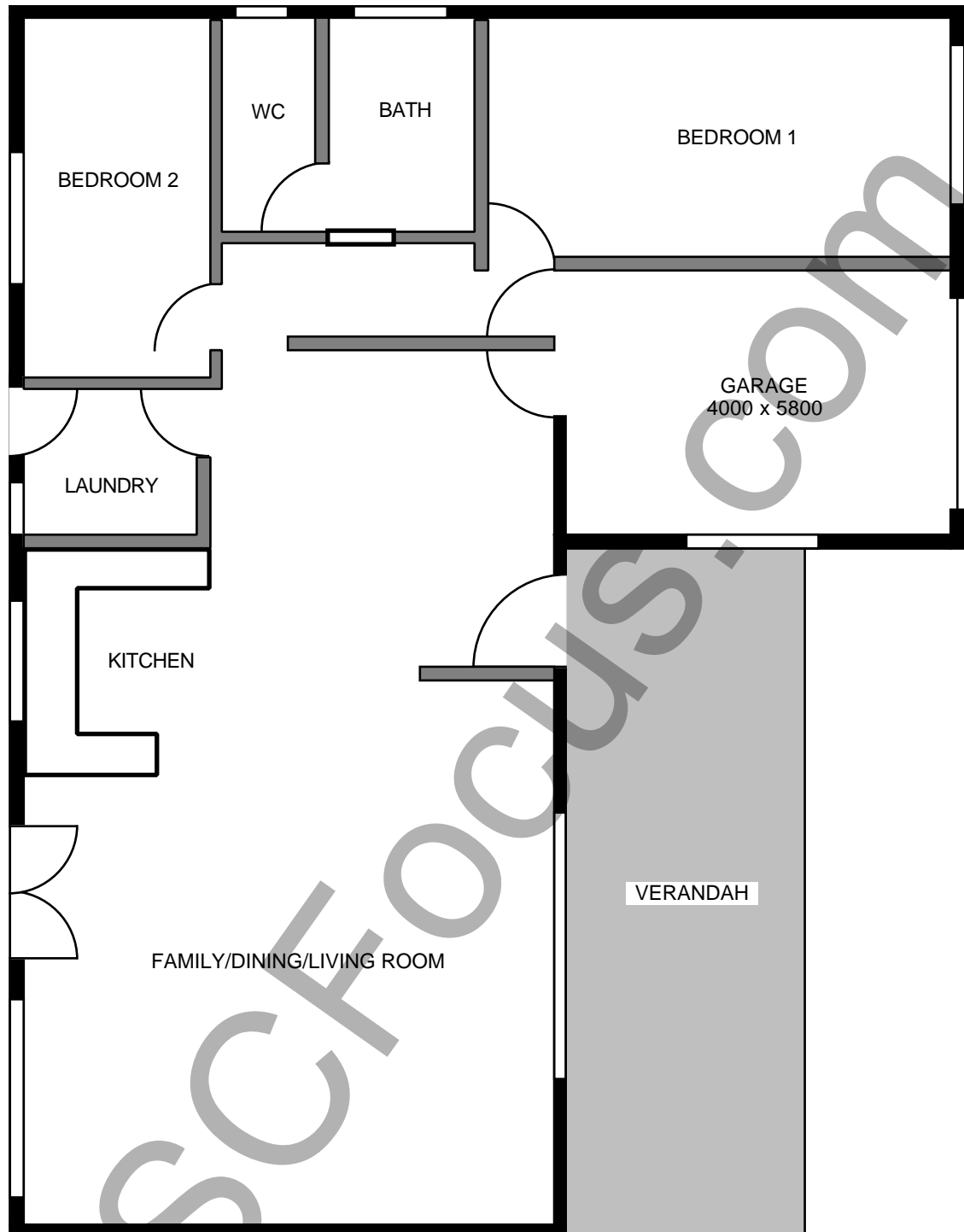
11



Clare wants to calculate the approximate maximum height of the New Year's Eve fireworks. From a position 350 metres from where they are let off she measures the angle of elevation to the top of the fireworks to be 58° . The height may be calculated using:

- (A) $350 \tan 58^\circ$
 (B) $\frac{\tan 58^\circ}{350}$
 (C) $\frac{350}{\tan 58^\circ}$
 (D) $350 \cos 58^\circ$

12 The sketch below is the floor plan of a house.



The scale of this plan is:

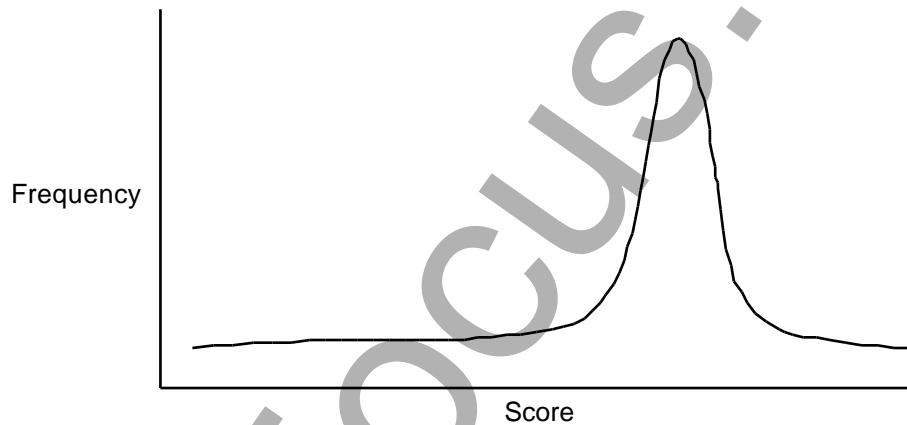
- (A) 1:50
- (B) 1:100
- (C) 1:200
- (D) 1:500

- 13** In a normal distribution, the mean is 13.6 and the standard deviation is 1.2. A score of 13 corresponds to a z -score of:
- (A) -1
 - (B) -0.5
 - (C) 0.5
 - (D) 1
- 14** The River Bank offers a "Vista" credit card with no interest-free period. Interest is charged at a flat rate of 18.8% p.a. Calculate the interest charged on a balance of \$847 if the card is paid off after 64 days.
- (A) \$13.69
 - (B) \$27.92
 - (C) \$339.70
 - (D) \$2792.08
- 15** A cylindrical tin can with a diameter of 10 cm and height 15 cm is open at the top. The external surface area of the can, to the nearest square centimetre, is:
- (A) 550
 - (B) 628
 - (C) 1257
 - (D) 1571
- 16** Chris has a fixed term deposit which earns interest at 10% p.a., compounded quarterly. His current balance is \$13 073. The balance of his account in 3 years will be:
- (A) \$14 078.19
 - (B) \$17 400.16
 - (C) \$17 581.73
 - (D) \$41 028.67

- 17 In a box are 14 bags, all of the same size. Each bag contains a sum of money and is marked with the amount of money it contains. Seven bags are marked with \$10, four bags with \$50 and three with \$100. If two bags are selected from the box, and the first bag is not returned to the box before the second is drawn, which expression best describes the probability that you receive \$50 on the first draw and \$100 on the second draw?

- (A) $\frac{4}{14} + \frac{3}{14}$
(B) $\frac{4}{14} + \frac{3}{13}$
(C) $\frac{4}{14} \times \frac{3}{14}$
(D) $\frac{4}{14} \times \frac{3}{13}$

18



Which of the following best describes the distribution of data in this display?

- (A) Symmetrical
(B) Normal
(C) Negatively skewed
(D) Positively skewed
- 19 Anusha borrows \$9900 in a flat-rate loan over 3 years, with interest charged at 9% per annum. Calculate the amount of each monthly repayment.
- (A) \$74.25
(B) \$222.75
(C) \$349.25
(D) \$1047.75

- 20 Tom measures a piece of fabric with a ruler that is only marked in centimetres. He measures the length to be 60 cm and the width 90 cm. The area of the fabric is:
- (A) Between 5399.5 cm^2 and 5400.5 cm^2
 - (B) Between 5384.75 cm^2 and 5414.75 cm^2
 - (C) Between 5325.25 cm^2 and 5475.25 cm^2
 - (D) Between 5251 cm^2 and 5551 cm^2
- 21 The cooking time for a roast varies with the square of the mass of the roast, when cooked at a constant temperature. A 1.2 kg roast takes $1\frac{1}{2}$ hours to cook. How long will a 1.5 kg roast take to cook, in the same oven at the same temperature?
- (A) 1 hour 48 minutes
 - (B) 1 hour 53 minutes
 - (C) 2 hours 21 minutes
 - (D) 2 hours 34 minutes
- 22 Nick deposits \$170 at the end of each month for 4 years in an annuity earning 8.4% p.a., compounded monthly. What single amount invested at the start of the same 4 year period, at the same rate of interest (compounded monthly), would reach the same financial result?
- (A) \$170
 - (B) \$6910.25
 - (C) \$8160
 - (D) \$9658.48

END OF SECTION I

Section II
Total Marks: 78

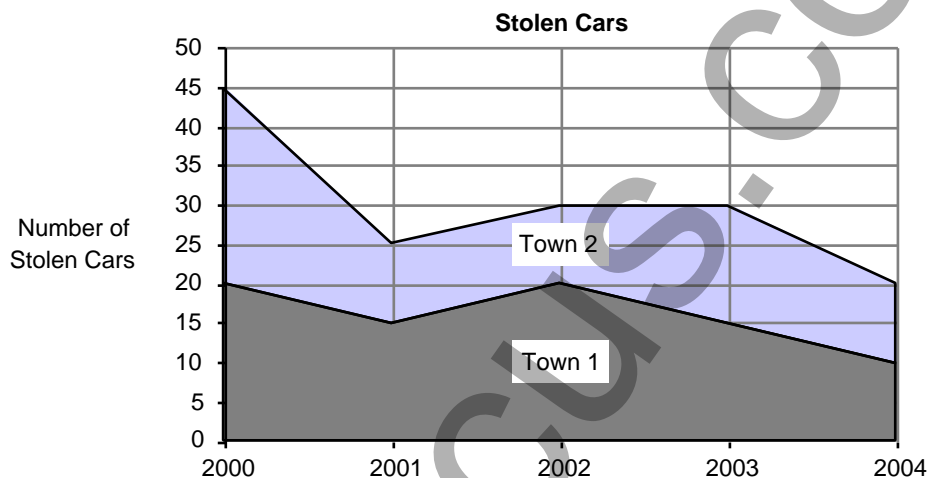
Attempt Questions 23-28
Allow about 2 hours for this section.

Answer each question in a SEPARATE writing booklet.

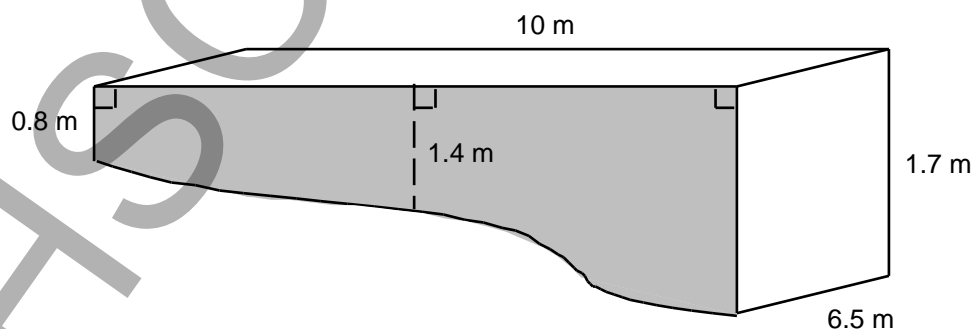
All necessary working should be shown in every question.

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

- (a) The following chart indicates the number of cars that were stolen from two small towns over the last five years.



- (i) How many cars were stolen in 2001 from Town 1? **1**
- (ii) In which year(s) did Town 2 have more cars stolen than Town 1? **1**
- (iii) Which town appears to be the safest town to leave your car? Give reasons for your answer. **1**
- (b) The Thorpes have a swimming pool in the shape indicated in the diagram below.



- (i) Use Simpson's Rule to show that the cross-sectional area of the side of the pool is 13.5 m^2 . **2**
- (ii) Use the area given in (i) to calculate the volume of the pool to the nearest cubic metre. **1**

Question 23 (continued)**Marks**

- (c) The letters of LILLI PILLI are each written on separate cards. The cards are shuffled and one card is selected at random.

(i) What is the probability of selecting an I?

1

(ii) Which letter has the least probability of being selected?

1

- (d) Renato performed a survey on all the households in his street. He asked each householder about the number of children in their house. His results are recorded in the table below:

Number of Children	Frequency
1	3
2	7
3	9
4	3
5	2

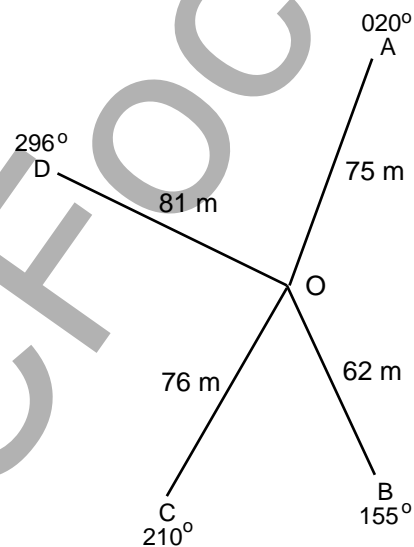
(i) Find the mean number of children per house.

1

(ii) Find the standard deviation, correct to 1 decimal place.

1

- (e) A compass radial survey of a council park is entered in the notebook as follows:



(i) Show that the size of $\angle DOA$ is 84° .

1

(ii) Calculate the area, correct to the nearest square metre, of the triangular section DOA.

2**End of Question 23**

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

- (a) A Mathematics teacher has four different textbooks. In how many different ways can these four textbooks be arranged on the shelf? Show working to justify your answer. **2**
- (b) The surface area of a sphere is given by the formula $A = 4\pi r^2$.
- (i) Rearrange the formula to find r in terms of A . **2**
- (ii) Hence, or otherwise, find the radius of a sphere with surface area of 1800 cm^2 . Give your answer correct to 3 significant figures. **2**
- (c) The following portion of a home loan table shows how the balance of a home loan progresses. The loan of \$230 000 is to be repaid over 18 years. Interest is calculated monthly at 9.6% p.a. Monthly repayments are \$2240.80.

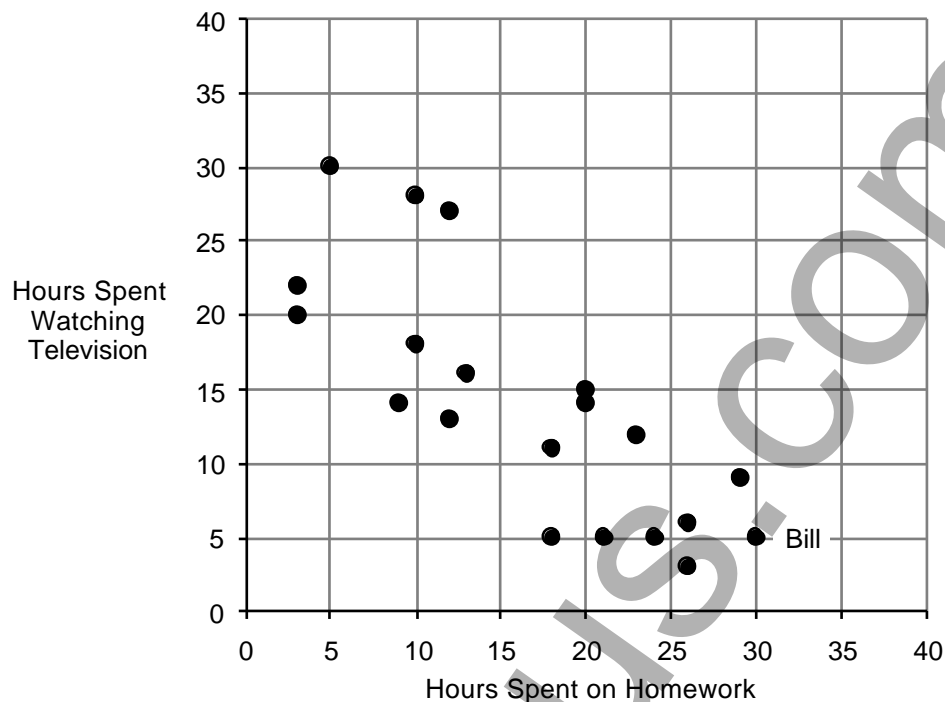
Month	Amount owing at beginning of month (P)	Interest charge at end of month (I)	Amount owing before repayment (P + I)	Amount owing at end of month (P + I – R)
1	230 000.00	1840.00	231 840.00	229 599.20
2	229 599.20	1836.79	231 435.99	229 195.19
3	229 195.19	1833.56	231 028.76	228 787.96
4	228 787.96	1830.30	230 618.26	228 377.46
5	228 377.46	1827.02	230 204.48	227 963.68

- (i) How much is owing on the home loan at the end of the first 5 months? **1**
- (ii) How much has been paid off the home loan at the end of the first 5 months? **1**
- (iii) What is the total amount that has been paid at the end of the first 5 months? **1**
- (iv) Calculate the interest charged at the end of the 6th month. **2**
- (v) Calculate the total amount of interest that will be paid over the 18 year life of the loan. **2**

End of Question 24

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

- (a) Twenty students were surveyed on the number of hours they spent on their homework and the number of hours they spent watching television in the last week. The results are displayed in the scatterplot below.



- (i) Bill's times are indicated in the scatterplot. How many hours of television did Bill watch last week? **1**
- (ii) Comment on the following statement: "*Based on this data, the less homework a person does, the more television they watch.*" **1**

Question 25 (continued)**Marks**

- (b) Sanath earned a gross income of \$59594. He had allowable tax deductions of \$1630 and work related deductions of \$430.

(i) Show that Sanath's taxable income was \$57534.

1

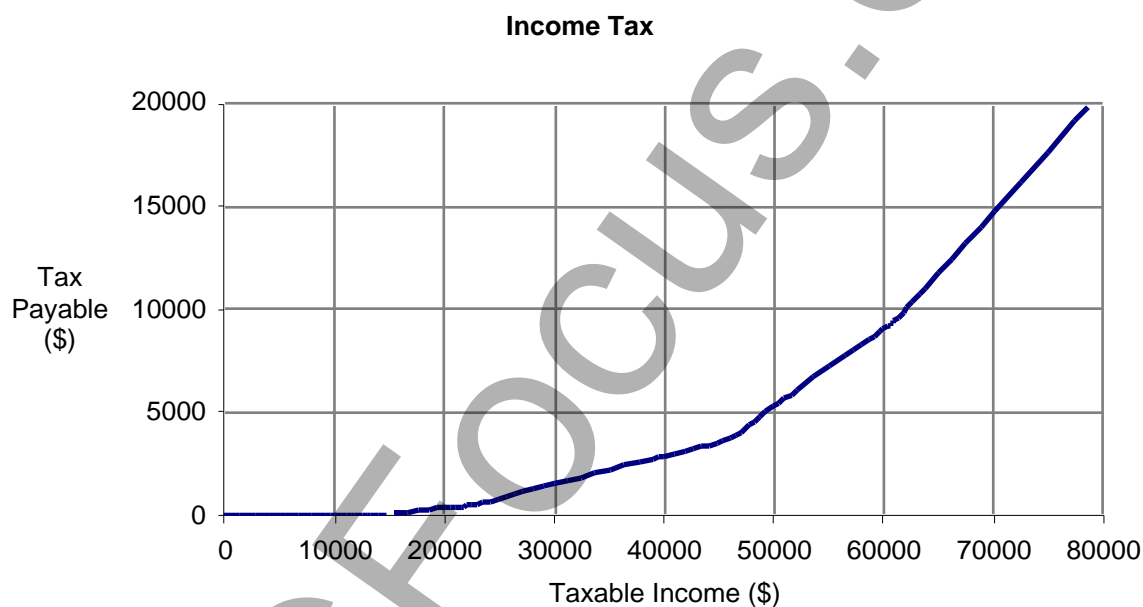
(ii)

2

Taxable Income	Tax on Taxable Income
\$1 – \$13300	Nil
\$13301 – \$23500	6¢ for each \$1 over \$13300
\$23501 – \$46000	\$612 plus 14¢ for each \$1 over \$23500
\$46001 – \$61000	\$3762 plus 38¢ for each \$1 over \$46000
\$61001 – and over	\$9462 plus 59¢ for each \$1 over \$61000

Using the tax table above, calculate the income tax that Sanath must pay.

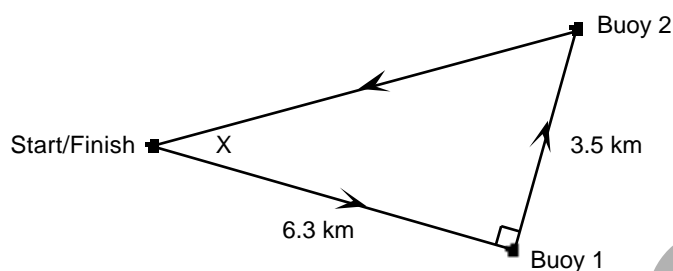
(iii) The diagram below shows the graph of the income tax rates used in part (ii).

1

This graph is sometimes called a "piecemeal" graph. Explain why the graph consists of a series of straight lines with different gradients.

Question 25 (continued)**Marks**

- (c) An off-shore yacht race is around a triangular course as shown in the diagram. The first leg, from the Start to Buoy 1 is 5.6 km, the second leg, from Buoy 1 to Buoy 2, is 3.5 km and is perpendicular to the first leg.

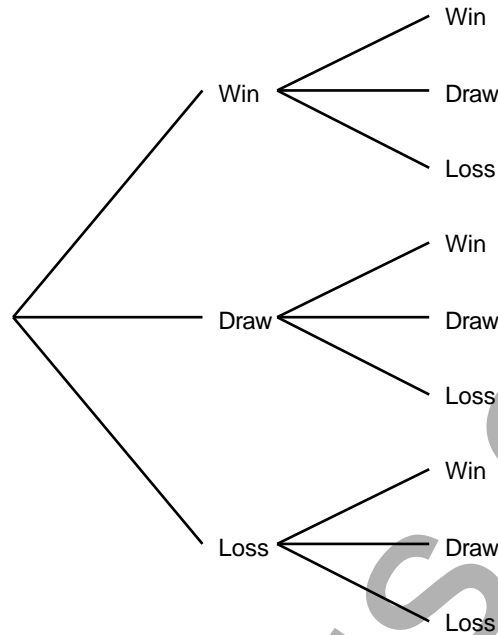


- (i) Show that the total distance around the course is 17 km, correct to the nearest kilometre. **2**
- (ii) Show that the size of the angle marked X is 29° , correct to the nearest degree. **1**
- (iii) If the bearing of the first leg is 100° , calculate the bearing of the final leg from Buoy 2 to the finish. **2**
- (d) Yachts in the Sydney to Hobart Race need to satisfy a set criteria to be placed in the various divisions. If one of the divisions required a yacht to weigh $28 \text{ tonnes} \pm 20 \text{ kg}$, calculate the percentage error allowed in this measurement to 1 significant figure. **2**

End of Question 25

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

- (a) A certain soccer team has a probability of 0.3 of winning a match, 0.2 of drawing and 0.5 of losing. The team plays two matches.



- (i) Copy and complete the probability tree diagram above into your answer booklet, by writing probabilities on each of the branches. **2**
- (ii) Find the probability that the team draws both matches. **1**
- (iii) Find the probability that the team wins at least one match. **2**
- (iv) Find the probability that the team will not win either match. **1**
- (b) A student made the following statement to his teacher: **2**
"When I performed my random sample I first divided the data into different categories so I would get more accurate results."
If you were the teacher of this student, what would you say in a comment back to the student about this statement.
- (c) On 1 July 2004, Antonia opened a body tanning studio. To assist in the smooth running of her business she purchased a new G5 computer for \$2200. Antonia has a choice of how to claim the depreciation that has occurred after 1 year.
- (i) The tax office allows a depreciation rate of 40% p.a. for computers if the declining balance method is used. Find the value of the computer after 1 year. **1**
- (ii) The computer has an effective life of 5 years. Using the straight line method, find the annual amount of depreciation. **2**
- (iii) Which method of depreciation should Antonia use to determine her tax deduction due to depreciation after the first year? Justify your answer using mathematical calculations. **2**

End of Question 26

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

(a) Solve the equation: $\frac{3x+2}{2} = \frac{x-1}{3} - 1$

2

- (b) Michelle received her exam marks back from a class test she had recently done. She was very excited as she had received a higher mark than the previous test. The class results for both tests are normally distributed, and details of the results are given below:

	Test 1	Test 2
Number of Students:	25	25
Mean Score:	60	65
Standard Deviation:	7.5	15
Michelle's Result:	75	80

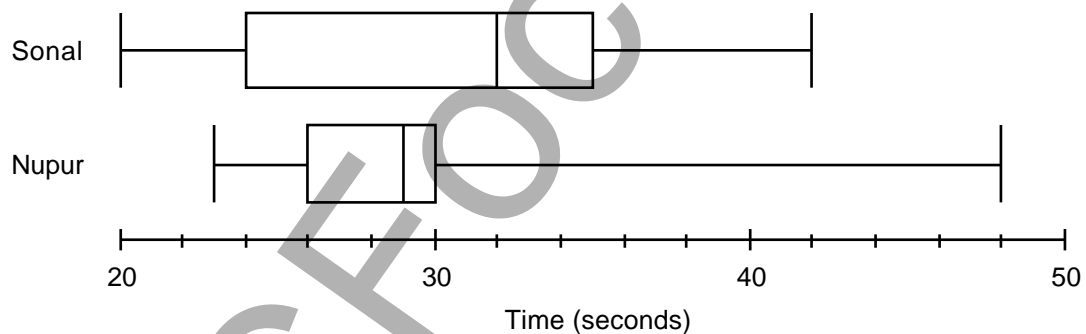
- (i) Was Michelle's second result really better than her first? Explain your answer and show any calculations you use.

2

- (ii) In the second test approximately what percentage of students achieved a result higher than Michelle?

1

- (c) Sonal and Nupur play a memory game on a computer. They both had ten attempts at the game. They recorded the time (in seconds) that they took to complete each game. The data is displayed in two box-and-whisker plots below.



- (i) Which student completes the game in the fastest time?
- (ii) Sonal's interquartile range is 11. Calculate Nupur's interquartile range.
- (iii) Compare and contrast the two data sets by commenting on the shape and skewness of the distributions, and the measures of the location and spread.

1**1****3**

- (d) Harshini needs to save \$9600 so she can buy a motor scooter. She invests \$240 at the end of each month in an account which pays interest at 6% p.a., compounded monthly. How long will it take Harshini to reach her target?

3**End of Question 27**

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

- (a) The time in Sydney is 10 hours ahead of the time in London. A plane leaves Sydney on Friday at 8am and flies directly to London. The flight takes 22 hours.
- (i) Calculate the time in London when the plane lands. **2**
 - (ii) If the distance between Sydney and London is 17 000 km, calculate the average speed of the plane in knots. Give your answer to the nearest whole number.
[1 nautical mile = 1.852 km] **2**
 - (iii) The plane started the flight with 184 tonnes of fuel, and on landing had enough fuel in reserve to fly for another 45 minutes. How much fuel was used for the flight? Give your answer correct to the nearest tonne. **2**
- (b) A gardener has 16 metres of fencing with which to enclose a rectangular vegetable patch.
- (i) If the length of the rectangular vegetable patch is x metres, show that the area of the rectangular vegetable patch is given by $A = 8x - x^2$. **2**
 - (ii) By considering the different possible lengths (x) of the rectangular vegetable patch, copy and complete the table of values below in your answer booklet. **2**
- | | | | | | | | | | |
|----------------|---|---|---|----|---|---|----|---|---|
| Length (x) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Area (A) | | | | 15 | | | 12 | 7 | 0 |
- (iii) Using half a page, draw a neat graph of the area (A) of the vegetable patch against its length (x). Use the horizontal axis for length (from $x = 0$ to $x = 8$) and the vertical axis for area. **2**
 - (iv) From your graph, find the dimensions of the vegetable patch that will maximise the area. **1**

END OF EXAMINATION