



St Ignatius' College Riverview.

2004

Year 12 Semester One Examination

General Mathematics

General Instructions

- Time allowed: 2.5 hours + 5minutes reading time.
- Write using black or blue pen.
- Board approved calculators and Mathaids may be used
- Show all necessary working
- Answer each question in a separate booklet with your teacher's name and your name clearly written.

Section One: Equations and Functions

Use Section One answer booklet.

Question 1 – 5 are multiple choice. Select the best response and clearly indicate this in your Section One answer booklet. (1 mark each)

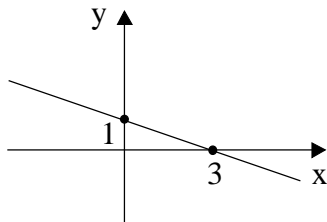
1. Expand and simplify the following: $6 - 3(2-3x) + 1$

- a $9x - 1$
- b $9x + 13$
- c $9x + 1$
- d $1 - 9x$

2. Find the value of $\sqrt[3]{6.3 \times 10^3}$ correct to 3 significant figures.

- a 18.4
- b 18.469
- c 18.5
- d 185

3. What is the correct equation for this line.



- a $y = x + 1$
- b $y = x + 3$
- c $x + 3y = 3$
- d $3x + y = 1$

4 There are twenty-seven times as many cars in Australia as motorcycles. C stands for the number of cars and M for the number of motorcycles. Which equation correctly describes the relationship between the number of cars and motorcycles?

a $M = 27C$

b $C = \frac{27}{M}$

c $C = 27M$

d $M = 27 + C$

5 Solve the equation $2x - 5 = \frac{x + 3}{2}$.

The solution is

a $x = -\frac{7}{3}$

b $x = -\frac{2}{3}$

c $x = \frac{8}{3}$

d $x = \frac{13}{3}$

Question 6 – 12 require full working in your Section One answer booklet

6 Find the value of $\frac{3.1 + 4.5}{6.7 \times 2.9}$ correct to two decimal places. **2**

7 Solve $3(x + 4) - 2(x - 3) = 0$. **2**

8 Given that $K = \frac{E}{T}$ find K, when $E = 5.26 \times 10^{-13}$ and $T = 700$. **2**

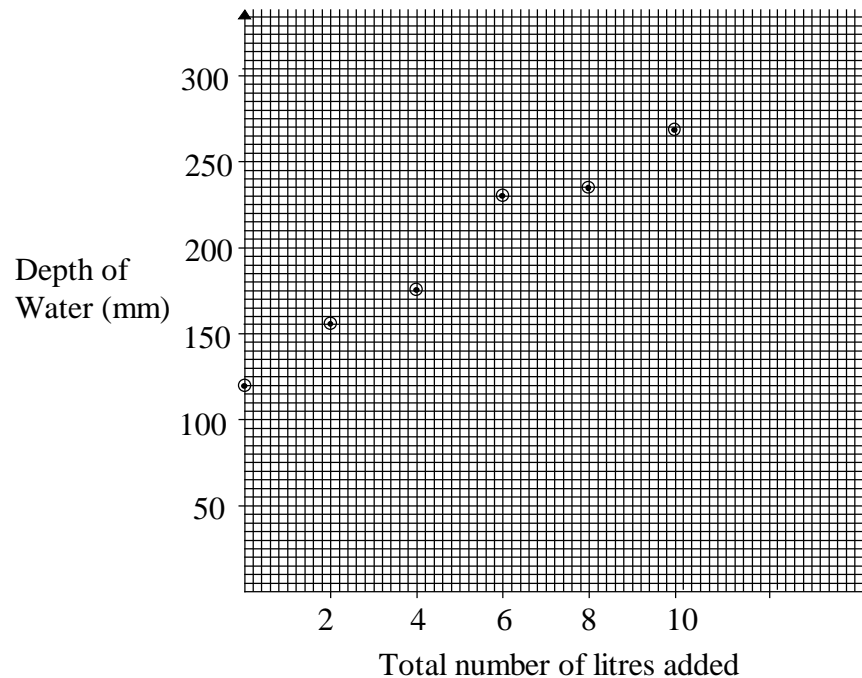
9. The formula for calculating Neil's income tax is $T = 17800 + 0.42(I - 48\,000)$ where I is his taxable income. Calculate Neil's **Taxable Income** if his income tax is \$24320. 2

10. The distance to the horizon, d kilometres, is given by the formula $d = 5\sqrt{\frac{h}{2}}$, where h is the height above sea level in metres.
- a) Find d when the height above sea level is 24.5 metres. 1
- b) Find h when the distance to the horizon is 25 km 2

11. In a measurement experiment, students poured measured volumes of water into a container partially full of water and recorded the total depth of water in the container. The results are shown in the following table:

Total number of litres added	0	2	4	6	8	10
Depth of water (millimetres)	120	155	175	210	235	270

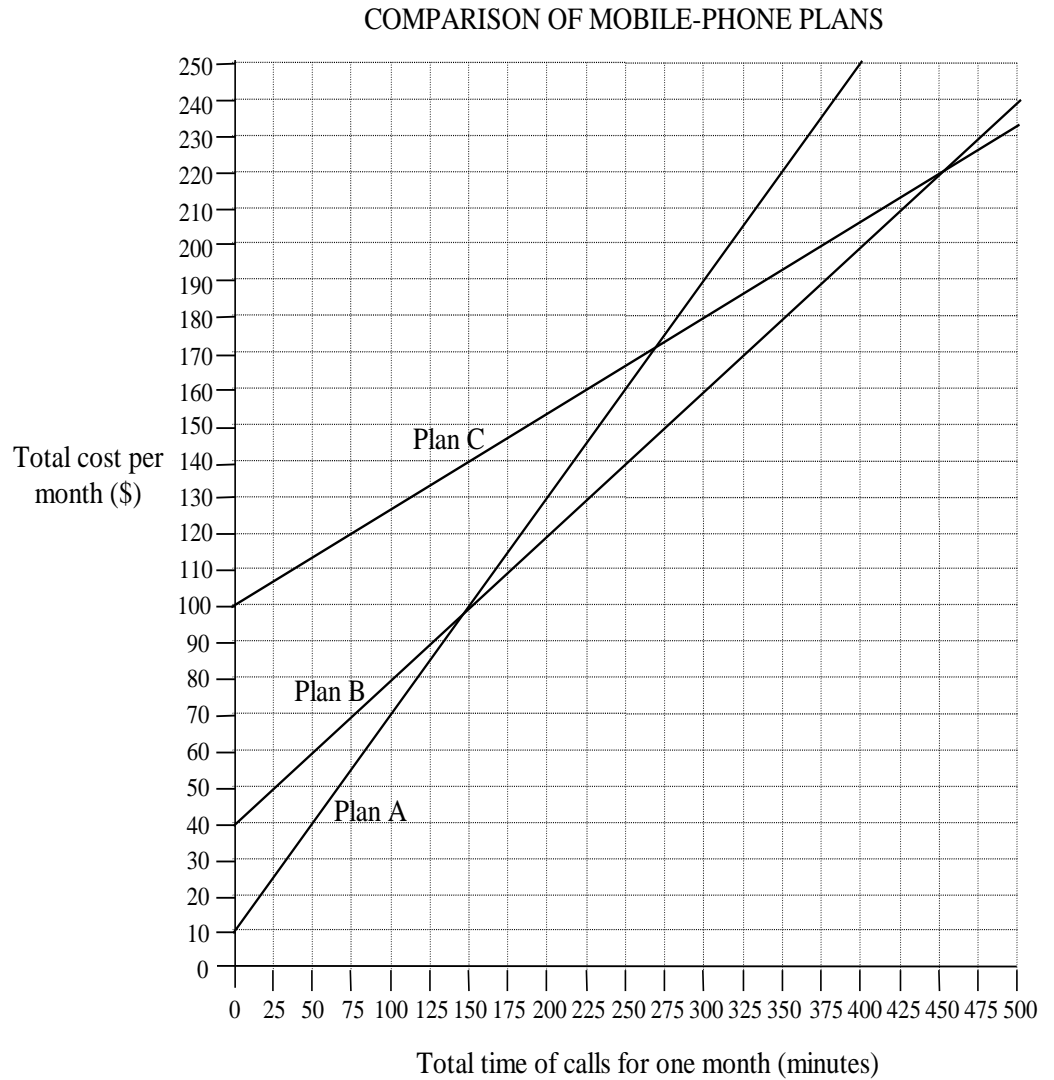
These results were then plotted as points on a graph, as shown below.



- a. What was the depth of water in the container at the start of experiment before additional water was added? 1

- b. How many litres of water did the students add to bring the depth to 175 millimetres? 1
- c. What was the percentage change from the original depth after the 10 litres was added? 2

12



The graph shows the comparative cost of three different plans for the use of a mobile phone.

- a. What is the total time of calls for Plan A and Plan B to have equal total cost for one month? 1
- b. If the total time of calls for one month is 250 minutes, find the cost saving by using Plan B instead of Plan A. 2
- c. By comparing all three plans, complete the following statement.

'Plan B is the cheapest option for total call time per month between minutes and minutes.'

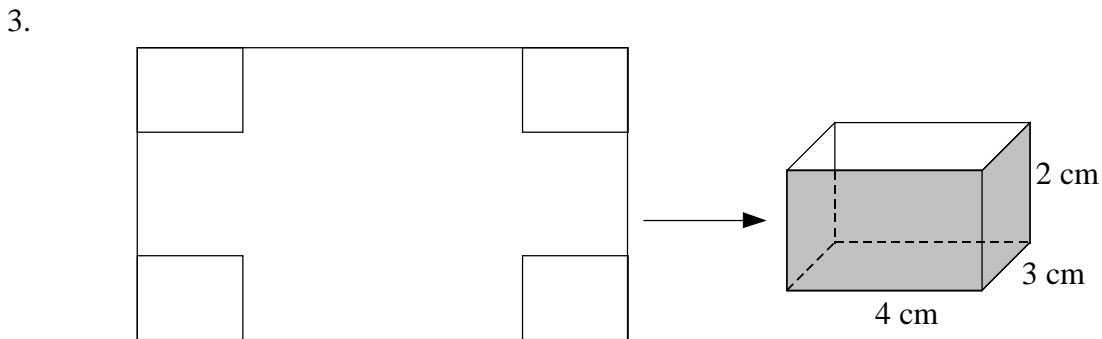
Section Two: Area and Volume

Use Section Two answer booklet.

Question 1 – 5 are multiple choice. Select the best response and clearly indicate this in your Section Two answer booklet. (1 mark each)

- 1. 75 mm =
 - a. 0.75 cm
 - b. 7.5 cm
 - c. 750 cm
 - d. 7500 cm

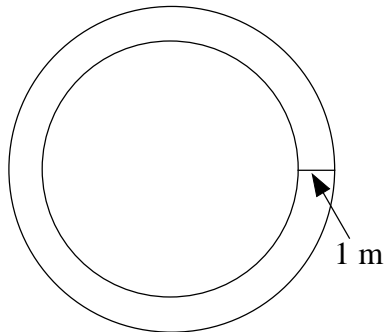
- 2. The volume of a sphere of radius 5 cm is closest to
 - a. 314 cm³
 - b. 524 cm³
 - c. 1257 cm³
 - d. 4189 cm³



The corners of a rectangular sheet of cardboard are cut out and thrown away. The remaining net is folded to form the open box shown. What was the area of the original rectangular sheet?

- a. 40 cm²
- b. 56 cm²
- c. 70 cm²

- d. none of these
4. The height of a tree is measured at 1200 cm correct to the nearest cm. The percentage error for this measurement is closest to:
- a. 0.0042 %
 - b. 0.63 %
 - c. 0.31 %
 - d. 3.1 %
- 5.



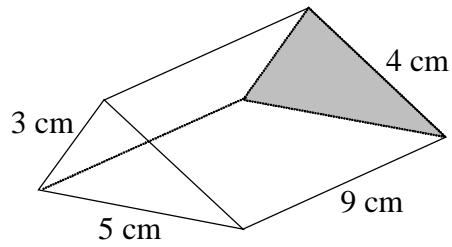
The diagram shows a circular running track, 1 metre wide. Two athletes circle the track once. One athlete runs on the inside line and the other on the outside line. What is the difference between the distances run by each athlete?

- a. 1 m
- b. 4 m
- c. π m
- d. 2π m

Question 6 – 12 require full working in your Section Two answer booklet

6. Find the volume of a cone with base radius 5 cm and perpendicular height 14 cm. (Give your answer correct to 1 decimal place.) 2

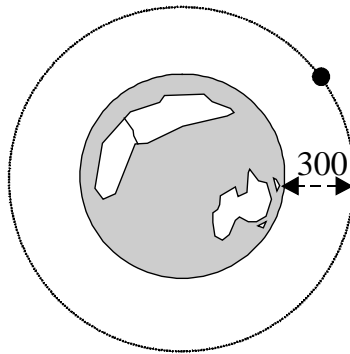
7.



Find the surface area of the right triangular prism.

3

8



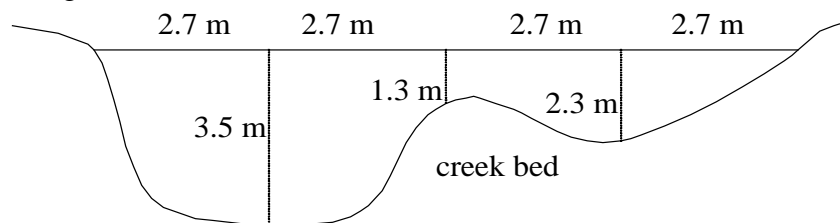
The Earth has a radius of 6400 km. A satellite travels round the Earth at a height of 300 km.

Find the distance (in kilometres) the satellite travels going once round the Earth.

2

9.

The diagram shows a vertical cross-section of a creek.



NOT TO SCALE

- i. By using Simpson's rule twice, find an approximation for the area of this cross-section of the creek.

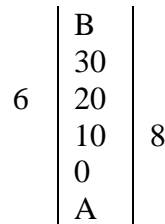
Give the answer correct to one decimal place.

2

- ii. Assume that an 85 metre length of this creek has approximately the same cross-section as above. Estimate the volume of water in this section of the creek, to the nearest 100 cubic metres. 2

10.

The following numbers are notebook entries obtained in a traverse survey of a tract of land. Dimensions are in metres.



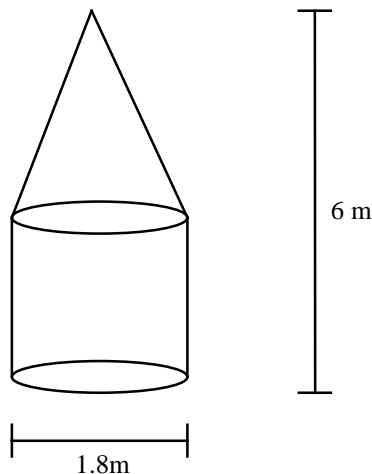
- a Calculate the area of the tract of land. 2
- b A fence is built around the boundary of the tract of land. Find the length of the fence to the nearest metre. 2

11 Jim measures his bathroom to be 4 m^2 .

- a Determine the area of Jim's bathroom in cm^2 . 1
- b How many 5 cm by 5 cm tiles would fit on Jim's bathroom floor with an area of 4 m^2 . 1

12.

A wheat silo is in the shape of a cylinder of diameter 1.8 metres surmounted by a cone as shown in the figure below.



a Given that the heights of the cone and the cylinder are equal state the height of each.

1

b Find the volume of the silo correct to three significant figures.

2

Section Three: Credit and Loans

Use Section Three answer booklet.

Question 1 – 5 are multiple choice. Select the best response and clearly indicate this in your Section Three answer booklet. (1 mark each)

1 The Value Added Tax (VAT) on motor vehicles in England is 17.5% of the retail price. Emily buys a car with a retail price of \$20 990. How much will Emily have to pay for the car?

a. \$3673.25

b. \$17 316.75

c. \$24 663.25

d. \$20 990

2. Boris, Horace and Delores invested a total of \$150 000 into a new business venture. The ratio of their respective investments was 3 : 7 : 2. The amount invested by Horace was:

a. \$62 500

b. \$70 000

c. \$87 500

c. \$105 000

3. Tom invests an amount of money in a deposit, which pays simple interest of 6 % p.a.. After the money has been invested for 8 years, the total interest earned is \$960.

How much did Tom invest initially ?

a. \$460.80

b. \$2 000

c. \$16 000

d. \$46000

4. A TV set is advertised as follows:

Cash Price : \$760 OR Terms : 15% deposit and \$37.50 per month for two years

How much extra is paid for the TV set if it is purchased on terms?

a. \$26

b. \$140

c. \$254

d. \$786

5. Brian borrowed \$500 from a bank for 3 years. He was charged simple interest on the loan. Altogether he repaid \$657.50. What was the rate of interest charged per annum?

a. 7.98%

b. 10.5%

c. 23.95%

d. 31.5%

Question 6 – 11 require full working in your Section Three answer booklet

6. Glenn takes out a \$7000 loan over 36 months. The repayment rate is \$242.69 per month.

a. How much will Glenn pay back altogether? **1**

b. How much interest did Glenn pay on the loan? **1**

7. Kate sees a new DVD recorder valued at \$1439. To buy this DVD on hire purchase, she will need to pay 15% deposit and 24 monthly payments of \$62.50.

a. How much deposit would Kate need to pay? **1**

b. How much would Kate pay for the VCR if she chose to pay for it on hire purchase. **2**

- c. What simple interest rate per annum would the Hire Purchase Company charge Kate? **2**
8. Chantal buys a dining table for \$1200 on hire purchase. Interest is 9% pa and she makes monthly payments of \$58.76 over 2 years.
- a. What is the total cost of the dining table on the hire purchase agreement? **1**
- b. How much does Chantal owe after she makes the third monthly payment? **1**
- c. In a special deal, the store offers a period of 2 months with no payments, then \$65 over the next 22 months. If she takes this special deal, how much will she owe at the end of the **third** month? **1**
- d. Would you recommend the special deal to Chantal? Explain why or why not using calculations. **2**
9. Maria owns a credit card that has no annual fee and charges 14.2% p.a. interest on all purchases made. The interest is charged from the day of purchase including the day of purchase.
- a. Show that the daily interest rate is 0.0389%. **1**
- b. On the 22nd May, Maria bought a new T.V. for \$1059 using her card. She paid the account on the June 14th. How much interest was she charged? (Answer to the nearest cent) **2**
10. Eric borrows \$20 000 to buy a car. He can choose between several different monthly repayment plans as shown in the table.
- | | | | | |
|----------------------|-------|----------|-------|-------|
| Number of repayments | 24 | 36 | 48 | 60 |
| Monthly instalments | \$912 | \$638.50 | \$505 | \$425 |
- How much more interest will he pay if he chooses to repay the loan in 60 months rather than in 36 months? **2**
11. Jacob borrowed \$100 000 at an interest rate of 9.5% per annum. This rate was fixed for 3 years. He is to pay back only the interest over this period.
- a. How much interest is to be paid over the 3 years? **1**

- b After paying the fixed rate of interest for 2 years, Jacob finds that the bank will drop his interest rate to 7.8% if he pays a charge of \$500. How much will he save by changing to the lower interest rate for the last year?

2

Section Four: Statistical Distributions

Use Section Four answer booklet.

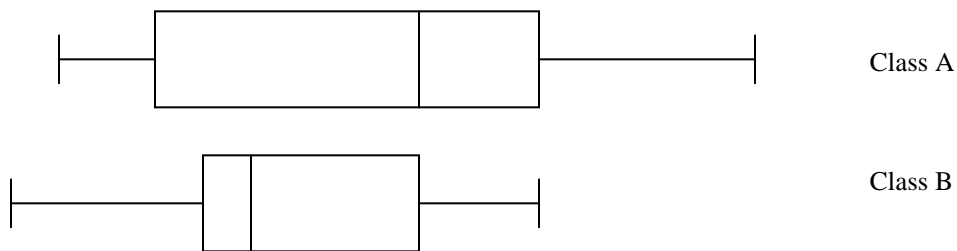
Question 1 – 5 are multiple choice. Select the best response and clearly indicate this in your Section Four answer booklet. (1 mark each)

1. Players in a sports competition are asked to write down their age last birthday.

Which of the following best describes this data?

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

2. You are given the following comparative box plot.



Choose the most correct statement from those below.

- a. The median of Class A is equal to Q_3 of Class B
- b. Both classes have a symmetric distribution
- c. The median of Class B is greater than the median of Class A.
- d. A is negatively skewed and Class B is positively skewed

3. Consider the following data set:

1, 1, 2, 3, 3, 3, 3, 4, 5, 8, 8, 9, 10, 11, 12, 13

If the 13 is replaced by 46, then:

- a. the mean and median will both increase
 - b. the mode will increase by more than the median
 - c. the mean will be the only measure of central tendency changed
 - d. the mode and the mean will both increase
4. Jane has recorded the following times (in minutes) for travelling to school.

8, 8, 10, 11, 35

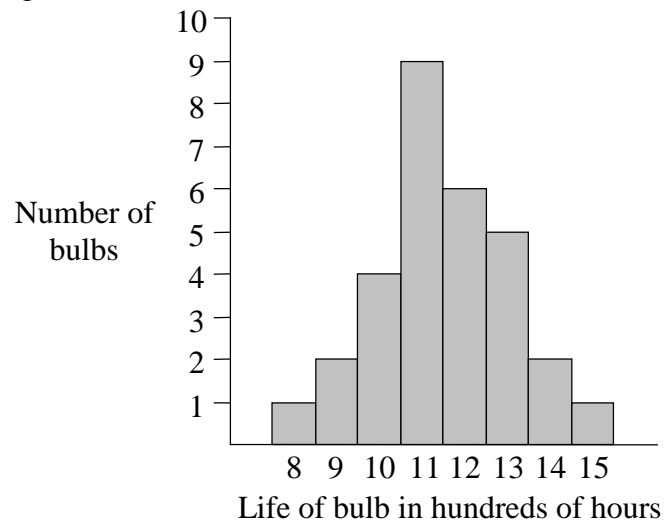
Which of the following gives the best indication of the usual time taken ?

- a. median
 - b. mean
 - c. mode
 - d. range
5. After five English tests, Sue's mean mark was 65. In the next three English tests she scored 70, 75 and 80. Calculate Sue's mean mark for all of these English tests.
- a. 68.75
 - b. 70
 - c. 72.5
 - d. 75

Question 6 – 9 require full working in your Section Four answer booklet

- 6 Neil scored 45%, 68% and 71% for the first three Mathematics tests in Semester One. What would he need to score in the final test if he wished to have an average score of 65% for the Semester? **2**

- 7 A light bulb manufacturer tests light bulbs by determining the number of hours for which bulbs will burn continuously. The results of testing 30 bulbs are presented in the histogram below.



- a. Draw up a frequency table to represent this information. **2**
- b. For this distribution calculate
- i. The mean life of a bulb. **1**
 - ii. The mode. **1**
 - iii. The range. **1**
 - iv. The median. **1**
 - v. The standard deviation. **1**

- 8 A factory produces small metal rods, designed to have a mass of 50 g. Samples were taken from two different machines and compared.

Machine X		Machine Y
	4	4
9 9 9 9 9	4	8 9
3 2 2 1 1 0 0 0	5	0 0 1 1 1 2 3 3 3 4 4
8 8 7 6 6 5	5	5 6 7 9
0	6	1
	6	5

- a Find a five figure summary for each data set. **2**
- b Find the mean and standard deviation for each machine, correct to one decimal place. **2**
- c Nick a foreman at the factory states "Machine X produces rods of a more consistent mass than that of Machine Y."
- Do you agree or disagree with Nick ? Use your results in part (ii) to justify your answer. **2**
- 9 Liz and George deliver pamphlets to letterboxes in the same neighbourhood. The number of pamphlets delivered over a 12 hour period is shown below:

Liz: 24 25 26 27 28 28 31 32 32 32 35 35
 George: 15 18 21 24 25 29 31 31 32 38 38 45

- a Display both sets of data using box and whisker plots **2**
- b Write down one observation that is best seen in the box plots **1**
- c Which worker showed the greater interquartile range of pamphlets delivered? **1**
- d Can we conclude that Liz is a better worker than George? Give reasons. **1**

Solutions

Qu	Section 1	Section 2	Section 3	Section 4
1	C	B	C	A
2	C	B	C	A
3	C	B	B	C
4	C	A	C	A
5	D	D	B	A
6	0.39	366.5 cu/cm	a) \$8736.84 b) 1736.84	X = 76
7	X = -18	3365 cm	a) \$215.85 b) \$1715.85 c) 9.62 %	a) Table b) i) 11.5 ii) 11 iii) 7 iv) 11 v) 1.59
8	7.51×10^{-16}	42 097 km	a) \$1410.24 b) \$1233.96 c) \$1365 d) Yes/No (Reason)	a) b) X Mean/SD 52.7 3.55 Y Mean/SD 53.3 4.62 c) Yes (Reason)
9	\$63 523.80	a) 23.3 sq/m b) 2000 cu/m	a) 0.0389 % b) \$ 9.52	a)..... b) > Range c) George d) Various
10	a) 17.5 km b) 1250 km	a) 210 sq/m b) 67 m	\$2514	
11	a) 120mm b) 4 litres c) 125 %	a) 40000 sq/cm b) 1600	a) \$28 500 b) Save \$1200	
12	a) 150 mins b) \$20	a) 3m b) 10.2 sq/m		

	c) 150 and 450 mins			
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