STRATHFIELD GIRLS HIGH SCHOOL

2002

TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

Name: _____

Class: _____

General Mathematics

General Instructions

- Reading time - 5 minutes
- Working time - $2^1/2$ hours
- Write using black or blue pen
- Calculators may be used
- A formulae sheet is provided at the back of this paper
- Write your name and teacher's name at the top of each page

Total marks - 100

Section I Pages 3 - 11

22 marks

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

Section II Pages 12 - 23

78 marks

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

Exam Requirements

- 1 exam paper
- 1 formulae sheet (Detach from back of exam)
- Question 24 scatter graph (page 23) (Detach from back of exam)
- Multiple Choice Answer Sheet (Detach from back of exam)
- 10 sheets of writing paper

This is a trial examination only and does not necessarily reflect the format of the paper in the HSC

Outcomes:
P2 - P11
H2, H3, H4, H5, H6, H7, H9, H11

1. Which of the following is **not** equivalent to $3m^2$?

   (A) $\frac{15m^2}{5}$

   (B) $6m \times \frac{1}{2}m$

   (C) $-5m^2 + 9m^2 - m^2$

   (D) $(3m)^2$

2. The time difference between (20^oS, 130^oE) and (25^oN, 70^oE) is:

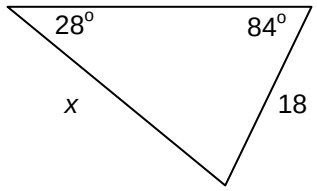
   (A) 3 hours

   (B) 4 hours

   (C) 16 min

   (D) 13 hours 20 min

3. In the triangle below, an expression for x is:



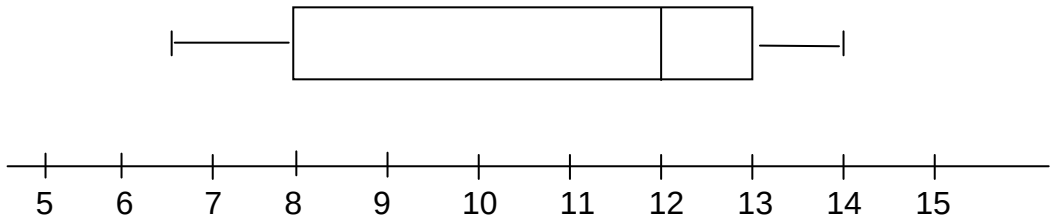
   (A) $\frac{18\sin 84^\circ}{\sin 28^\circ}$

   (B) $\frac{18\sin 28^\circ}{\sin 84^\circ}$

   (C) $\frac{\sin 84^\circ}{18\sin 28^\circ}$

   (D) $\frac{\sin 28^\circ}{18\sin 84^\circ}$

4.



From this box plot, the median is:

(A) 14

(B) 12

(C) 7.5

(D) 5

5. Simplify $2a(3a-4b)-b(8a-6b)$

(A) $6a^2+6b^2$

(B) $6a^2-6b^2$

(C) $6a^2-16ab+6b^2$

(D) $6a^2+16ab-6b^2$

6. The distance between towns of Launceston and Hobart is 165 km in a straight line. Leonie measures the distance between Launceston and Hobart on a map to be approximately 23.6 cm. The scale of the map is most likely:

(A) 1 : 7

(B) 1 : 700

(C) 1 : 7000

(D) 1 : 700 000

7. Two groups of people are compared on their fitness, based on the time (in seconds) that it took their heart rate to return to normal after completing a set of simple exercises. The results for the groups are shown below

GROUP A		*GROUP B*
988	1	88
9875422111	2	7899
75422	3	4566788
32	4	4578
4	5	244

Which statement is **not true** about the two groups?

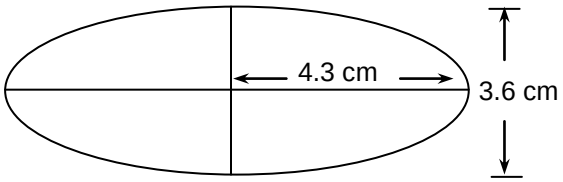
(A) Group B is a much more symmetrical distribution

(B) Group A has a higher median score

(C) Both groups have the same range of scores

(D) Group A is positively skewed

8.



The expression for the area of this ellipse is:

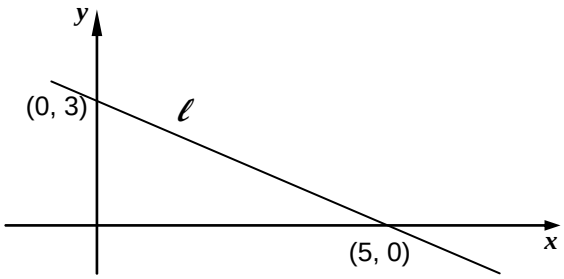
(A) $A = \pi(4.3 \times 3.6)\,\text{cm}^2$

(B) $A = \pi(4.3 \times 1.8)\ \text{cm}^2$

(C) $A = \pi(8.6 \times 7.2)\ \text{cm}^2$

(D) $A = \pi(2.15 \times 1.8)\ \text{cm}^2$

9.



What is the equation of the line ℓ?

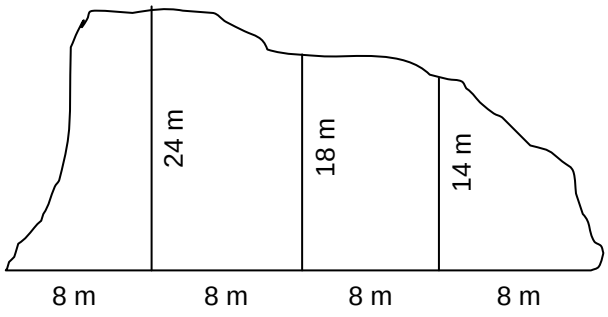
(A) $y = -\frac{3}{5}x + 3$

(B) $y = -\frac{5}{3}x + 3$

(C) $y = -\frac{3}{5}x + 5$

(D) $y = -\frac{5}{3}x + 5$

10.



An approximation for the area of this block of land using 2 applications of Simpson's Rule is:

(A) $\frac{8}{3}(24 + 4 \times 18 + 14)$

(B) $\frac{16}{3}(24 + 4 \times 18 + 14)$

(C) $\frac{8}{3}(0 + 4 \times 24 + 18) + \frac{8}{3}(18 + 4 \times 14 + 0)$

(D) $\frac{8}{3}(0 + 4 \times 18 + 14) + \frac{8}{3}(24 + 4 \times 18 + 0)$

11. The solution of $\frac{3x}{2}+1=10$ is:

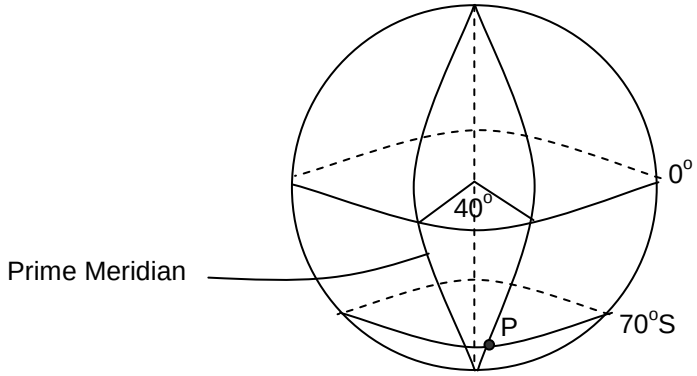
(A) $x = 6\frac{1}{3}$

(B) $x = 6$

(C) $x = 1\frac{1}{3}$

(D) $x = 2\frac{2}{3}$

12.



The position of P in this diagram is:

(A) (70°S, 140°E)

(B) (70°S, 140°W)

(C) (70°S, 40°W)

(D) (70°S, 40°E)

13. A set of scores is normally distributed with a mean of 63.2 and standard deviation of 5.7. What percentage of scores will be below 68.9?

(A) 50%

(B) 68%

(C) 84%

(D) 95%

14. In Sydney the probability of rain during the day is 2.5%. On approximately how many days would you expect rain during July (31 days)?

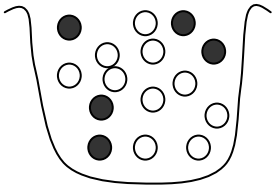
(A) Less than 1 day

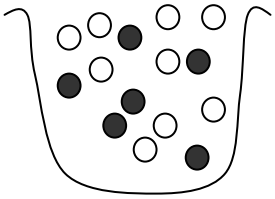
(B) 1 to 2 days

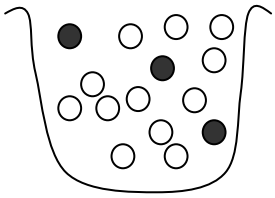
(C) 3 to 4 days

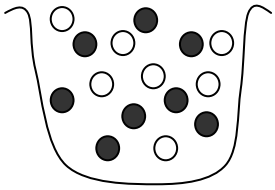
(D) 5 to 6 days

15. From which bag did I choose if the probability of choosing a black marble from a bag is $\frac{2}{5}$?

A 

B 

C 

D 

(A) Bag A

(B) Bag B

(C) Bag C

(D) Bag D

16. The percentage error of a measurement of 200 kg, if measured to the nearest 10 kg is:

(A) $\pm\frac{5}{200}\times 100\%$

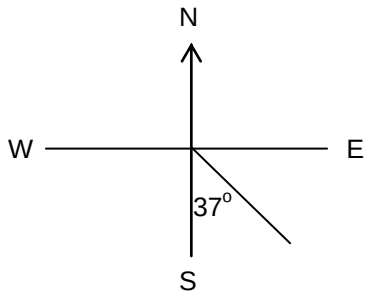
(B) $\pm\frac{50}{200}\times 100\%$

(C) $\pm\frac{1}{200}\times 100\%$

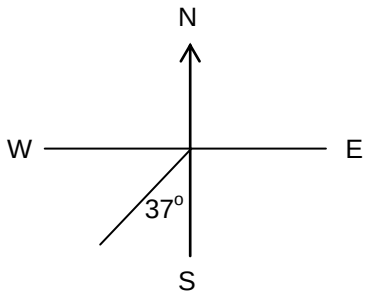
(D) $\pm\frac{10}{200}\times 100\%$

17. Which of the following diagrams shows a bearing of 127^o?

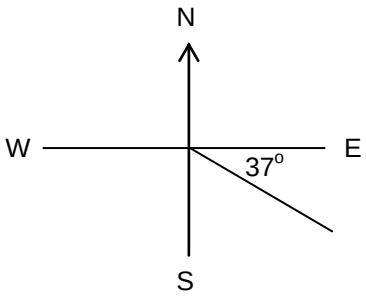
(A)



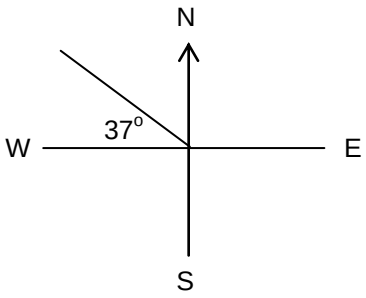
(B)



(C)



(D)



18. Which description is an example collecting data using stratified sampling

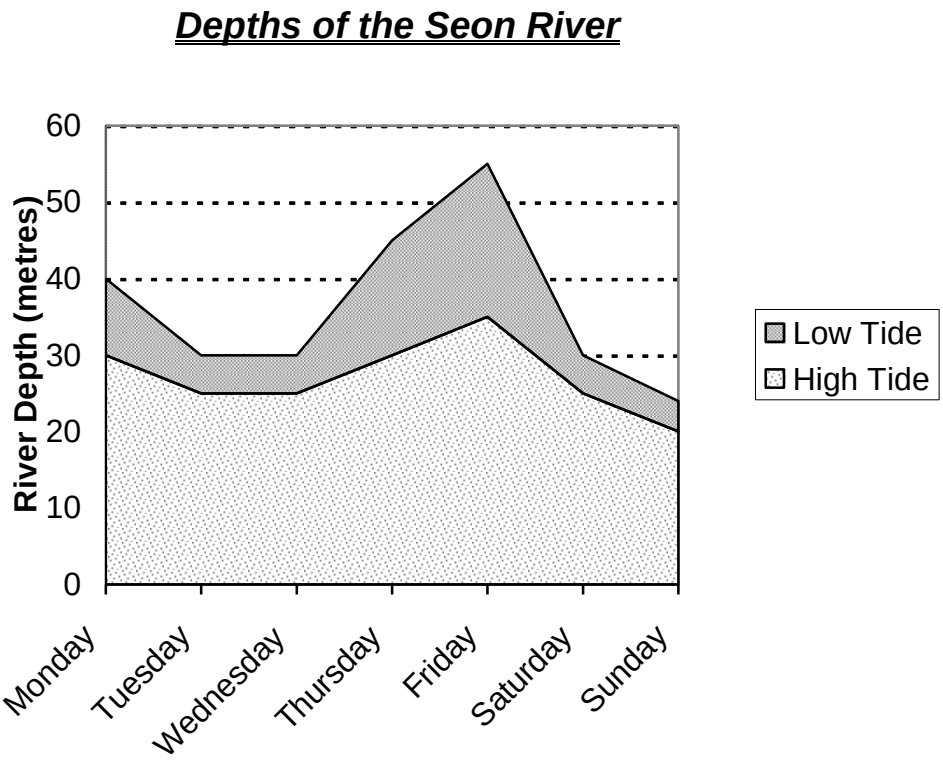
(A) Measuring the height of every student in the school

(B) Randomly choosing 50 names from a hat and measuring the heights of those students

(C) Listing students names alphabetically and measuring the height of every 20^{th} student

(D) Randomly choosing a number of students from years 7 - 12 in proportion to the number of students in each year

19. The chart shows the depth at a certain point on the Seon River at high tide and low tide over a period of 1 week during the wet season



On Friday the depth at low tide was:

(A) 20 metres

(B) 25 metres

(C) 35 metres

(D) 55 metres

20. The rate of fuel consumption for a certain type of engine varies directly with the square of the speed at which it is running, measured in revolutions per minute (rpm). When the engine is running at a speed of 1200 rpm its consumption rate is 9 L/hour. What is the consumption rate when it is running at a speed of 800 rpm?

(A) 4 L/hour

(B) 9 L/hour

(C) 6 L/hour

(D) 20.25 L/hour

21. The formula $v^2 = u^2 + 2as$ has v^2 as its subject. If rewritten with u as the subject the formula would be:

(A) $u = v - 2as$

(B) $u = 2as - v$

(C) $u = \sqrt{v^2 - 2as}$

(D) $u = \sqrt{2as - v^2}$

22. The table shows personal income tax rates

Taxable income	*Tax on this income*
$0 - $6 000	Nil
$6 001 - $20 000	17 cents for each $1 over $6 000
$20 000 - $50 000	$2 380 plus 30 cents for each $1 over $20 000
$50 000 - $60 000	$11 380 plus 42 cents for each $1 over $50 000
$60 001 and over	$15 580 plus 47 cents for each $1 over $60 000

Marie has a gross income of $58 420 and deductions that total $1390.

What is the tax payable on Marie's taxable income?

(A) $13 489.00

(B) $13 526.40

(C) $14 332.60

(D) $306 640.00

END OF SECTION 1

Section II

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

Answer each question on a new page

Question 23 (13 marks) **Marks**

(a) Linda works as a ranger in the Briamble State Forest. She wants to calculate the height of one of the tallest trees. From a point X, on level ground, she measures the angle of elevation of the top of the tree (T) as 32^o. She then walks 16 metres directly toward the tree to a point Y and measures the angle of elevation as 47^o.

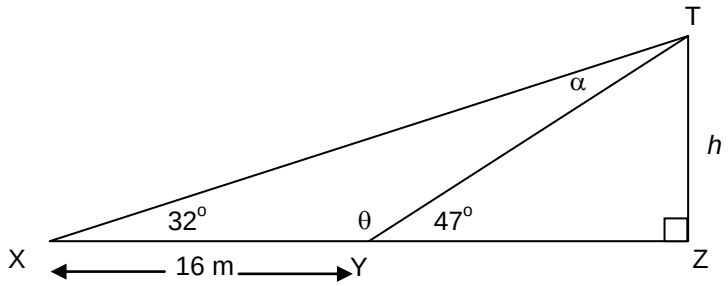


Diagram not to scale

(i) Calculate the size of the angles marked θ and α **2**

(ii) Use the sine rule to calculate the distance YT, correct to 1 decimal place **2**

(iii) Hence calculate the height of the tree, ZT **2**

Question 23 continues on page 13

Marks

(b) Valar has a store credit card that has no annual fee and charges a daily interest rate is 0.0419% interest on all purchases made. The interest is charged from the day of purchase, not including the day of purchase.

On the 2nd of July Valar bought a new dining table for $1899 using her store credit card. She paid her credit account in full on 6th August. **2**

What was the total amount she paid for the table, including interest? Answer correct to the nearest 5 cents.

(c) In her Trial HSC exams Tabitha scored 72% in English and 68% in Mathematics. The overall exam results for these subjects were as follows:

Subject	Mean	Standard Deviation
English	60	7
Mathematics	58	10

(i) Calculate Tabitha's z-score for mathematics and explain what this means in terms of the mean and standard deviation **2**

(ii) Determine the English mark equivalent to Tabitha's Mathematics mark **1**

(iii) In which subject did Tabitha perform better? Justify your response. **2**

End of Question 23

Question 24 (13 marks) START A NEW PAGE **Marks**

(a) A survey into television viewing preferences gave the following results

Television Show	Frequency
News/current affairs	16
Sports	24
Movies	15
Drama serials	36
Comedy shows	32

(i) Find, as a fraction, the relative frequency of people who prefer movies as their first choice. **2**

(ii) If this survey is typical of people's preferences for television viewing, find

1 the probability that a person chosen at random will prefer drama serials or comedy shows as their first choice. **1**

2 the probability that a person chosen at random will not prefer sports as their first choice. **1**

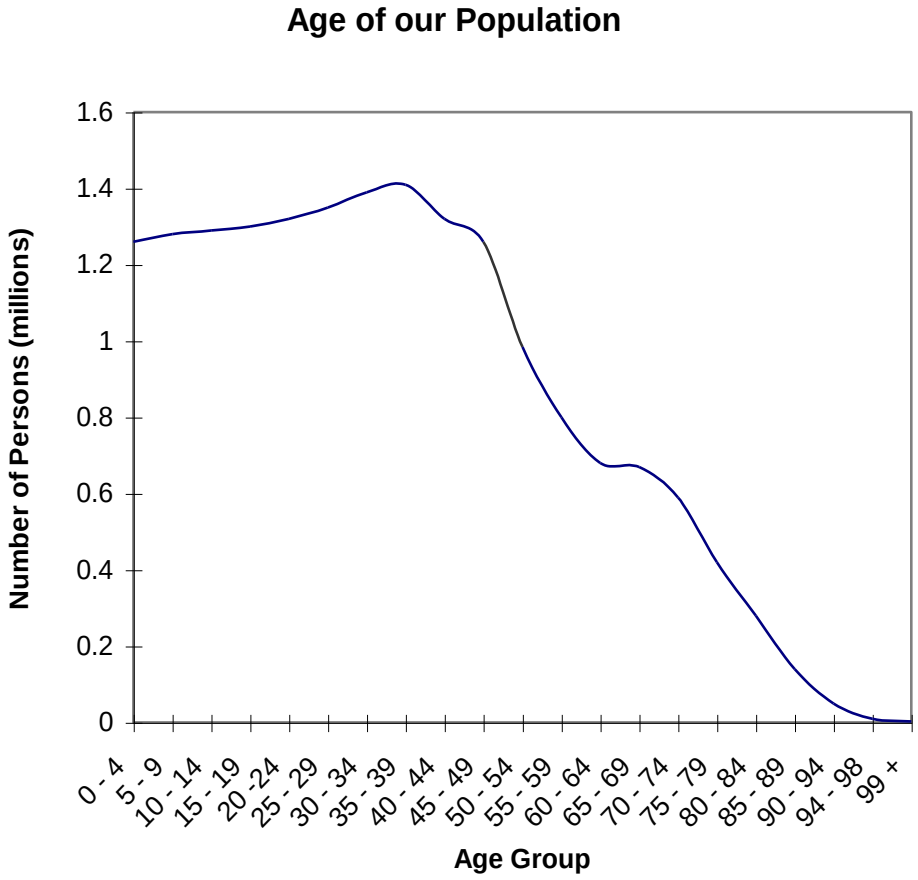
Question 24 continues on page 15

(b) In Australia a census is taken every 4 years. The table below shows information about the age of our population gathered from the 1996 Census.

Age group	Number of persons (million)
0 – 4	1.26
5 – 9	1.28
10 – 14	1.29
15 – 19	1.25
20 – 24	1.32
25 – 29	1.35
30 – 34	1.39
35 – 39	1.41
40 – 44	1.32
45 – 49	1.26
50 – 54	0.98
55 – 59	0.80
60 – 64	0.68
65 – 69	0.67
70 – 74	0.59
75 – 79	0.42
80 – 84	0.28
85 – 89	0.14
90 – 94	0.05
95 – 98	0.01
99 years and over	0.003

Question 24 continues on page 16

The information from the table on the previous page can be represented on a graph as follows:



2

(i) Describe the general shape of the graph and what it suggests about the data

(ii) What is the value of the vertical intercept and what does it represent? **2**

(iii) The data for age groups 30 and over has been plotted as a scatter graph on page 23. ***Detach the graph on page 23*** of the question booklet and use it to answer the following questions

1 On the graph draw in a median regression line. Clearly indicate on the graph the division of the data into three groups AND your median points **3**

2 Describe the correlation between age group and number of persons in that group. **2**

End of Question 24

Question 25 (13 marks) START A NEW PAGE **Marks**

(a) Ahlam buys a microwave for $260.70, including 10% GST. **1**

What is the value of the GST component?

(b) A tennis team consists of three men, Andre, Pat and Leighton and two women, Selina and Venus. From the team a captain and vice-captain must be chosen.

(i) If one person is chosen at random, what is the probability that this person is male? **1**

(ii) List all the possible combinations of captain and vice-captain **2**

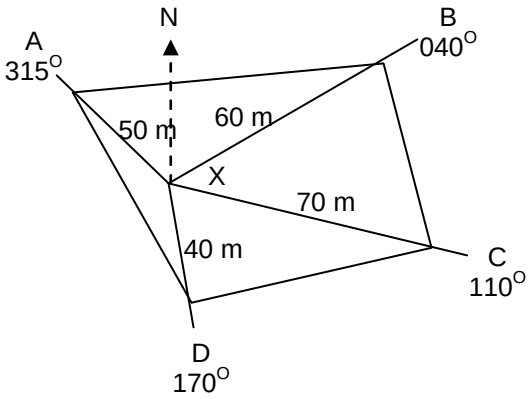
(iii) Calculate the probability that the captain is Venus and the vice-captain is Pat **1**

(iv) Calculate the probability that the captain and vice-captain are both men **1**

(v) Selina calculates her chance of holding one of the positions and concludes that this is highly likely. **2**

Do you agree? Justify your answer

(c) The following notebook entry was made during a compass radial survey of a field.



NOT TO SCALE

(i) What is the size of $\angle AXB$? **1**

(ii) Calculate the area of triangle AXB. Round your answer to the nearest square metre. **2**

(iii) Find the distance from A to B **2**

End of Question 25

Question 26 (13 marks) START A NEW PAGE

Marks

(a) Convert 58 000mm^3 to cm^3 **1**

(b) The approximate latitude and longitude of Ottawa is (46^{o}N, 76^{o}W)
of Kingston is (19^{o}N, 76^{o}W)
and of Las Palmas is (28^{o}N, 14^{o}E)

(i) Nouchkott is located due south of Las Palmas and due east of Kingston. What is the latitude and longitude of Nouchkott? **1**

(ii) Using the radius of the earth as 6400 km, calculate the distance between Ottawa and Kingston. **2**

(iii) Mardi leaves Ottawa at 9pm, local time. Her flight to Las Palmas takes 7 hours. What is the local time in Las Palmas when she arrives? **3**

(c) Sally wanted to save money for a holiday and decided to invest $5000 for 6 months. She drew up a table to show the progress of her savings as follows:

Sally's Savings
Amount invested $5000
Interest rate earned 8 % p.a. compounded monthly (at the end of each month)

Month No.	Investment ($P)	Interest ($I)	$(P + I)
1	5000.00	33.33	5033.33
2	5033.33	33.56	5066.89
3	5066.89	33.78	5100.67
4	5100.67	**A**	**B**

(i) Calculate the values that would appear after 4 months in the table at the points **A** and **B**. (Write your answers on the paper provided) **2**

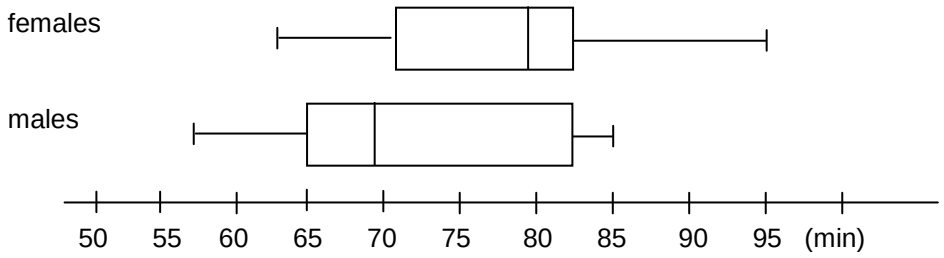
(ii) Sally could have earned simple interest on her investment at 8.1% p.a. By the end of the 4th month how much better off would she have been if she had taken the simple interest investment rather than the compound interest investement? **2**

(iii) Would Sally always be better off taking the simple interest option at 8.1%? Justify your answer. **2**

End of Question 26

Question 27 (13 marks) START A NEW PAGE **Marks**

(a) The box-and-whisker plots drawn below show the times, in minutes, taken for an equal number of men and women to cycle 70 km in a road race



(i) Which group, males or females, had the slowest time AND what was this time? **2**

(ii) What is the interquartile range for male times? **2**

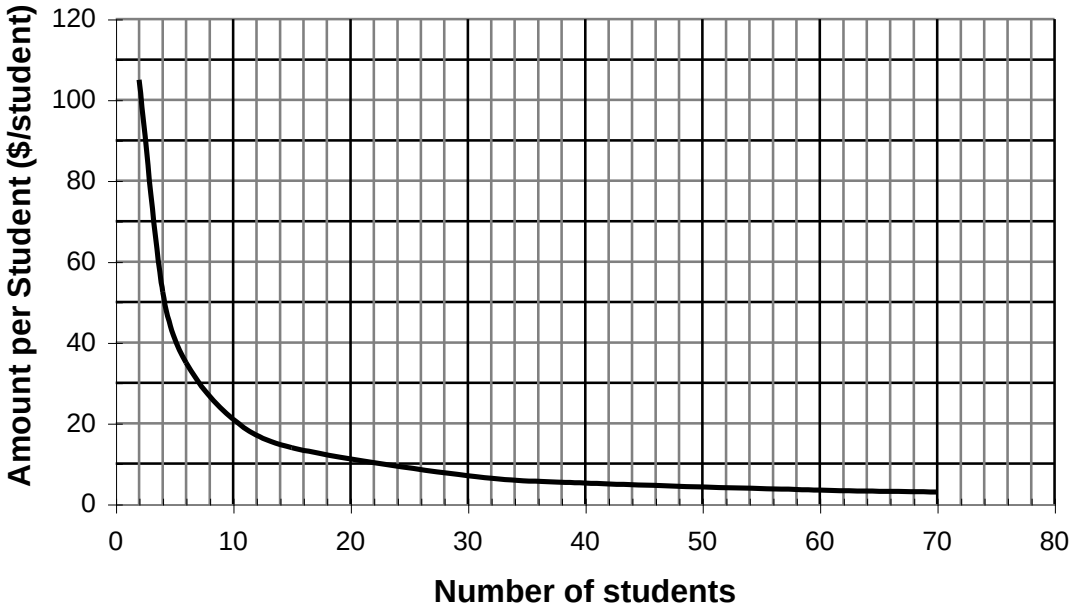
(iii) Compare and contrast the two data sets by examining the shape and skewness of the distributions and the measures of location and spread **3**

Question 27 continues on page 20

(b) A preschool centre pays $270 to hire a bus for an excursion. Ms Worth is organising the excursion and has worked out an equation that will determine, depending on the number of students, the amount each student will need to pay to cover the cost of the bus.

The graph below also shows the amount to be paid per student based on the number of students

Cost of the Bus Per Student



(i) The formula used to draw this graph was $A = \frac{270}{N}$

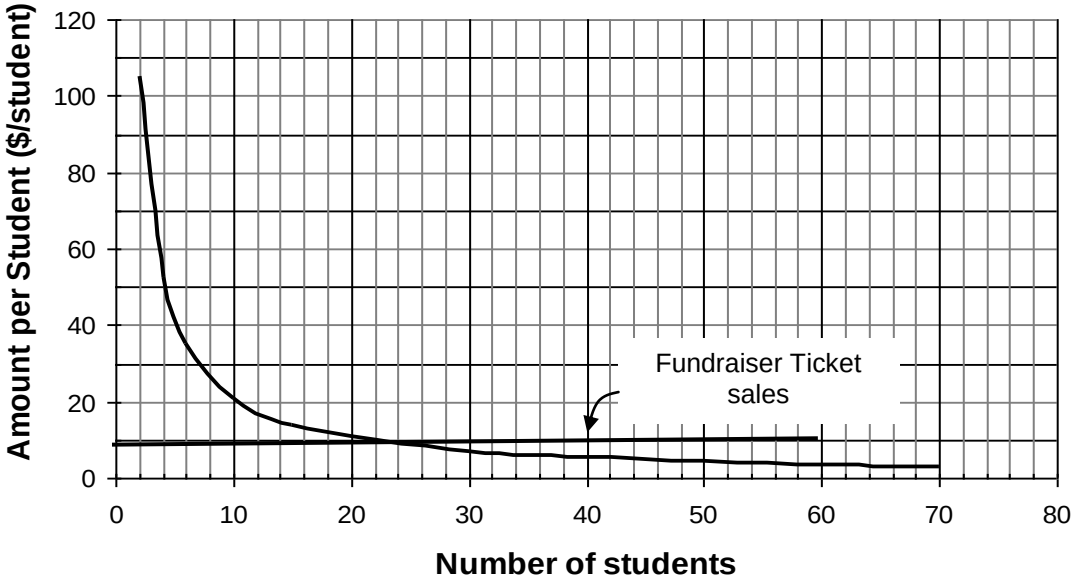
Where A = amount per student
and N = number of students attending the excursion

1 Use the graph to read off the approximate cost per student if 20 students go on the excursion **1**

2 Use the formula to find out how many students will go on the excursion if they pay $3 each **1**

Question 27 continues on page 21

(ii) Ms Worth decided to hold a fundraiser to reduce the cost of the bus. ***Each student*** attending the excursion was asked to sell a book of raffle tickets for $10.
The straight line graph below represents the raffle ticket sales per student from selling raffle tickets. Ms Worth included this line with the original graph so that she could compare the funds raised with the cost of the bus per student.



1 How many students will need to sell a book of raffle tickets for no-one to have to pay for the bus? **2**
Explain your answer

2 If 10 students attended the excursion, after selling their book of raffle tickets, explain how you'd use the information from the equation or from the combined graph to approximately calculate the amount each student would need to pay for the bus. **2**

End of Question 27

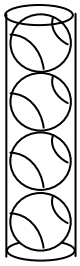
Question 28 (13 marks) START A NEW PAGE **Marks**

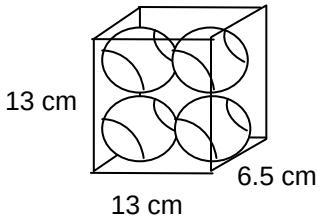
A company makes tennis balls which have a diameter of 6.5 cm. The tennis balls are to be sold in packs of four. The company needs to take 2 issues into consideration:

- Minimising the cost of materials used in packaging and
- Finding a way to effectively store the containers of balls

The company has designed two options for packaging:

OPTION A **OPTION B**





NOT TO SCALE

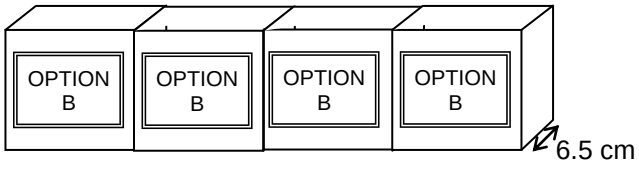
The balls just fit inside each container option

(i) For container option A explain why the minimum diameter is 6.5 cm and the minimum height is 26cm **2**

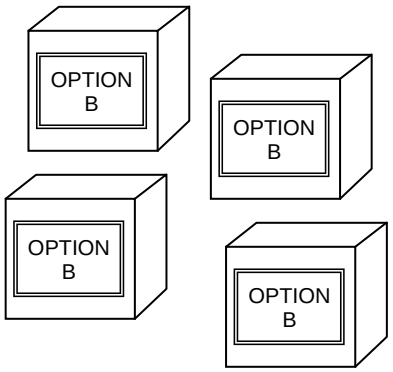
(ii) Hence find the surface area of the container in option A **2**

(iii) Show that the surface area of the container in option B is 676 cm^2 and state which option should be used to minimise costs. **2**

(iv) The surface area of a row of option B boxes is less than the total surface area of the individual boxes. **4**



A row of 4 containers

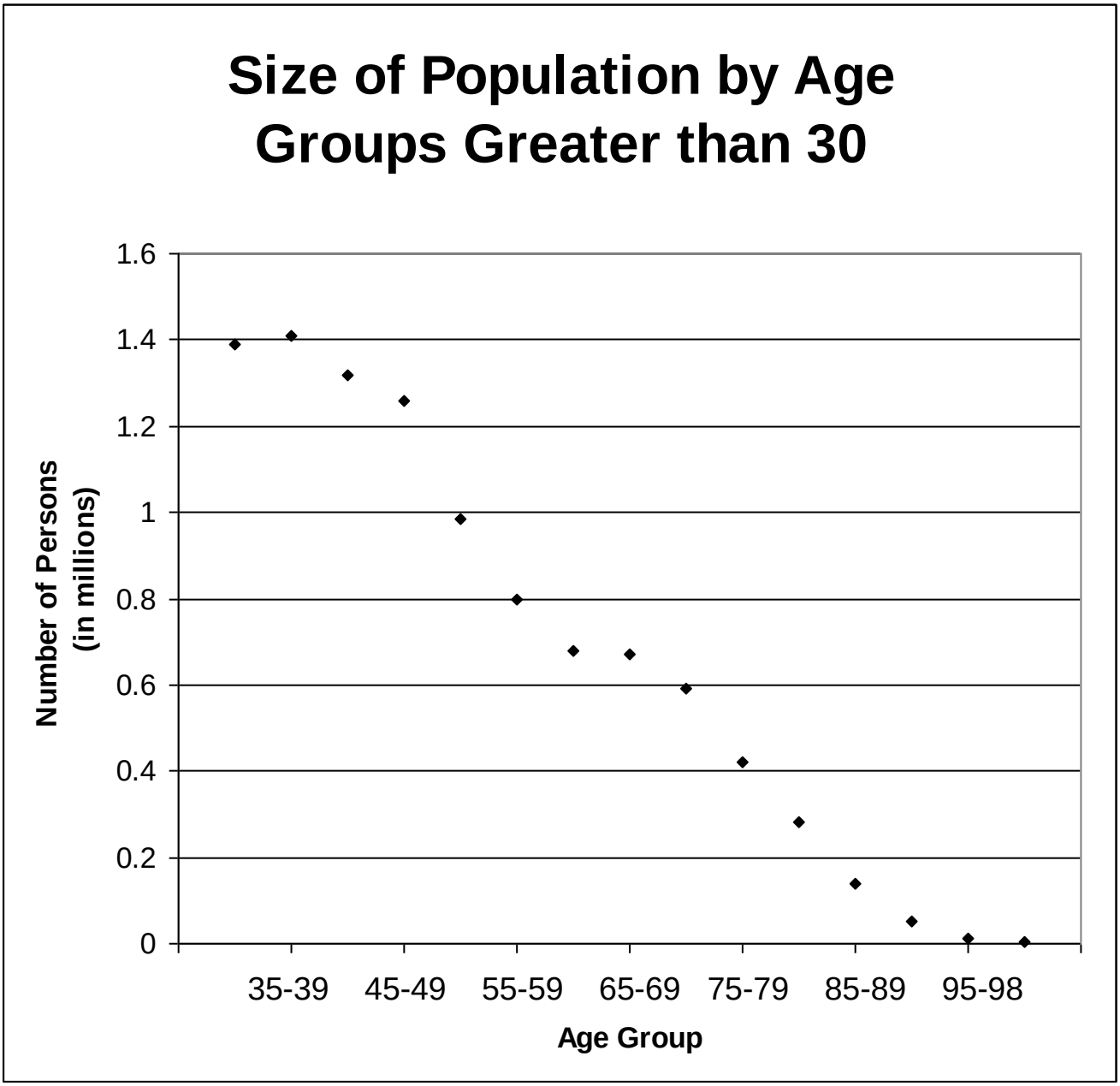


Four individual containers

Write down the formula for the surface area of *N* individual containers
AND
Determine a formula for the surface area of a row of *N* containers

(v) Calculate the volume of ***empty space*** in container B **3**

END OF PAPER

Name:_____

GRAPH FOR QUESTION 24 (b) DETACH AND HAND IN WITH YOUR ANSWERS