



STUDENT NUMBER

--	--	--	--	--	--	--	--

## GENERAL MATHEMATICS

### TRIAL HIGHER SCHOOL CERTIFICATE

WEDNESDAY 18<sup>th</sup> JULY 2012

**General Instructions**

- Reading Time – 5 minutes
- Working time – 2½ hours
- Write using black or blue pen
- Board-approved calculators may be used
- A formula sheet is provided at the back of this paper
- All necessary working should be shown in every question
- Start a new booklet for each question

**Total Marks - 100**

- Attempt questions 1 - 30
- Answer questions 1 – 25 on the multiple choice answer sheet provided
- For questions 26-30, start each question in a new booklet

QUESTION NO	MARK
1 - 25	/10
26	/15
27	/15
28	/15
29	/15
30	/15
<b>TOTAL</b>	<b>/100</b>

**THIS QUESTION PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM**  
*This assessment task constitutes 40% of the Higher School Certificate Course Assessment.*

*Answer questions 1 – 25 on the multiple choice answer sheet provided*

Mark

- 1 Below are the results of a test screening for a disease. A positive test indicates that the patient has the disease.

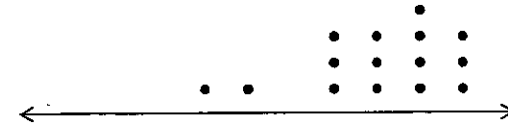
	Test results		Total
	Accurate	Inaccurate	
With disease	18	2	20
Without disease	108	12	120
<b>Total</b>	<b>126</b>	<b>14</b>	

How many positive test results were recorded?

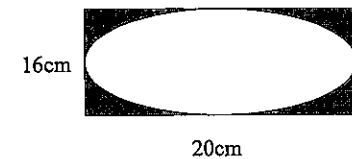
- (A) 18
  - (B) 30
  - (C) 126
  - (D) 20
- 2 Simplify  $(3m^4)^3$ .
- (A)  $9m^{12}$
  - (B)  $27m^7$
  - (C)  $9m^7$
  - (D)  $27m^{12}$
- 3 The annual leave loading at 17.5% for four weeks of annual leave for ordinary pay of \$2200 per fortnight is:
- (A) \$385.00
  - (B) \$1540.00
  - (C) \$3080.00
  - (D) \$770.00

4. If  $v = \sqrt{u^2 + 2as}$ , find the value of  $v$ , given that  $u = 7$ ,  $a = 2.4$  and  $s = 8$ .
- (A) 9.35  
 (B) 9.34  
 (C) 45.4  
 (D) 87.4
5. A venusbar costs \$1.45. If the inflation rate is predicted to be 3.5% for the next 4 years, the cost of a venusbar in four years will be?
- (A) \$1.66  
 (B) \$1.61  
 (C) \$1.65  
 (D) \$2.18
6. Saskia has a portfolio of 1500 shares in JB hi-fi which are currently valued at \$9.96 each. The company paid her a dividend of \$240. Calculate the dividend yield.
- (A) 0.16%  
 (B) 62.25%  
 (C) 1.61%  
 (D) 4.15%
7. Yambi has latitude  $36^\circ\text{S}$  and longitude  $139^\circ\text{E}$ . Zani is due North of Yambi. Which could be the latitude and longitude of Zani?
- (A)  $15^\circ\text{S } 139^\circ\text{E}$   
 (B)  $36^\circ\text{S } 112^\circ\text{E}$   
 (C)  $36^\circ\text{S } 160^\circ\text{E}$   
 (D)  $48^\circ\text{S } 139^\circ\text{E}$

8. The results of a survey are displayed in a dot plot. Describe the data.



- (A) Bell shaped  
 (B) Normally distributed  
 (C) Negatively skewed  
 (D) Positively skewed
9. There are 7 people on standby for a flight to Melbourne. Four seats become available. Find the number of ways in which 4 people can be chosen to fill the seats, assuming that each passenger is allocated a specific seat number.
- (A) 140  
 (B) 35  
 (C) 28  
 (D) 840
10. The shaded area is closest to:
- (A)  $69\text{cm}^2$   
 (B)  $183\text{cm}^2$   
 (C)  $240\text{cm}^2$   
 (D)  $685\text{cm}^2$
11. How many  $\text{mm}^3$  in  $3.7\text{m}^3$ ?
- (A)  $3\,700\text{ mm}^3$   
 (B)  $37\,000\text{ mm}^3$   
 (C)  $3\,700\,000\text{ mm}^3$   
 (D)  $3\,700\,000\,000\text{ mm}^3$



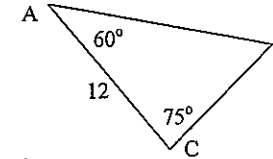
12. New Zealand has a VAT (value added tax) levied at 12.5%. This tax is similar to Australia's GST (goods and services tax).  
Conor buys a jumper in New Zealand for \$115 including VAT. What is the price of the jumper to the nearest cent before VAT is added?
- (A) \$100.62  
(B) \$100.63  
(C) \$102.22  
(D) \$129.38

Use the following information to answer Questions 13 and 14.

Glasses of water	0	1	2	3	4	5
Number of students	3	6	15	9	4	3

13. Some Year 12 students were asked how many glasses of water they drank on a particular day. The results are shown in the table. What is the average number of glasses of water drunk by students on that particular day?
- (A) 2  
(B) 2.35  
(C) 2.5  
(D) 3
14. One of the students is chosen at random. What is the probability that this student drinks at least 3 glasses of water on that particular day?
- (A) 0.175  
(B) 0.225  
(C) 0.4  
(D) 0.6

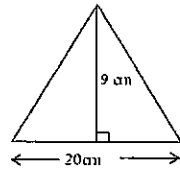
15. For the triangle ABC, find an expression for the length of AB.



- (A)  $\frac{12\sin 75^\circ}{\sin 45^\circ}$   
(B)  $\frac{12\sin 45^\circ}{\sin 60^\circ}$   
(C)  $\frac{12\sin 75^\circ}{\sin 60^\circ}$   
(D)  $\frac{\sin 45^\circ}{12\sin 75^\circ}$
16. Ju-Yie calculates the future value, A, of an annuity after 6 years. An amount of \$500 is invested each month and the interest rate is 8.4% pa with interest compounding monthly. Which calculation will result in the correct answer for the value of the annuity after 6 years?
- (A)  $500 \left\{ \frac{(1+0.007)^{72}}{0.007} \right\}$   
(B)  $500 \left\{ \frac{(1+0.084)^{72}}{0.084} \right\}$   
(C)  $500 \left\{ \frac{(1+0.007)^6}{0.007} \right\}$   
(D)  $500 \left\{ \frac{(1+0.084)^6}{0.084} \right\}$
17. For adults, the body-mass index is given by  $B = \frac{m}{h^2}$  where  $m$  is the mass in kilograms and  $h$  is the height in metres. Jordan is 1.8m tall and has a body mass index of 25. What is his mass?
- (A) 77kg  
(B) 81kg  
(C) 90kg  
(D) 2025kg

18. Using the letters of the word SPORTY, what is the total number of four-letter words that can be made given the words start with S and end with Y? You can only use each letter once.
- (A) 720  
 (B) 12  
 (C) 6  
 (D) 20

19.

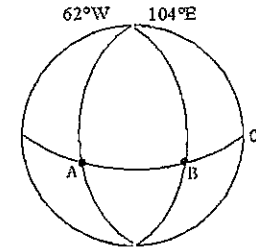


Between what lower and upper values does the actual area of this triangle lie?

- (A)  $\left(\frac{1}{2} \times 8.4 \times 19.4\right)$  lower and  $\left(\frac{1}{2} \times 9.5 \times 20.5\right)$  upper  
 (B)  $\left(\frac{1}{2} \times 8.5 \times 19.5\right)$  lower and  $\left(\frac{1}{2} \times 9.5 \times 20.5\right)$  upper  
 (C)  $\left(\frac{1}{2} \times 8.5 \times 19.5\right)$  lower and  $\left(\frac{1}{2} \times 9.4 \times 20.4\right)$  upper  
 (D)  $\left(\frac{1}{2} \times 8.6 \times 19.6\right)$  lower and  $\left(\frac{1}{2} \times 9.4 \times 20.4\right)$  upper
20. The median price of a house in a Newcastle suburb at the end of 2008 was \$300 000. Due to the global financial crisis, the median price dropped by 10% during 2009. During 2010, the market had regained strength and the median house price rose by 10%. What was the median house price at the end of 2010?
- (A) \$300 000  
 (B) \$297 000  
 (C) \$243 000  
 (D) \$363 000

21. Simplify the following:  $3(a-5) - 2(a+2)$
- (A)  $a-3$   
 (B)  $a-11$   
 (C)  $a-13$   
 (D)  $a-19$

22.

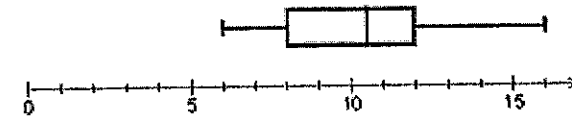


The distance between A and B to the nearest km is:

- (A) 9960 km  
 (B) 11617 km  
 (C) 18542 km  
 (D) Unable to calculate as A and B are not on the same longitude.
23. The box and whisker plot represents the set of scores

$$a, 7, b, 9, 10, c, 11, d, 14, 16.$$

The scores are in ascending order, and all scores are whole numbers.



The values of  $a$ ,  $b$ ,  $c$  and  $d$  are:

- (A) 6, 8, 10.5, 12  
 (B) 6, 7, 11, 12  
 (C) 6, 7, 10.5, 12  
 (D) 6, 8, 11, 12

24. The table below produced by the Australian Bureau of Statistics shows the results of interviews with over two million asthma sufferers.

National Health Survey: Summary of Results, 2007–2008  
Asthma: Medications and actions taken, Persons

Persons with asthma (in '000)	Age group (years)					Males	Females	Persons
	0–14	15–24	25–44	45–64	65 years and over			
Has a written asthma action plan	188.3	40.1	67.1	77.5	46.7	188.3	240.5	428.8
Does not have a written asthma action plan	216.8	278.7	517.4	392.6	214.3	720.6	898.3	1 620.0
Total persons with asthma	415.2	318.8	584.5	470.1	261.0	909.9	1 139.8	2 049.7

Note: All data are rounded.

Given that the asthma sufferer is over the age of 44, determine the probability that they do not have a written action plan (correct to two decimal places).

- (A) 0.83  
(B) 0.19  
(C) 0.17  
(D) 0.86

25. Marjory is conducting a scientific study using the 'capture-recapture' technique. She initially captures 36 bilbies, tags them and releases them back into the wild.

She returns later to the same area to complete the second stage of the study. She captures more bilbies and discovers that 27 have tags, which represents 30% of the total number of bilbies captured during the second stage of the study.

How many bilbies did she capture during the second stage of the study?

- (A) 120  
(B) 90  
(C) 75  
(D) 810

Question 26 (15 marks) Use a SEPARATE writing booklet.

Marks

- (a) (i) Elliot invests \$12 000 in a term deposit for one year. 3  
He earns 6.5% per annum interest, compounding 6 monthly.  
Calculate the amount of interest that Elliot earns on his investment.

- (ii) Elliot works as a horse trainer. He earns \$65 000pa in addition to the interest earned from his investment in (i). He has allowable deductions of \$1745 and can claim depreciation of \$195 on a computer. He has paid \$21 690.40 tax on his income.

What is Elliot's total taxable income from both his job and interest earned on his investment? 2

- (iii) Use the table below to find the tax payable on his income. 1

Taxable income	Tax payable
\$0 – \$12 000	Nil
\$12 001 – \$30 000	Nil plus 30 cents for each \$1 over \$12 000
\$30 001 – \$45 000	\$5400 plus 40 cents for each \$1 over \$30 000
\$45 001 – \$60 000	\$11 400 plus 50 cents for each \$1 over \$45 000
over \$60 000	\$18 900 plus 55 cents for each \$1 over \$60 000

- (iv) Elliot pays a Medicare levy of 1.5% of his taxable income. 1  
Calculate the amount of medicare levy payable.
- (v) Will Elliot receive a refund or will he owe money? 1  
You must explain your answer.
- (vi) Calculate Elliot's net income from the interest earned on his investment. 2

Question 26 is continued on the next page

End of multiple choice section

Question 26 continued

- (b) In order to buy a new ipod docking system, Samson negotiated a personal loan of \$4000 with repayments of \$400 to be made at the end of each month. The table shows the amount owing at the start of each month, the interest payable for that month, the monthly repayment and the amount owing at the end of each month.

Month	Amount owing at the start of the month	Interest	Repayment	Amount owing at the end of the month
1	\$4000.00	\$30.00	\$400.00	\$3630.00
2	\$3630.00	\$27.23	\$400.00	\$3257.23
3	\$3257.23	\$24.43	\$400.00	\$2881.65
4	\$2881.65	\$21.61	\$400.00	\$2503.27
5	\$2503.27	\$18.77	\$400.00	\$2122.04
6	\$2122.04	\$15.92	\$400.00	\$1737.96
7	\$1737.96	\$13.03	\$400.00	\$1350.99
8	\$1350.99	\$10.13	\$400.00	\$961.12
9	\$961.12	\$7.21	\$400.00	\$568.33
10	\$568.33	\$4.26	\$400.00	\$172.59
11	\$172.59	A	B	

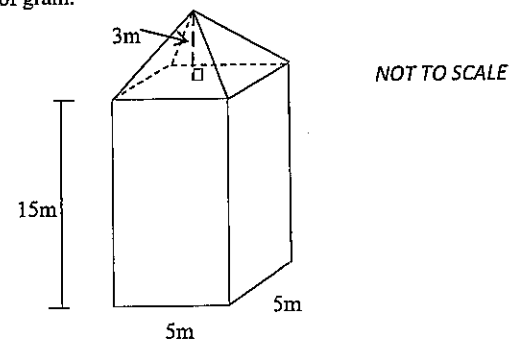
- (i) Show the interest rate is 0.75% per month. 1
- (ii) Calculate the amounts A (the interest paid in the 11<sup>th</sup> month) and B (the final payment) 2
- (iii) What is the total amount that Samson paid for the system? 1
- (iv) Calculate the flat rate of interest per annum on this loan. Answer correct to two decimal places. 1

End of Question 26

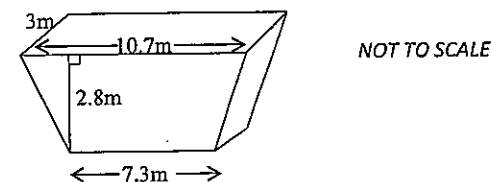
Question 27 (15 marks) Use a SEPARATE writing booklet

Marks

- (a) Six identical silos, as shown below, are located in a railway siding. Each silo is full of grain.



- (i) Which 2 shapes make up each silo? 1
- (ii) Calculate the total volume of grain in the six silos. 2
- (iii) The grain is to be loaded in to railway trucks in the shape of trapezoidal prisms with the dimensions shown below:



- How many railway trucks will be needed to move all the grain from the six silos? 2
- (iv) The grain is loaded on to the railway trucks from an overhead chute at the rate of 370m<sup>3</sup> grain/hour. How long will it take for the grain to be loaded on to the trucks? Give your answer to the nearest half hour. 1

Question 27 is continued on the next page

*Question 27 continued*

- (b) Kristy owns a dress shop. At the end of summer she has sold 140 dresses. She records the number of dresses in each size sold over the season in the table below:

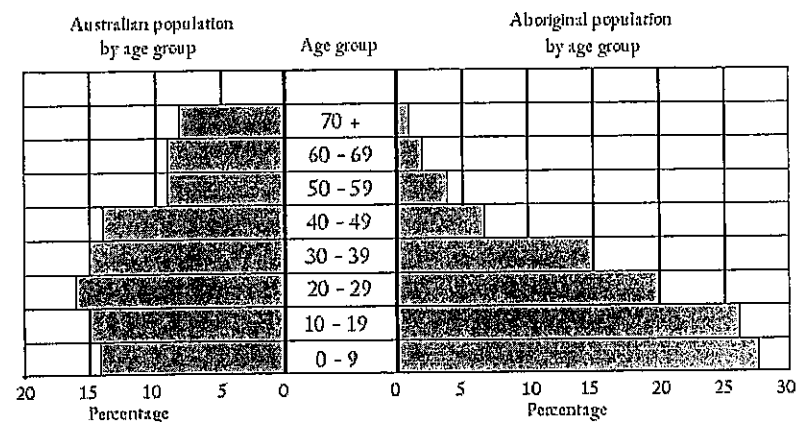
Dress size	Number sold
8	4
10	17
12	25
14	38
16	20
18	16
20	10

- (i) Before the next summer Kristy consults this table. Which measure of CENTRAL TENDENCY will be of most use to her in placing her order for the coming summer? Explain why you have chosen this measure. 1
- (ii) If Kristy drew a sector graph to represent the information in the table, state which dress size would be represented by the smallest sector AND what the angle size of this sector would be, correct to the nearest degree. 1
- (c) Sydney is at (34°S, 151°E) and New York is at (41° N, 74°W). Kei flew from New York to Sydney. He left New York at 8am on Wednesday and his flight took 20 hours. What day and time was it in Sydney when he arrived? 2

*Question 27 is continued on the next page*

*Question 27 continued*

- (d) The graph below shows the age distribution of the whole of the Australia population (including aborigines) and of the Aboriginal population on its own.



Use the graph to answer the following questions:

- (i) Which age group in the whole of the Australian population has the greatest number of people? 1
- (ii) What percentage of the Aboriginal population is 60 years of age or older? 1
- (iii) Describe TWO ways in which the structure of the Aboriginal population is different from the Australian population as a whole. You must include numerical data shown in the graph as part of your answer. 2
- (iv) Suggest a possible reason for ONE of the differences you have described 1

*End of Question 27*

Question 28 (15 marks) Use a SEPARATE writing booklet.

Marks

Please refer to the graph at the back of the paper for Question 28 (a). Detach the graph from your question paper and include it in your Question 28 answer booklet

(a) The Year 12 Formal Committee at Arallik High School has estimated that approximately 250 people will attend the formal this year. The Luna Park Convention Centre offers Year 12 a choice of 2 payment plans for their formal.

Plan 1: \$80 per person

Plan 2: \$4000 plus \$55 per person

The cost of the formal using payment Plan 1 is shown on the graph labelled "LUNA PARK CONVENTION CENTRE PLAN 1" which can be found at the back of the paper.

(i) Find the rule linking the cost  $C$  and the number of people,  $n$ , attending the formal for Plan 1. 1

(ii) State the rule linking the cost,  $C$ , and the number,  $n$ , attending the formal for Plan 2. 1

(iii) Copy the table of values below into your answer booklet and complete it for Plan 2, where  $C$  is the cost and  $n$  is the number of people 1

$n$	0	60	100
$C$			

(iv) Using the table of values in (iii), plot these points on the graph and join them. 1

(v) From your graph, determine the number of students attending for which the cost using either plan is the same. You must show construction lines on your graph to support your answer. 1

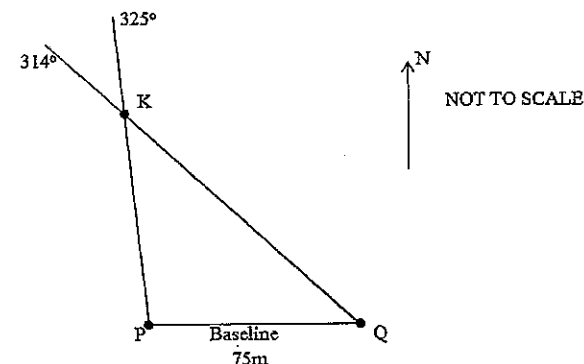
(vi) Hence or otherwise determine this cost. 1

(vii) The Year 12 formal committee know there will be at least 180 students attending the formal. Using the above information and your graph, explain which payment plan the Year 12 students should use. 1

Question 28 is continued on the next page

Question 28 continued

(b) A student using the surveying method of triangulation has written down the information she needs on the sketch below. The sketch shows a baseline PQ, and the compass bearings of a post K from each of P and Q. The baseline PQ lies in the east-west direction. The diagram shows that K and Q are on bearings of  $314^\circ T$  from Q, and  $325^\circ T$  from P, respectively.



COPY OR TRACE THE DIAGRAM INTO YOUR ANSWER BOOKLET

(i) The student noted that  $K\hat{P}Q = 125^\circ$ . Show that  $K\hat{Q}P = 44^\circ$ . 1

(ii) Find the distance from P to the post K (to the nearest metre). 2

Question 28 is continued on the next page



Question 28 continued

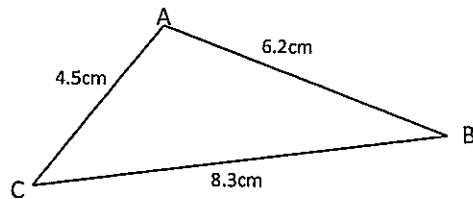
- (c) Ms Jones, the Art teacher, has made a fruit bowl in the shape of a hemisphere. The internal diameter is 26cm.



NOT TO SCALE

She is going to use a special glaze for the inside of the bowl. What is the internal surface area of the bowl that she is going to glaze. 2  
 (Give your answer to the nearest square centimetre.)

- (d) (i) Show that the size of  $\angle ABC$  in the triangle below is  $32^\circ 13'$ , correct to the nearest minute. 2



- (ii) Hence find the area of  $\triangle ABC$ , correct to two significant figures. 1

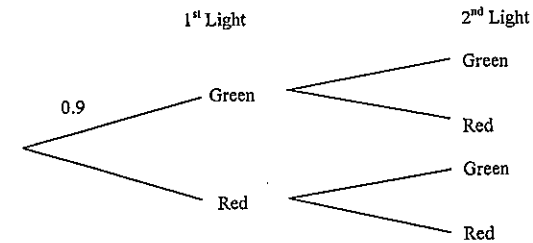
End of Question 28

Question 29 (15 marks) Use a SEPARATE writing booklet.

Marks

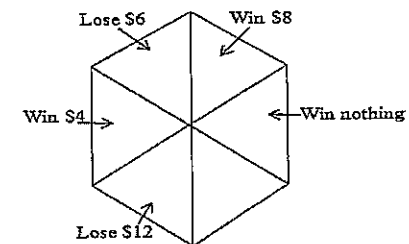
- (a) Along a highway there are two sections of road works under construction. These two sections are controlled by red and green traffic lights. Anne has calculated that there is a 90% chance that the first set of lights is green and a 70% chance that the second set of lights is green.

- (i) Copy the probability tree below into your writing booklet. Complete the probability tree by writing the correct probability on each branch. 2



- (ii) Calculate the probability that Anne will have a clear run (ie that both the lights are green). 1
- (iii) Anne says that because she has had two green lights in a row there is much less chance that the next light will be green. Is she correct in making that assumption? You must explain your answer. 1
- (iv) Calculate the probability that Anne will have to stop at least once. 2

- (b) Sam is making up a spinner for a game, as shown in the diagram below. The spinner is divided into 6 equal sections.



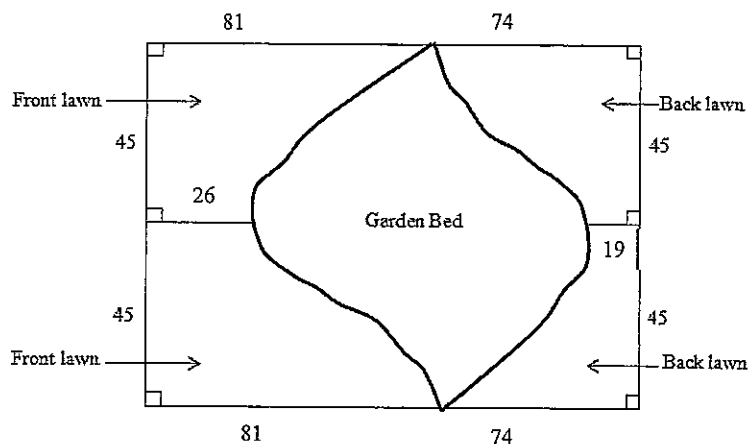
NOT TO SCALE

Sam wants the financial expectation of one game to be 50¢ and has one section of the spinner to complete. What should be written in the last section of the spinner? 2

Question 29 is continued on the next page

Question 29 continued

- (c) A rectangular park is made up of lawn and a large irregular garden bed. Measurements in metres, have been taken of the park and are marked on the diagram below.



Find the approximate area of the Garden Bed using Simpson's Rule. 3

- (d) Martha is hoping to travel to New York in three years' time. She plans to diligently deposit \$200 at the end of each month for the next three years into an account which pays 6%pa interest, compounding monthly. A long lost aunt leaves her some money in her will. What single amount of money could Martha invest today to have the same amount in three years' time as she would have had had she invested \$200 each month? 3

- (e) At the end of the netball season, Coach Carl looked at the number of goals scored in each match by each of the seven players in his team. He calculated the mean and standard deviation for each player and displayed the results in the table below. 1

	Lauren	Yu Jie	Chloe	Natalie	Beate	Jo	Emma
$\bar{x}$	22.6	17.3	20.1	14.9	24.2	19.1	23.7
$\sigma_n$	6.8	4.6	9.2	6.3	6.9	8.7	2.3

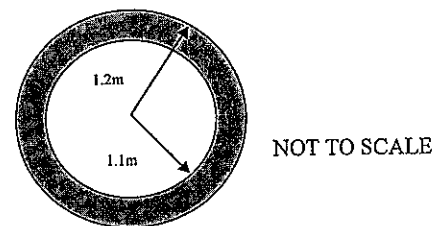
Coach Carl has to choose a player to receive the 'MOST CONSISTENT GOAL SCORER AWARD' for the season. Who should he choose and why?

End of Question 29

Question 30 (15 marks) Use a SEPARATE writing booklet.

Marks

- (a) The figure shown below is a section of concrete drainage pipe.



- (i) Calculate the area of the annulus, correct to 1 decimal place. 2
- (ii) Calculate the volume of concrete needed to make a 5m length of this pipe (correct to 1 decimal place). 1
- (iii) Calculate the volume of water that this pipe would hold at any moment (in Litres, to the nearest 100 Litre). 1

- (b) A large sphere with a volume of 900 m<sup>3</sup> is used to store gas in an Oil refinery. The volume of the sphere is given by the formula

$$V = \frac{4\pi r^3}{3}$$

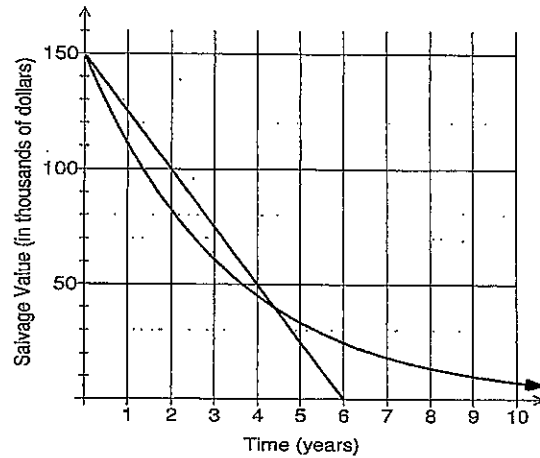
where  $V$  is the volume of the sphere and  $r$  is the radius.

- (i) Calculate the radius of the oil refinery sphere. 2  
(answer correct to the nearest metre)
- (ii) Rewrite the formula with  $r$  as the subject. 2

Question 30 is continued on the next page

*Question 30 continued*

- (c) Nathan and Jessica both purchase office equipment with an initial value of \$150 000. Nathan uses the declining balance method to calculate the depreciation of his equipment. Jessica uses the straight line method. The graph below illustrates the depreciation of both Nathan's and Jessica's equipment.



- |       |   |   |
|-------|---|---|
| (i)   | After approximately how many years does the equipment have the same salvage value?        | 1 |
| (ii)  | What is the value of Nathan's office equipment after 3 years?                             | 1 |
| (iii) | Find the value of the rate of depreciation, $R\%$ per annum, used for Nathan's equipment. | 2 |
| (iv)  | Find the gradient of the straight line. Explain what this gradient represents?            | 2 |
| (v)   | Using the gradient found in part (iv) write the equation of the straight line.            | 1 |

*End of Paper*



STUDENT  
NUMBER:

--	--	--	--	--	--	--	--	--	--

**Multiple Choice Answer Sheet**

Completely fill the response oval representing the most correct answer.

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



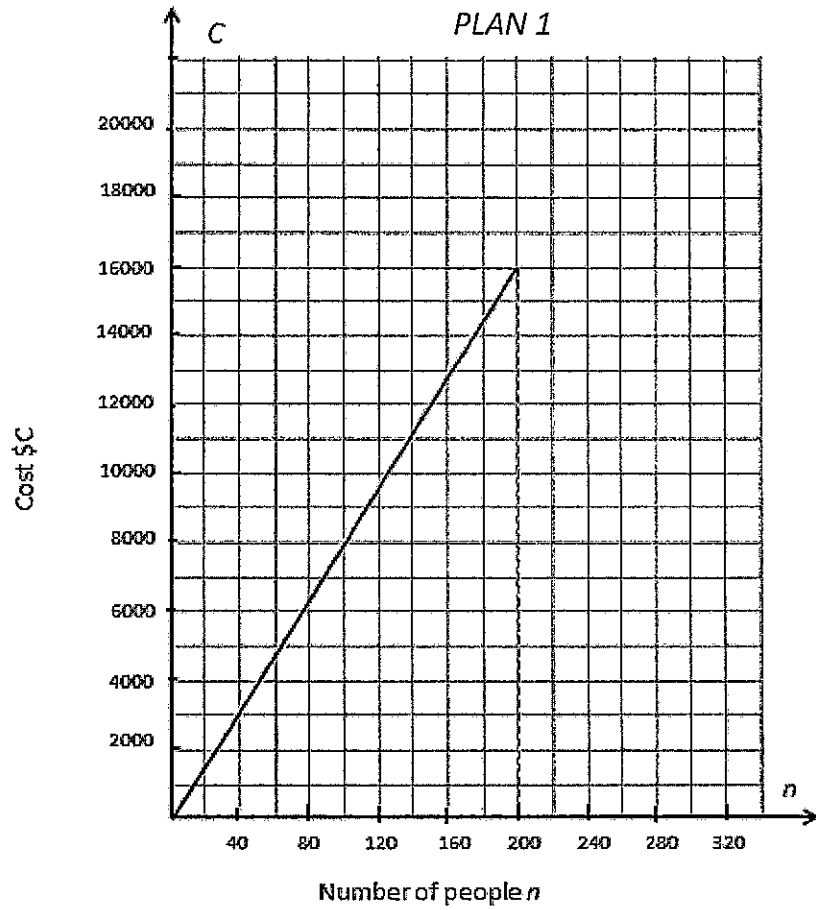
STUDENT  
NUMBER:

--	--	--	--	--	--	--	--	--	--

QUESTION 28 (a)

LUNA PARK CONVENTION CENTRE

PLAN 1



## FORMULAE SHEET

## Area of an annulus

$$A = \pi(R^2 - r^2)$$

$R$  = radius of outer circle

$r$  = radius of inner circle

## Area of an ellipse

$$A = \pi ab$$

$a$  = length of semi-major axis

$b$  = length of semi-minor axis

## Area of a sector

$$A = \frac{\theta}{360} \pi r^2$$

$\theta$  = number of degrees in central angle

## Arc length of a circle

$$l = \frac{\theta}{360} 2\pi r$$

$\theta$  = number of degrees in central angle

## Simpson's rule for area approximation

$$A = \frac{h}{3}(d_f + 4d_m + d_l)$$

$h$  = distance between successive measurements

$d_f$  = first measurement

$d_m$  = middle measurement

$d_l$  = last measurement

## Surface area

Sphere  $A = 4\pi r^2$

Closed cylinder  $A = 2\pi rh + 2\pi r^2$

$r$  = radius

$h$  = perpendicular height

## Volume

Cone  $V = \frac{1}{3}\pi r^2 h$

Cylinder  $V = \pi r^2 h$

Pyramid  $V = \frac{1}{3}Ah$

Sphere  $V = \frac{4}{3}\pi r^3$

$r$  = radius

$h$  = perpendicular height

$A$  = area of base

## Sine rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

## Area of a triangle

$$A = \frac{1}{2}ab \sin C$$

## Cosine rule

$$c^2 = a^2 + b^2 - 2ab \cos C$$

or

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

## Simple interest

$$I = Prn$$

$P$  = initial quantity

$r$  = percentage interest rate per period, expressed as a decimal

$n$  = number of periods

## Compound interest

$$A = P(1+r)^n$$

$A$  = final balance

$P$  = initial quantity

$n$  = number of compounding periods

$r$  = percentage interest rate per compounding period, expressed as a decimal

## Future value (A) of an annuity

$$A = M \left\{ \frac{(1+r)^n - 1}{r} \right\}$$

$M$  = contribution per period, paid at the end of the period

## Present value (N) of an annuity

$$N = M \left\{ \frac{(1+r)^n - 1}{r(1+r)^n} \right\}$$

or

$$N = \frac{A}{(1+r)^n}$$

## Straight-line formula for depreciation

$$S = V_0 - Dn$$

$S$  = salvage value of asset after  $n$  periods

$V_0$  = purchase price of the asset

$D$  = amount of depreciation apportioned per period

$n$  = number of periods

## Declining balance formula for depreciation

$$S = V_0(1-r)^n$$

$S$  = salvage value of asset after  $n$  periods

$r$  = percentage interest rate per period, expressed as a decimal

## Mean of a sample

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \frac{\sum fx}{\sum f}$$

$\bar{x}$  = mean

$x$  = individual score

$n$  = number of scores

$f$  = frequency

## Formula for a z-score

$$z = \frac{x - \bar{x}}{s}$$

$s$  = standard deviation

## Gradient of a straight line

$$m = \frac{\text{vertical change in position}}{\text{horizontal change in position}}$$

## Gradient-intercept form of a straight line

$$y = mx + b$$

$m$  = gradient

$b$  = y-intercept

## Probability of an event

The probability of an event where outcomes are equally likely is given by:

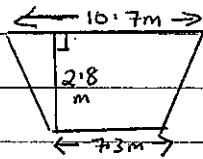
$$P(\text{event}) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$$

Start here $\%$	1 mark for correct $r$ & $n$
a (i) $A = 12000(1 + 0.065)^2$ $= \$12792.68$	1 mark for correct use of compound interest formula. 1 mark for Interest 0 marks for simple interest.
Interest = $\$12792.68 - 12000$ $= 792.68$	Many students neglected to change $r$ & $n$ . Students are reminded to <b>READ THE QUESTION CAREFULLY!</b>
(ii) Total earnings: $\$65000 + \$792.68 = \$65792.68$	1 mark: total earnings 1 mark: taxable income.
Taxable Income: $65792.68 - 1745 - 195 = \$63852.68$	Many students seemed unclear about adding or subtracting deductions. Many students are unclear about the tax that has been paid.
<b>STUDENTS NEED TO UNDERSTAND THAT THEY ONLY ROUND OFF TO THE NEAREST 5c WHEN SHOPPING WITH CASH!</b>	
(iii) Tax Payable: $18900 + 0.55(63852.68 - 60000)$ $= \$21018.97$	1 mark. MUST HAVE WORKING. Many students did not use the taxable income found in (ii). Others were unable to correctly read the table. There were many calculator errors resulting in zero marks.
Medicare Levy: (iv) $= 0.015 \times 63852.68 = \$957.79$	1 mark MUST HAVE WORKING Many students found $0.015 \times$ their answer in (iii) (tax). This needs revising

(v) Elliot has paid $\$21690.40$ tax. Elliot should have paid $\$21976.76$ ( $21018.97 + 957.79$ ) $\therefore$ Elliot will owe $\$286.36$ .	1 mark. Students must have an explanation to support their calculations and use their calculations in their answer. Many students forgot to include the Medicare Levy. This was done poorly.
(vi) Net income on INTEREST Tax: $0.55 \times \$792.68 = \$554.88$ $\therefore$ Net income = $0.45 \times \$792.68 =$ $\$356.71$	1 mark for $0.55 \times$ interest 1 mark for $792.68 - 0.55 \times$ interest
	This part was very poorly done. Very few students were able to communicate that $\$792.68$ all fell in the highest bracket. So 55c in each \$ was paid in tax.
<b>General Comments</b>	
* Many students truncated the cents or rounded off to the nearest \$0.05 - <b>THEY ARE NOT SHOPPING</b>	
* Students are reminded that correct answers from incorrect working receive <b>ZERO</b> marks.	
* All working must be shown.	
* <b>REVISE</b> taxation.	
* <b>READ</b> the question carefully and <u>underline</u> key points	
	Additional writing space on back page.

<p>b) (i) Interest rate:</p> $\frac{30}{4000} \times 100 = 0.75\%$	<p>1 mark for correct numerical expression</p> <p>The translation of 'SHOW' in general maths is you must show the correct numerical expression</p>
<p>(ii) <math>0.75 \times 172.59 = \\$1.29</math> (A)</p>	<p>1 mark - must have working</p>
<p><math>172.59 + 1.29 = \\$173.88</math> (B)</p>	<p>1 mark - must have working</p>
<p>(iii) <math>10 \times 400 + 173.88 = \\$4173.88</math></p>	<p>1 mark - must have working</p> <p>Many students counted the interest twice or counted 11 months of \$400 instead of 10</p>
<p>(iv) <math>173.88 = 4000 \times r \times 11</math>  <math>\therefore r = 173.88 \div (4000 \times \frac{11}{12})</math>  <math>r = 0.0474 \dots</math>  <math>r = 4.74\%</math></p>	<p>1 mark - must have working</p> <p>This was very poorly done. Most students who attempted this question considered the interest over 12 months rather than 11. Students who used the simple interest formula were more successful than those who didn't</p>

You may ask for an extra Writing Booklet if you need more space.

Start here for Question No.	27	QUESTION 27	✓ = should be shown in working
ANSWER.		COMMENTS	
(a)	<p>(i) square pyramid + rectangular prism (square) ①</p>	<ul style="list-style-type: none"> <li>Must have both</li> <li>Some students left out "square" with pyramid (<math>\therefore</math> no mark)</li> </ul>	
	<p>(ii) Volume in 1 silo = <math>(5 \times 5 \times 15) + (\frac{1}{3} \times 5 \times 5 \times 3)</math>  <math>= 400 \text{ m}^3</math> ①  <math>\therefore</math> TOTAL IN 6 SILOS = <math>400 \times 6</math>  <math>= 2400 \text{ m}^3</math> ①</p>	<ul style="list-style-type: none"> <li>Many students did not find TOTAL VOLUME IN THE 6 SILOS.</li> </ul>	
(iii)	 <p>Cross-section = trapezium  <math>\therefore</math> Volume of 1 truck = <math>\frac{2.8 \times (7.3 + 10.7)}{2} \times 3</math>  <math>= 75.6 \text{ m}^3</math> ①  <math>\therefore</math> number of trucks needed = <math>\frac{2400}{75.6} = 31.74 \dots</math>  <math>= 32</math> trucks ①</p>	<ul style="list-style-type: none"> <li>Many students had a carried error from their answer to (ii) so answer marked correct may be different</li> </ul>	
(iv)	<p>Time = <math>\frac{2400}{370} = 6.486 \text{ hrs}</math>  <math>= 6 \text{ hrs } 29'</math>  <math>= 6\frac{1}{2} \text{ hrs}</math> to not <math>\frac{1}{2} \text{ hr}</math> ①</p>	<ul style="list-style-type: none"> <li>carried error for many so answer may be different</li> </ul>	



Q27 continued.	ANSWER	COMMENTS
(b) (i)	MODE as most popular dress size ①	• must have both
(ii)	Smallest sector = size 8 ✓ Angle size = $\frac{4}{140} \times 360 = 10^\circ$ (or $\frac{4}{130} \times 360 = 11^\circ$ ) MUST HAVE WORKING	• correct dress size + correct angle needed for 1 mk.
(c)		• this question well done by many • a diagram was helpful. • must have correct time and day for mark.
(d) (i)	20-29 years ①	• some looked at wrong graph
(ii)	$1 + 2 = 3\%$ approximately ① (2.5% - 3.5%)	• some answers not accurate enough.
(iii)	Answers MUST include correct %'s from graph. ① Aboriginal population has much higher % aged 0-9 - 28% - compared with 14% in Australian population ② Aboriginal population has much lower % aged 60+ - 3% - compared with 17% in Aust. population	• generally well done. • no mark unless correct %'s given to support statement
(iv)	One only: must relate REASON to DIFFERENCE ① higher 0-9 - lack of access to contraception, cultural reasons for large families OR lower 60+ - poor health care, lack of access to health care due to isolation.	• reason ed NOT be "lower lifespan" as this shown in graph. (is a DIFFERENCE not a REASON)

END OF QUESTION 27

Start here for Question No. 28

COMMENTS

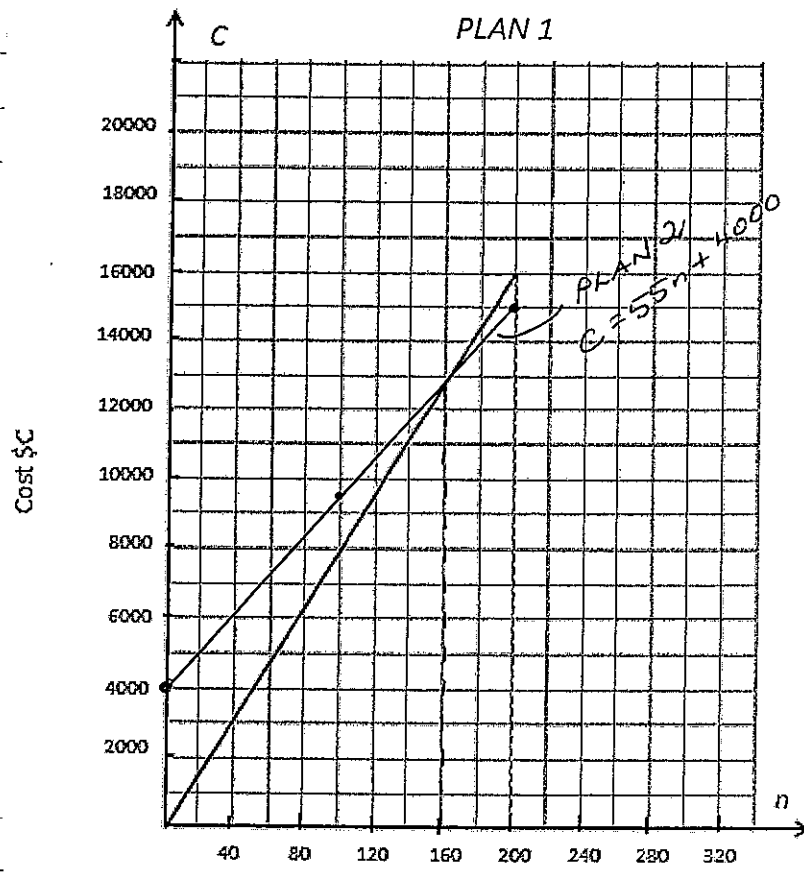
- a) (i)  $C = 80n$  (most students answered this well. some used 'x' and 'y' instead of 'c' and 'n' ∴ 0 mark) ① mark
- (ii)  $C = 55n + 4000$  (same as above) ① mark
- (iii) 

n	0	6	100
C	4000	7300	9500

 (most students answered correctly; 0 marks awarded if one value of C in correct e.g.  $n=0, c=0$ ) ① mark.

LUNA PARK CONVENTION CENTRE

PLAN 1



Number of people

- iv) on graph (most students awarded one mark, several students had their graph beginning at (0,0) earning 0 marks or incomplete or not a straight line) ① mark.
- v)  $n=160$  (needed to show on graph; answers close to 160 shown as intersection point on graph were awarded 1 mark) ① mark.
- vi)  $C = \$12800$  (this answer had to match student's answer in (v) but needed to be accurate/checked using formula to be awarded 1 mark) ① mark.
- vii) Plan 2, as (students needed to support shown by graph answer with reason to of  $C = 55n + 4000$  be awarded 1 mark) being below Plan 1 after intersection point or by substitution in each formula  $n=180$  ① mark.
- b) 'copy diagrams' - 0 marks.
  - i) acute angle at K =  $325^\circ - 314^\circ = 11^\circ$  (needed answer with some reasoning)
    - $\therefore$  In  $\Delta PKQ$ ,  $\hat{K} = 11^\circ$  (vert. opp) for 1 mark
    - $P = 125^\circ$ , so  $Q = 180 - (125 + 11) = 44^\circ$  ( $\Delta = 180^\circ$ ) ① mark.

Additional writing space on back page.

- ii)  $\frac{PK}{\sin 44} = \frac{75}{\sin 11}$  ① (some students assumed  $\Delta$  was right angled and used 'tan'; most students awarded 2 marks; no penalty for degree of accuracy)
  - $PK = \frac{75 \sin 44}{\sin 11} = 273 \text{ metres.}$  ①
- c)  $SA = \frac{1}{2} \times 4\pi r^2 = 2\pi r^2 = 2 \times \pi \times 13^2 = 1062 \text{ cm}^2$  ① (most students answered well, some used radius = 26 and correct formula - awarded 1 mark) ② marks.
- d) i)  $\cos \hat{A}BC = \frac{8.3^2 + 6.2^2 - 4.5^2}{2 \times 8.3 \times 6.2} = 0.8460940536$  (several students earned only 1 mark as the  $\therefore \hat{A}BC = \cos^{-1}(0.8460940536)$  value, 0.846... was not shown i.e. not enough working for 'show...') ② marks.
  - $= 32^\circ 13'$
- ii)  $A = \frac{1}{2} ab \sin C = \frac{1}{2} \times 6.2 \times 8.3 \times \sin 32^\circ 13' = 13.71723938 \approx 14 \text{ cm}^2$  (2 sig. fig.) (most students answered well and scored 1 mark; no penalty in this question re significant figures) ① mark.

Start here for Question No. <span style="border: 1px solid black; padding: 2px;">29</span>		1 mark for the correct result at the first light 1 mark for the correct result at the 2nd light
ii) $P(GG) = 0.9 \times 0.7$ $= 0.63$		1 mark for correct result.
iii) Anne's assumption is incorrect. There is no information indicating the length of time that the third light remains green.		1 mark if students gave a valid explanation of the incorrect assumption.
iv) $P(\text{Anne stops at least once})$ $1 - P(GG)$ $= 1 - 0.63$ $= 0.37$  OR $P(GR) + P(RG) + P(RR)$ $= 0.27 + 0.07 + 0.03$		1 mark awarded for working 1 mark for correct answer
b) $F(E) = 0.5$ $2x + \frac{1}{6} \times 4 - \frac{1}{6} \times 12 - \frac{1}{6} \times 6 + \frac{1}{6} \times 8 = 0.50$ $x = 1.5$ $A = 9$		1 mark awarded for working 1 mark awarded for correct ANS

1.1 - 1.5 1.2 should read

(c) Area of garden bed = Area of rectangle - (area of front lawn + back lawn). $A = (155 \times 90) - \frac{45}{3} [81 + 4 \times 26 + 81]$ $- \frac{45}{3} [74 + 4 \times 19 + 74]$ $= 13950 - 3990 - 3360$ $= 6600 \text{ m}^2$	There are variations to this working, which are acceptable. 2 marks for showing complete working 1 mark for answer.
d) $A = M \left\{ \frac{(1+r)^n - 1}{r} \right\}$ $= 200 \left\{ \frac{1.005^{36} - 1}{0.005} \right\}$ $= \$ 7867.22$	A lot of students were unable to go beyond the first stage of working 1 mark
$N = \frac{A}{(1+r)^n}$ $= \frac{7867.22}{1.005^{36}}$ Single amount of $= \$ 6574.20$	1 mark awarded for using second equation 1 mark awarded for correct answer.
e) - Coach Carl should choose Emma. Although her average is not the highest, her standard deviation is the lowest and therefore her scores are the most consistent.	1 mark awarded for saying EMMA because her standard deviation is lowest Additional writing space on back page.

Start here for Question No. **30**

a) i)  $\pi \times 1.2^2 = \pi \times 1.1^2$   
 $= 0.7 \text{ m}^2$  (1 d.p.)

Many students did not round to 1 d.p. and some had incorrect units but generally well done.

ii)  $0.7 \text{ m}^2 \times 5 \text{ m} = 3.6 \text{ m}^3$  (1 d.p.)

Many used rounded answer. Quite a few had incorrect units but most knew to multiply by 5.

iii)  $\pi \times 1.1^2 \times 5 = 19 \text{ m}^2$   $1 \text{ m}^2 = 1000 \text{ L}$   
 $\therefore 19000 \text{ L}$

Very few students knew that there were 1000L in  $1 \text{ m}^3$

b) i)  $900 = \frac{4\pi r^3}{3}$

$2700 = 4\pi r^3$

$r^3 = \frac{2700}{4\pi}$

$r = \sqrt[3]{\frac{2700}{4\pi}}$

$= 5.989 \dots \text{ m}$

$= 6 \text{ m}$  (to nearest m)

Generally well done though some students found square root not cube root and many didn't round.

ii)  $V = \frac{4\pi r^3}{3}$

$3V = 4\pi r^3$

$r^3 = \frac{3V}{4\pi}$

$r = \sqrt[3]{\frac{3V}{4\pi}}$

Quite a few students did not show any working at all and many used the values in part (i)

c) i)  $4\frac{1}{2}$  years

(i and ii) generally well done.

ii) \$60000

iii)  $60000 = 150000(1-r)^3$

$\frac{60000}{150000} = (1-r)^3$

$(1-r)^3 = 0.4$

$1-r = \sqrt[3]{0.4}$

$= 0.736 \dots$

$r = 1 - 0.736 \dots$

$= 0.263 \dots$

$\hat{=} 26\%$

Very poorly done. Many students left it out altogether and many more treated it as  $1-r^3$  not  $(1-r)^3$

iv)  $m = -25000$

Many students had  $+25000$  or  $+25$  or  $-25$

The gradient represents the loss in value of the office equipment each year.

Many students didn't write 'each year' or they wrote 'over time'. There was an improvement in the number of students answering this type of question correctly.

v)  $y = -25000x + 150000$

Many used 150 instead of 150,000

Additional writing space on back page.