

ST. IGNATIUS' COLLEGE
RIVERVIEW



Year 12
General Mathematics

Semester I Exam
April 2003

Time Allowed: 2 ½ Hours

Name: _____

Instructions:

- Write using blue or black pen.
- Start each section in a New Answer Booklet
- Write Your Name and Your Teacher's name at the top of each answer booklet.
- Approved Calculators may be used.
- Attempt all Questions
- Four Sections of Equal Value

Section A “Equations & Functions”

Start a new answer booklet

Questions 1 – 5 are multiple choice. Select the best response and clearly indicate this in your Section A answer booklet.

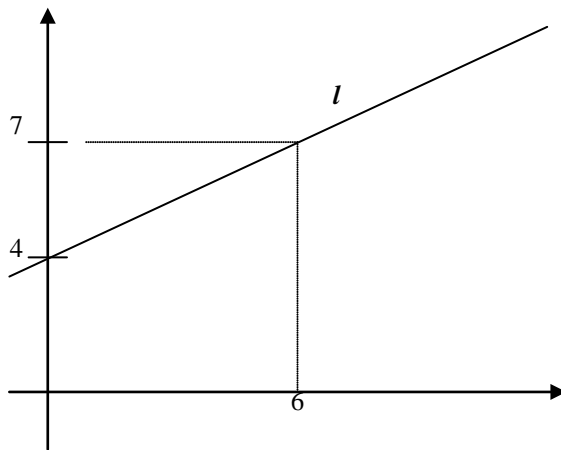
1. Find the value of $\sqrt[3]{5 \cdot 7 \times 10^6}$ correct to 2 decimal places.

- a. $384 \cdot 85$
- b. $178 \cdot 63$
- c. $1 \cdot 852 \times 10^{20}$
- d. $5 \cdot 70 \times 10^2$

2. Simplify: $8 + 4(x - 3) + 5x$

- a. $9x - 4$
- b. $9 + 6x$
- c. $17x - 36$
- d. $12 + 2x$

3.



A line of fit l is drawn through the points as shown. What is the correct equation for line l ?

- a. $y = 2x + 4$
- b. $y = 2x - 4$
- c. $y = \frac{x}{2} + 4$
- d. $y = \frac{x}{2} - 4$

Use the following information to answer Questions 4 – 5.

Glenn was conducting a biological study on centipedes. He found that a particular family of centipedes has individuals with 2 pairs of legs on each segment of its body except for the first and last segments, which have no legs at all.

4. According to Glenn, a centipede with 12 segments will have:
- a. 40 legs
 - b. 20 legs
 - c. 48 legs
 - d. 24 legs
5. Glen found that there was a linear relationship between the number of legs L and the number of segments S . The equation that best represents this relationship is:
- a. $S = 4L - 8$
 - b. $S = \frac{1}{4}L - 8$
 - c. $L = 4S - 2$
 - d. $L = 4(S - 2)$

Questions 6 – 12 require full working in your **Section A** answer booklet.

marks

6. Express $3 \cdot 016 \times 10^{-4}$ in normal decimal form. 1
7. Make c the subject of the equation: $s = \frac{3}{4}(a + b + c)$ 2
8. Solve: $12k - 10 = 5(2k - 7)$ 2

9. The distance travelled by a falling rock after a period of time can be calculated by using the formula:

$$d = \frac{1}{2}gt^2$$

where: d = distance travelled in metres

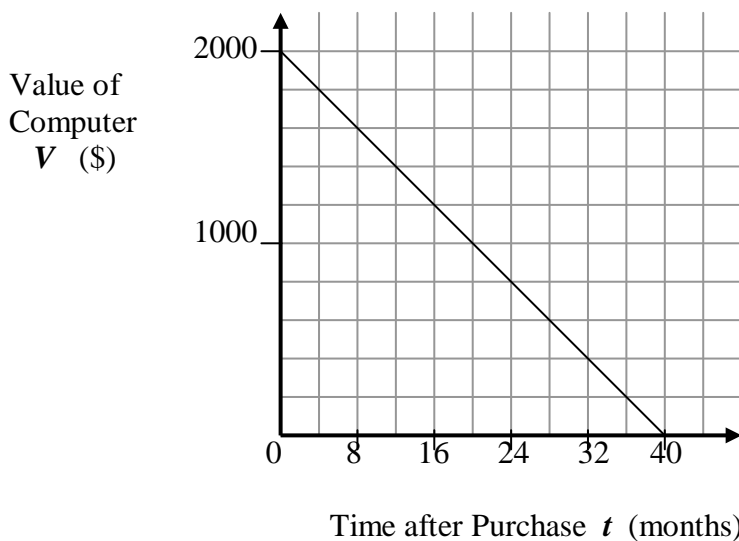
$$g = 9.8$$

t = time in seconds

Find:

- i. The distance travelled by a rock after 2 seconds. 1
- ii. The time taken for a rock to fall 50 metres. 2
10. Peter purchased a new computer and its value over a period of 40 months has been graphed below.

Value of Peter's Computer over time



- i. What is the independent variable ? 1
- ii. What is the vertical intercept on this graph ? 1
- iii. After what period of time will the computer be worth \$800 ? 1
- iv. Find the gradient of the line. 1
- v. Find the equation of the line. 1

11. The distance d kilometres that an observer can see to the horizon from the top of a structure of height h metres is:

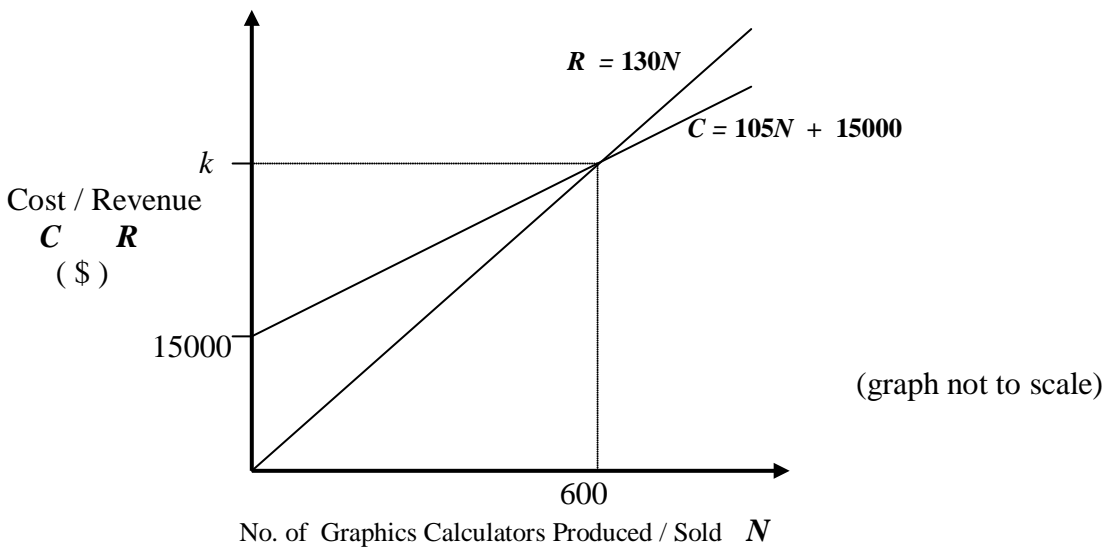
$$d = 8\sqrt{\frac{h}{5}}$$

- i. What distance can be seen from the top of a vertical cliff 320m above the sea? 1
- ii. If the observer at the top of another cliff can see a distance of 36km, How high is the cliff? 2

12. Nahsum Computer Company is considering manufacturing graphics calculators. The general manager Dr Jacqueline Hyde, has found that the cost of production C (\$) of producing N units is: $C = 105N + 15000$ and the revenue R from selling N units is: $R = 130N$

The graphs below show the relationship between the Cost and Revenue of Producing and selling N graphics calculators.

Cost and Revenue graphs for Graphics Calculators.



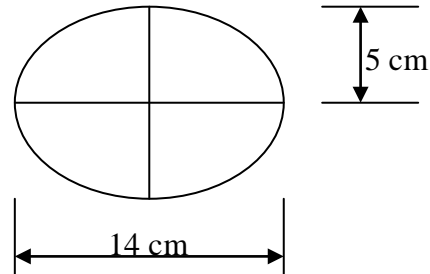
- i. What is the significance of the point of intersection of the two lines?
ie. The significance of producing and selling 600 graphics calculators. 1
- ii. Find the value k on the vertical axis. 1
- iii. Find the profit made by Nahsum Computer Company if 1000 graphics calculators were produced and sold. 2

Section B “Area & Volume”

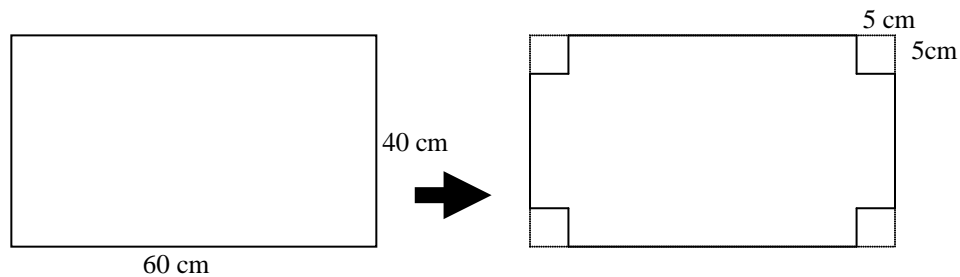
Start a new answer booklet

Questions 13 – 17 are multiple choice. Select the best response and clearly indicate this in your Section B answer booklet.

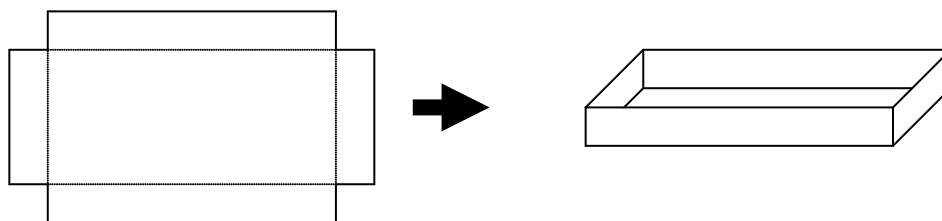
13. Find the area of the ellipse



- a. 140 cm^2
- b. 439.82 cm^2
- c. 219.91 cm^2
- d. 109.96 cm^2
14. A rectangular piece of cardboard 60 cm X 40 cm has squares 5 cm X 5 cm cut from each corner as shown below.



The remaining piece has the remaining flaps folded up to create an open rectangular box.



The volume of the box is closest to:

- a. 7500 cm^3
- b. 9625 cm^3
- c. $12\,000 \text{ cm}^3$
- d. $24\,000 \text{ cm}^3$

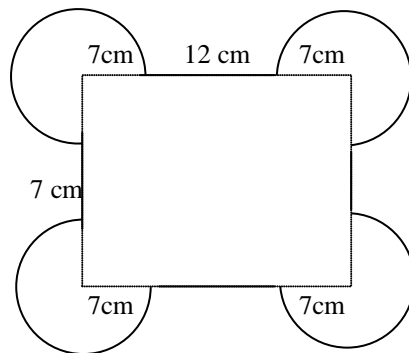
15. The length of a calculator is measured as 160 mm correct to the nearest mm. The percentage error for this measurement is closest to:

- a. 0.003 %
- b. 0.31 %
- c. 0.63 %
- d. 3.1 %

16. The radius of the earth is 6400 km correct to 2 significant figures. The surface area of the earth is closest to:

- a. $4.1 \times 10^7 \text{ km}^2$
- b. $1.6 \times 10^8 \text{ km}^2$
- c. $5.1 \times 10^8 \text{ km}^2$
- d. $1.1 \times 10^{12} \text{ km}^2$

17. Fred wanted to find the area of the composite shape below:



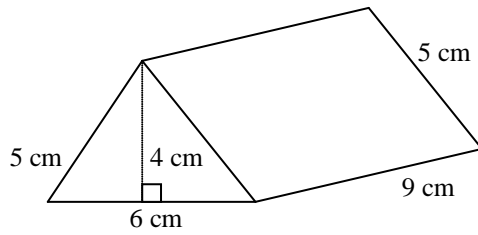
Which strategy will find the area of the shape ?

- a. Area of Rectangle $19\text{cm} \times 14\text{cm}$, plus Area of 3 circles of radius 7cm.
- b. Area of Rectangle $26\text{cm} \times 21\text{cm}$, plus Area of 4 circles of radius 7cm.
- c. Area of Rectangle $19\text{cm} \times 14\text{cm}$, plus Area of 3 circles of radius 7cm.
- d. Area of Rectangle $26\text{cm} \times 21\text{cm}$, plus Area of 3 circles of radius 7cm.

Questions 18 – 23 require full working in your **Section B** answer booklet.

18. A block of wood is cut into a triangular prism as shown below.

marks



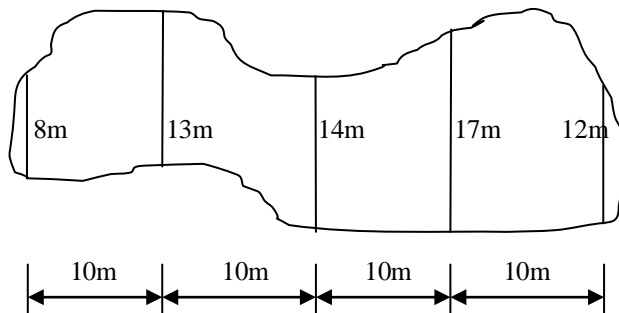
i. Find the area of the triangular end.

1

ii. Find the surface area of the prism.

2

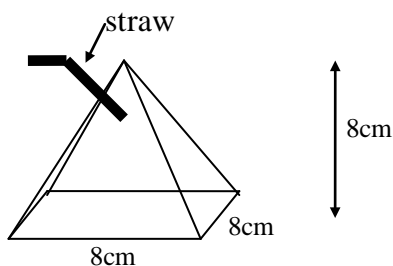
19. An irregular shaped pond sits in the middle of a local park. Five measurements were taken across the pond 10m apart as shown in the diagram below.



By using 2 applications of Simpson's Rule, find an approximation for the area of the pond.

3

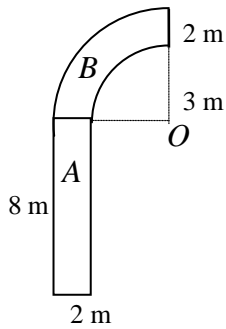
20. A fruit drink container is in the shape of a square pyramid as shown in the diagram



Find the volume of fruit drink in the container if it is full.

2

21. The Smiths want to pave their driveway. It consists of a rectangular section *A* and a curved section *B*. The curved edges of *B* are circular arcs with centre *O* as shown on the diagram. **marks**



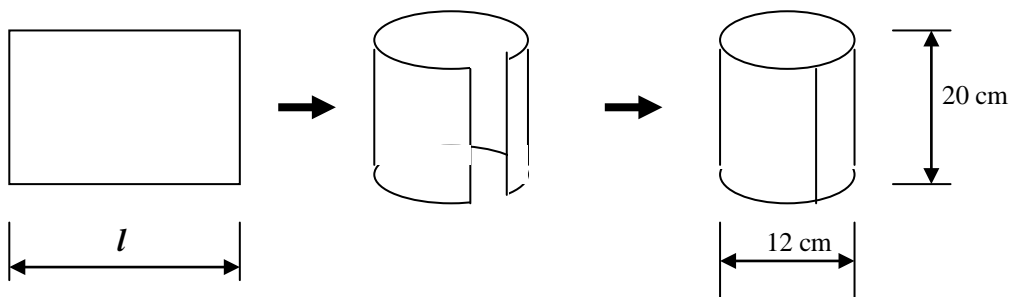
- i. calculate the area of *A* **1**
- ii. calculate the area of *B* **2**
- iii. The driveway is to be concreted to an average depth of 12 cm. Find, to the nearest cubic metre, the volume of concrete required. **1**
- iv. Find the total cost of the concrete if it costs \$155 per cubic metre and an additional delivery fee of \$50 is charged. **1**

22. The notebook entry for an offset survey is shown below. All measurements are in metres.

		C	
		52	
		44	15
D	20	30	B
E	13	12	
		0	
		A	

- i. Draw a neat sketch of the area surveyed. **2**
- ii. Calculate the distance *AB* to the nearest metre. **2**

23. A piece of paper is rolled to form an open cylinder.



The cylinder formed has a diameter of 12 cm and a height of 20 cm.

- i. Find the volume of the cylinder **1**
- ii. Find the length *l* of the piece of paper **2**

Section C “Credit & Loans”

Start a new answer booklet

marks

Questions 24 – 28 are multiple choice. Select the best response and clearly indicate this in your Section C answer booklet.

24. Peter buys a new bass guitar costing \$1566 on interest-free terms over 2 years. If he pays one-third deposit, how much will he be required to pay each month ?
- a. \$21·75
 - b. \$43·50
 - c. \$65·25
 - d. \$87·00
25. Paul borrows \$7400 to buy a second-hand car on a flat rate loan at 9% p.a. interest over 5 years. The amount of interest he pays over the five years is closest to:
- a. \$3 330
 - b. \$10 730
 - c. \$8 066
 - d. \$40 330
26. The Flat rate interest formula has been rearranged. Which of the following is **not correct** ?
- a. $P = \frac{I}{rn}$
 - b. $n = \frac{IP}{r}$
 - c. $r = \frac{I}{Pn}$
 - d. $\frac{I}{n} = Pr$

Use the following to answer questions **27** and **28**.

A bank advertised the following fixed interest rates per annum for secured personal loans.

<i>Loan Security</i>	Loan	
	Amount of Greater than \$20 000	Less than \$20 000
New motor vehicle	8.8 %	8.8 %
Used motor vehicle	10.2 %	11.5 %
New or used motorbike, caravan or boat	11.1 %	11.5 %

- 27.** Peter borrowed \$31 000 over 5 years for a 1997 Toyota Landcruiser (motor vehicle). Find the amount of interest Peter had to pay over 5 years:
- a. \$13 640
 - b. \$15 810
 - c. \$17 205
 - d. \$17 825
- 28.** Fonzie borrowed less than \$20 000 to buy an old used Harley Davidson (motorbike). He paid \$1 782.50 interest in the first year. The amount he borrowed is closest to:
- a. \$15 500
 - b. \$16 059
 - c. \$17 475
 - d. \$20 256

Questions 29 – 33 require full working in your Section C answer booklet.

29. The table shows monthly repayments for various amounts borrowed, and different annual reducible interest rates, for a term of 20 years.

Amount Borrowed	Monthly Repayment			
	5% p.a.	6% p.a.	7% p.a.	8% p.a.
\$10 000	\$66.00	\$71.64	\$77.53	\$83.64
\$15 000	\$98.99	\$107.46	\$116.29	\$125.47
\$20 000	\$131.99	\$143.29	\$155.06	\$167.29
\$25 000	\$164.99	\$179.11	\$193.83	\$209.11

- i. Neil borrows \$20 000 at 7% p.a. over 20 years. Find his monthly repayment. **1**
- ii. Calculate the total of Neil’s repayments over 20 years. **1**
- iii. How much interest does Neil pay over 20 years ? **1**
- iv. Find the equivalent flat (simple) interest rate for this loan. **2**
- v. How much money would Neil save over 20 years if he was only charged 6% p.a. interest ? **1**
30. Jodi wanted to buy a new kitchen from “Chris the Kitchen Master” worth \$18 000. She decided to buy on terms of 15% deposit and \$290 per month for 5 years.
- i. Calculate the deposit Jodi needs to pay. **1**
- ii. Find out how much Jodi will eventually pay for the kitchen. **1**
- iii. Find the amount of interest Jodi pays over 5 years. **1**
- iv. Calculate the Flat interest rate charged for the kitchen. **2**
31. Mr Smith has a credit card with no interest-free period and an interest rate of 16% p.a. He makes the following purchases for the period 1 Feb to 28 Feb.
- | | | |
|--------|--------|----------|
| 5 Feb | Shirt | \$ 64.00 |
| 12 Feb | Petrol | \$ 52.75 |
- Mr Smith pays his account in full on 12 March.
- i. Calculate the amount of interest Mr Smith pays. **2**
- ii. What is total payment made by Mr Smith ? **1**

32. Dom has a gross income of \$75 000 p.a. and wants to purchase a new home. The bank will allow her to repay up to 30% of her gross income per annum. She wants to borrow the maximum amount.

- i.** What is her maximum repayment per fortnight ? **1**
- ii.** If she maintains this maximum repayment, how much would she pay the bank over 10 years ? **1**

33. Paul borrow \$150 000 to buy a home unit at 6% p.a. reducible interest. He makes monthly payments of \$900. The table below shows the progress of Paul's loan for the first 4 months.

Paul's Home Unit				
Loan for				
Amount	Borrowed :		\$150 000	
Interest	Rate p.a. :		6%	
Monthly	Repayment :		\$900	
No. months (n)	Principle (\$P)	Interest (\$I)	Amount owing before repayment \$ (P + I)	Balance \$(P + I - R)
1	150 000.00	750.00	150 750.00	149 850.00
2	149 850.00	749.25	150 599.25	149 699.25
3	149 699.25	748.50	150 447.75	149 547.75
4	149 547.75	A	B	149 395.49

- i.** Of the \$900 payment made in the second month, how much was interest ? **1**
- ii.** How much had Paul paid off the loan at the end of 4 months ? **1**
- iii.** Calculate the values A & B **2**

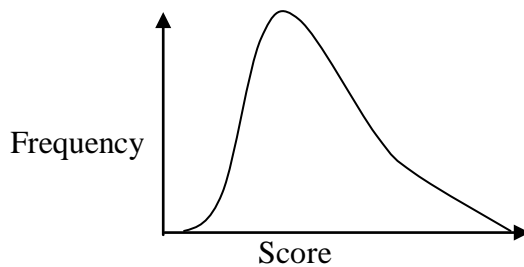
Section D “Statistical Distributions” Start a new answer booklet

Questions 34 – 38 are multiple choice. Select the best response and clearly indicate this in your Section D answer booklet.

34. Year 12 students were asked to write down how many siblings they had. These data are best described as:

- a. Discrete
- b. Stratified
- c. Categorical
- d. Continuous

35. Consider the following frequency polygon.



The distribution represented above:

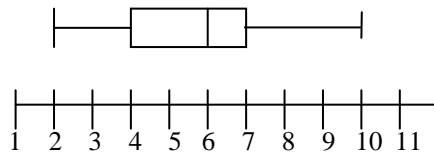
- a. Has its mode greater than its mean
- b. Is negatively skewed
- c. Has its median less than its mean
- d. Is symmetrical

36. Calculate the difference between the mean and the mode of these scores:

7, 6, 2, 1, 3, 1, 1

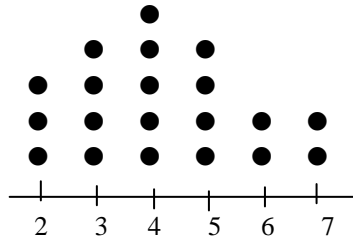
- a. 7
- b. 3
- c. 2
- d. 0

37. Which of the following is a true statement about this box-and-whisker plot?



- a. The median is 6 and the range is 8
- b. The median is 6 and the range is 3
- c. The mean is 6 and the range is 8
- d. The mean is 6 and the range is 3

38. The following dot-plot represents the ages, in years, of children at a “Bananas in Pyjamas” pantomime.



:

What percentage of children were under 5

- a. 12 %
- b. 75 %
- c. 80 %
- d. 60 %

Questions 39 – 42 require full working in your Section D answer booklet.

39. There are 8300 male and 5700 female students at a local university campus. A survey is to be carried out to see how many students have part time jobs. It is decided to use a sample of 200 students.

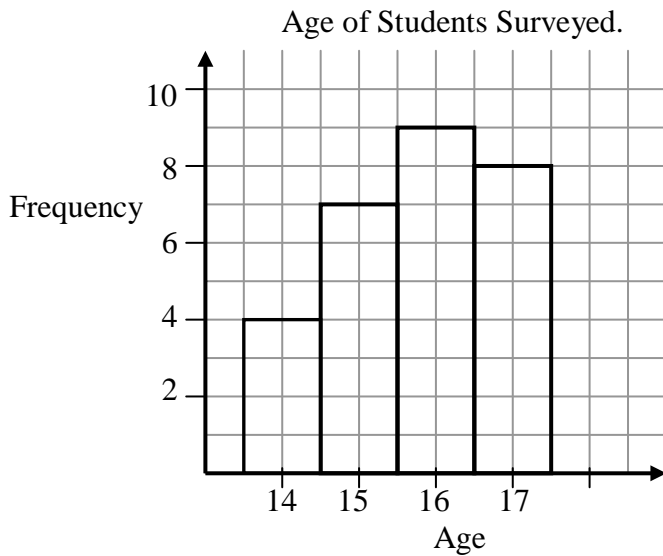
- i.** Explain why a sample might be used instead of a census. **1**
- ii.** Fred chooses to survey 100 male and 100 female students. Why isn't Fred's choice appropriate in this case ? **1**
- iii.** Calculate the number of males and females that should make up the sample. **1**

40. The waiting times (in minutes) for patients at the McHugh-Betta Medical Centre are shown in the ordered stem-and-leaf plot below.

Stem	Leaf
0	2 3 3 4 8
1	0 1 2 6 <input type="text"/> 8
2	1 1 2 4 8
3	0 2 3 5 7
4	6 8
5	1

- i.** One entry is missing and is shown as . **What waiting time** could be represented by this entry ? **1**
- ii.** Find the median of this distribution. **1**
- iii.** Find the inter-quartile range (Show your calculation) **2**

41. A sample of students from Riverview were surveyed and their ages are displayed on the frequency histogram below.



- i. Calculate the mean age for the sample. 1
- ii. Calculate the sample standard deviation for this distribution. 1

42. The number of Dollars spent by students visiting the Easter show are displayed in the back-to-back stem-and-leaf plot below.

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

- i. Find a five-figure summary for each data set 4
- ii. Draw **on the same axes** box-and-whisker plots for both boys and girls. 4
- iii. Compare and contrast the displays for Boys and Girls by examining: 3
- the shape and skewness of the distributions; and
 - measures of location and spread.