



PYMBLE LADIES' COLLEGE

2005

TRIAL HIGHER SCHOOL CERTIFICATE

GENERAL MATHEMATICS

General Instructions

- Reading time – 5 minutes
- Working time - $2\frac{1}{2}$ hours
- Write using black or blue pen
- Calculators may be used
- A formulae sheet is provided at the back of this paper

Total Marks - 100

Section I

Pages 1 – 9

22 marks

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

Section II

Pages 10 – 21

78 marks

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

22 marks

Allow about 30 minutes for this section

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word **correct** and drawing an arrow as follows.

(A)  (B)  *correct* (C)  (D) 

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

How much would Kate pay for the DVD if she chose to pay for it on hire purchase?

- (A) \$1500.00
(B) \$1654.85
(C) \$1715.85
(D) \$1501.50

- 2) The table shows monthly payments for each \$1000 borrowed.

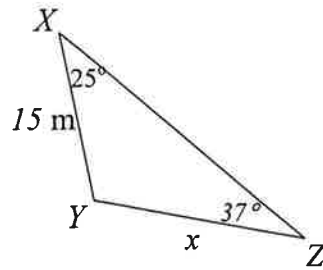
INTEREST RATE (% p.a.)	PERIOD OF LOAN				
	5 years	10 years	15 years	20 years	25 years
5	\$18.87	\$10.61	\$7.91	\$6.60	\$5.85
6	\$19.33	\$11.10	\$8.44	\$7.10	\$6.44
7	\$19.80	\$11.61	\$9.00	\$7.75	\$7.07
8	\$20.28	\$12.13	\$9.56	\$8.36	\$7.72
9	\$20.76	\$12.67	\$10.14	\$9.00	\$8.39
10	\$21.25	\$13.22	\$10.75	\$9.65	\$9.10
11	\$21.74	\$13.78	\$11.37	\$10.32	\$9.80
12	\$22.24	\$14.35	\$12.00	\$11.01	\$10.53
13	\$22.75	\$14.93	\$12.65	\$11.72	\$11.28
14	\$23.27	\$15.53	\$13.32	\$12.44	\$12.04
15	\$23.79	\$16.13	\$14.00	\$13.17	\$12.81

Melita borrows \$250 000 to buy a house at 7% p.a. over twenty years.

Use the information in the table to find out how much Melita repays in total for this loan.

- (A) \$1937.50
(B) \$23 250
(C) \$424 200
(D) \$465 000

- 3) In the figure which of the following will give the value of x ?



- (A) $\frac{15 \sin 118^\circ}{\sin 37^\circ}$
- (B) $\frac{15 \sin 37^\circ}{\sin 25^\circ}$
- (C) $\frac{15 \sin 25^\circ}{\sin 37^\circ}$
- (D) $\frac{15 \sin 25^\circ}{\sin 118^\circ}$
- 4) Express in the simplest form: $5(y - 3) - 4(y - 2) + 2y$
- (A) $11y - 23$
- (B) $11y - 7$
- (C) $3y - 23$
- (D) $3y - 7$
- 5) In a certain test six students scored:
- | | | | | | |
|----|----|----|----|----|----|
| 63 | 38 | 90 | 73 | 59 | 64 |
|----|----|----|----|----|----|

After further revision the test was repeated and the students' marks all increased by 8.

When comparing the second set of results with the first the:

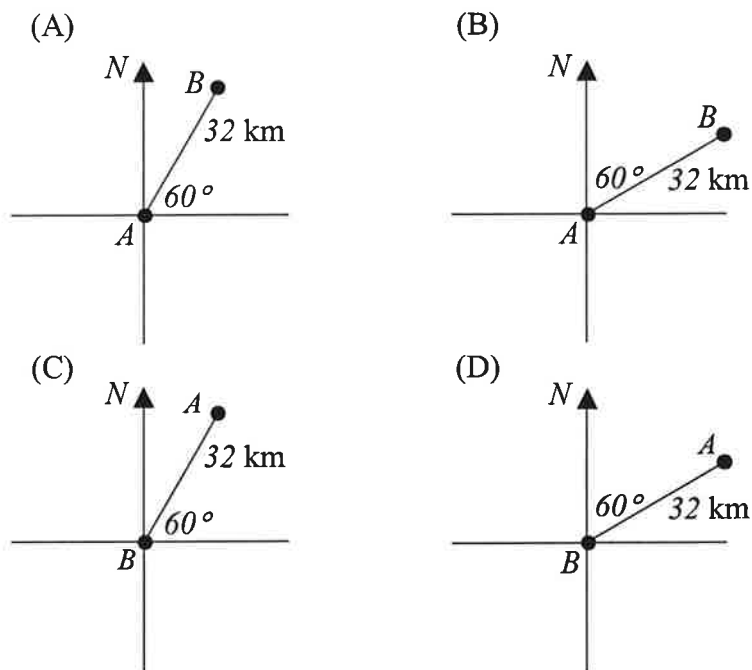
- (A) mean had increased by 8 and the standard deviation remained the same.
- (B) mean had decreased by 8 and the standard deviation remained the same.
- (C) mean had increased by 8 and the standard deviation increased by 8.
- (D) mean had decreased by 8 and the standard deviation increased by 8.

6) Express in the simplest form: $15xy^3 \times -3py$

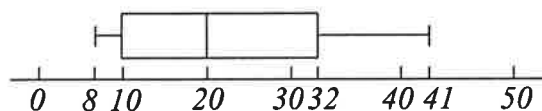
- (A) $45pxy^2$
- (B) $-45pxy^4$
- (C) $5pxy^4$
- (D) $-12pxy^2$

7) A woman walks 32 kilometres from B to A on a bearing of 060° .

Which diagram best illustrates this information?



8) A Geography class of 12 students is going on a three-day excursion by bus. The students are asked to each pack one bag for the trip. The box-and-whiskers plot below shows the weights of the student bags in kilograms.



The interquartile range of the weights of the student bags is:

- (A) 33 kg
- (B) 24 kg
- (C) 22 kg
- (D) 20 kg

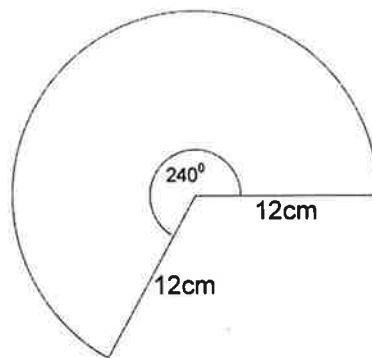
- 9) Vicki works for an insurance company for a salary of \$52 000 p.a. She has \$4500 of work related deductions.

Use the tax table below to calculate the tax payable on Vicki's income.

Taxable income	Tax payable
\$0 - \$6000	NIL
\$6001 - \$22 000	18 cents for each \$1 over \$6000
\$22 001 - \$55 000	\$2880 plus 30 cents for each \$1 over \$22 000
\$55 001 - \$66 000	\$12 780 plus 45 cents for each \$1 over \$55 000
\$66 001 and over	\$17 730 plus 48 cents for each \$1 over \$66 000

- (A) \$11 880
 (B) \$10 530
 (C) \$15 330
 (D) \$12 450

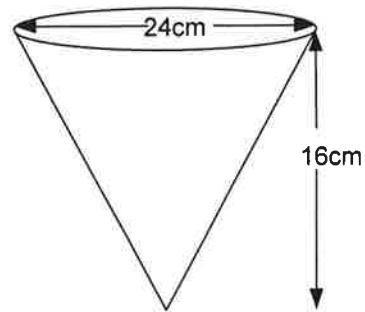
- 10) This is a sketch of a sector of a circle.



Calculate the area of this sector (correct to one decimal place).

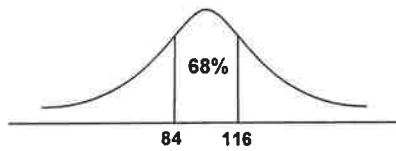
- (A) 50.2 cm^2
 (B) 226.2 cm^2
 (C) 301.6 cm^2
 (D) 960.2 cm^2
- 11) Using the digits 1, 2, 3, 4, 5, 6, 7, 8 and 9 once each to form a 9 digit number, how many 9 digit numbers are possible if the 9 digit number must start with a multiple of 2?
- (A) 40 320
 (B) 806 40
 (C) 161 280
 (D) 362 880

- 12) The volume of the given cone is closest to:

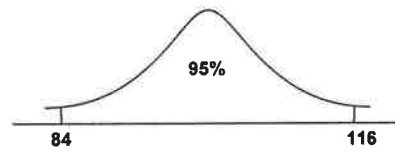


- (A) 2412cm^3
(B) 2413cm^3
(C) 7238cm^3
(D) 9651cm^3
- 13) Which of the graphs below shows a variable following a normal distribution with a mean of 100 and a standard deviation of 4?

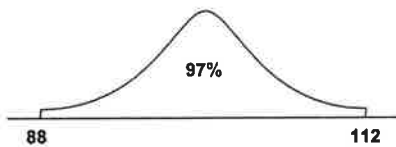
(A)



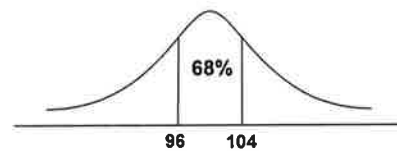
(B)



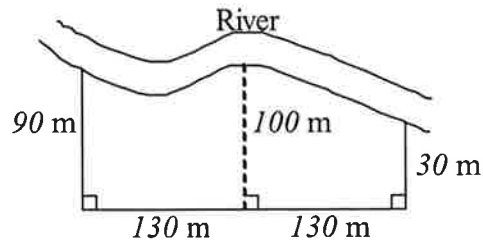
(C)



(D)



- 14) A field is bordered by three straight sides and a river, as shown.



NOT TO SCALE

Use Simpson's rule, $A = \frac{h}{3}(d_F + 4d_L + d_M)$, to calculate the area of the field shown to the closest square metre?

- (A) $9\,533\text{ m}^2$
 (B) $22\,533\text{ m}^2$
 (C) $19\,067\text{ m}^2$
 (D) $45\,067\text{ m}^2$
- 15) The following table summarizes the results for a class in a yearly examination.

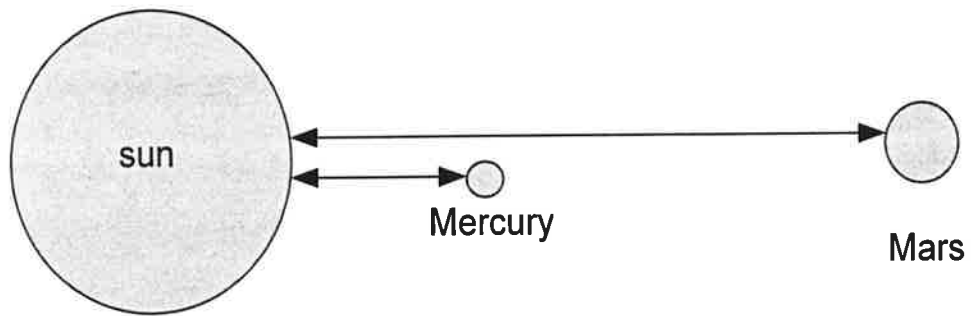
SUBJECT	MEAN	STANDARD DEVIATION	KATE'S MARK
English	69	12	80
History	71	9	78
Maths	64	7	76
Science	64	10	74

Kate's best result relative to her class was in:

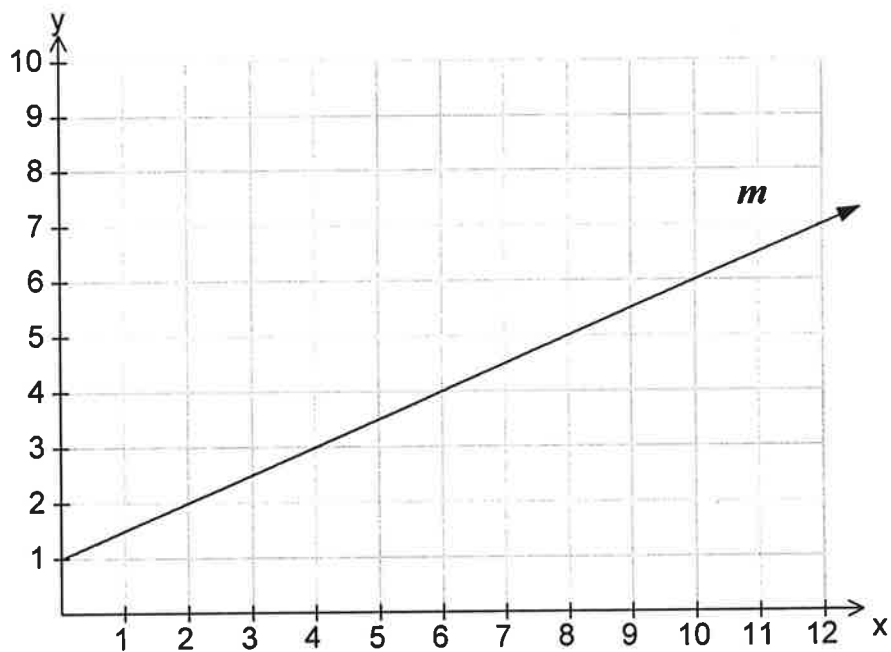
- (A) English
 (B) History
 (C) Maths
 (D) Science

- 16) The distance from the Sun to Mercury is approximately $5.79 \times 10^7 \text{ km}$ and the distance from the Sun to Mars is approximately $2.28 \times 10^8 \text{ km}$.

How far is it from Mercury to Mars in kilometres?



- (A) 1.701×10^8
(B) 17.01×10^8
(C) -3.51×10^1
(D) 3.51×10^{-1}
- 17) The equation of the line m is;



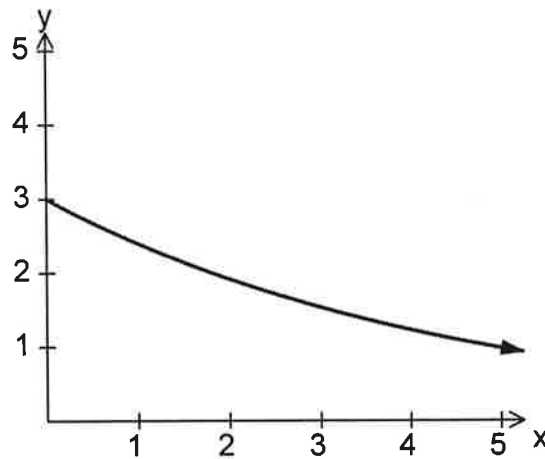
- (A) $6y = x$
(B) $3y = 6x$
(C) $3y = 6x + 1$
(D) $y = \frac{1}{2}x + 1$

- 18) The depreciation formula $A = P\left(1 - \frac{r}{100}\right)^n$ gives the value A of an item after n years where the initial value is P and the annual depreciation rate is $r\%$.

Calculate the number of years it would take for a car initially valued at \$44 000 and depreciating at 15% annually to be valued at \$8662. (Give answer to the nearest year.)

- (A) 8 years
- (B) 10 years
- (C) 18 years
- (D) 23 years

19)



The graph above is best illustrated by which model?

- (A) $y = 3(0.8^x)$
 - (B) $y = 3(1.8^x)$
 - (C) $y = (3^x)$
 - (D) $y = 3(1.0^x)$
- 20) Mira's sister lives in New York (41°N 74°W). She would like to call her for her birthday on Friday the 30th September. Her sister will be home after 6pm that night. Mira is currently in Portugal (38°N 9°W). At what time should she call from Portugal?
- (A) After 10.20pm 29th September
 - (B) After 10.20 pm 30th September
 - (C) After 1.40pm 29th September
 - (D) After 1.40pm 30th September

- 21) In the game of 'Double Barrel' there are two barrels.
- Barrel 1 contains 4 balls, numbered 1, 2, 3, 4.
 - Barrel 2 contains 6 balls, numbered 5, 6, 7, 8, 9, 10.

	DOUBLE BARREL	
	<i>Level 1 Game</i>	<i>Level 2 Game</i>
Step 1	Nominate one numbered ball from each barrel	Nominate two numbered balls from each barrel
Step 2	Select one ball from each barrel	Select two balls from each barrel
Step 3	WIN prize if all nominated balls are selected	

What is the possibility of winning a Level 1 game?

- (A) $\frac{1}{5}$
- (B) $\frac{1}{6}$
- (C) $\frac{5}{12}$
- (D) $\frac{1}{24}$
- 22) Georgie is organising Theatre tickets for people working in her office. The cost of each ticket (C) depends on the number of people attending (n), such that $C \propto \frac{1}{n}$.
- If 8 people purchase tickets, the cost of each ticket is \$35. Find the cost of each ticket if 14 people purchase tickets. (*Answer to the nearest dollar.*)
- (A) \$18
- (B) \$20
- (C) \$30
- (D) \$61

Section II

78 marks

Attempt Questions 23-28

Allow about 2 hours for this section

Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.

All necessary working should be shown in every question.

Question 23 (13 marks) Use a SEPARATE writing booklet.

Marks

- (a) The medals which are to be awarded at the Queensland All Schools Athletics Championships are solids with an elliptical cross section as shown in Figure 1 below. The cross section is also shown with its dimensions in Figure 2.

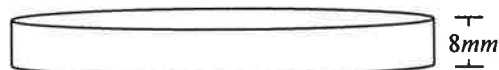


Figure 1

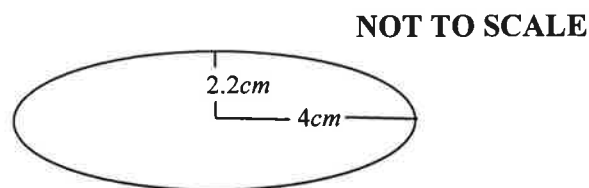


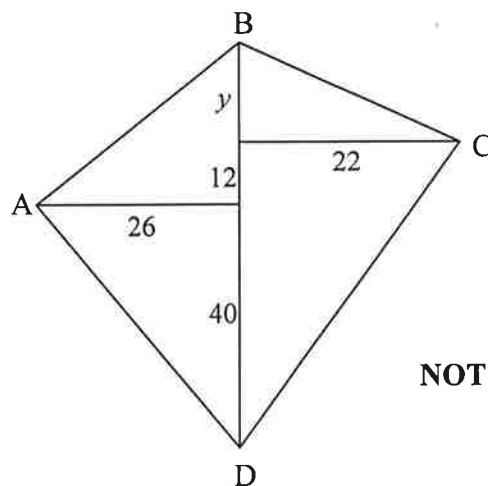
Figure 2

- | | | |
|-------|--|----------|
| (i) | Calculate the area of the elliptical cross section shown in Figure 2. Give your answer to 1 decimal place. | 1 |
| (ii) | Find the volume of alloy required to make each medal to 1 decimal place. | 1 |
| (iii) | The total surface area of a stack of 10 medals is 684 cm^2 . Find the total surface area of one medal. | 3 |

Question 23 continues on the next page

- (b) An offset survey is done of a block of land in a new subdivision in country NSW. The surveyor's notebook entry and subsequent sketch are shown below. All measurements are in metres.

$$\begin{array}{c|c|c} & \text{B} & \\ \hline & 66 & \\ & x & \\ \hline \text{A } 26 & 40 & 22 \text{ C} \\ & 0 & \\ & \text{D} & \end{array}$$



NOT TO SCALE

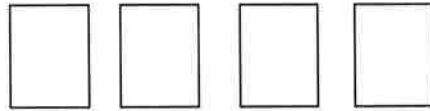
- (i) Find the value of x then y . 2
 - (ii) Find the area of the land. 2
 - (iii) The road runs along the boundary AD. Find the length of AD to the nearest metre. 2
-
- (c) The kinetic energy, E , of a particle is found by applying the formula $E = \frac{1}{2}mv^2$, where m is the mass of the particle and v is its velocity.
- (i) Make v the subject of the formula. 1
 - (ii) Given that $E = 450$ and $m = 25$, find the value of v . 1

End of Question 23

Question 24 (13 marks) Use a SEPARATE writing booklet.

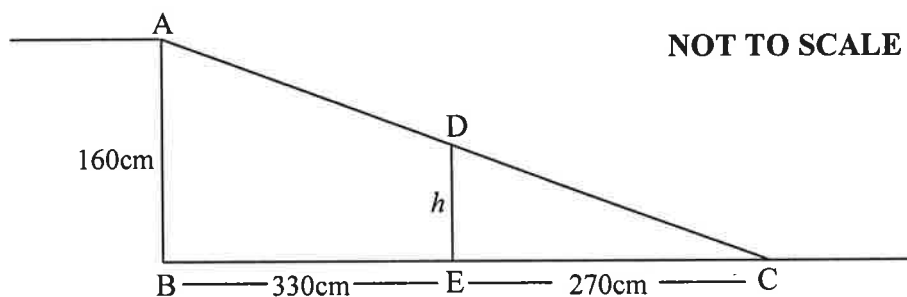
- (a) Nicky notices the game below set up at a local fair.

Four cards are placed face down on a table. Three of the cards show a circle and the fourth a star. The object of the game is to pick the card which shows the star. The cards are shuffled and reset after each game.



- | | | |
|-------|---|----------|
| (i) | What is the probability that Nicky can select the star ? | 1 |
| (ii) | If Nicky decides to play twice, what is the probability that she selects | |
| | (α) the star both times ? | 1 |
| | (β) the star on exactly one occasion ? | 2 |
| (iii) | What is the probability that after 3 games, she has selected the star at least once ? | 2 |

- (b) The diagram below represents a ramp, AC, which is being built to provide wheelchair access to a new community centre. Because of the ramp's length, council requires a supporting wall to be constructed, DE.



Find the height, h , of the supporting wall.

2

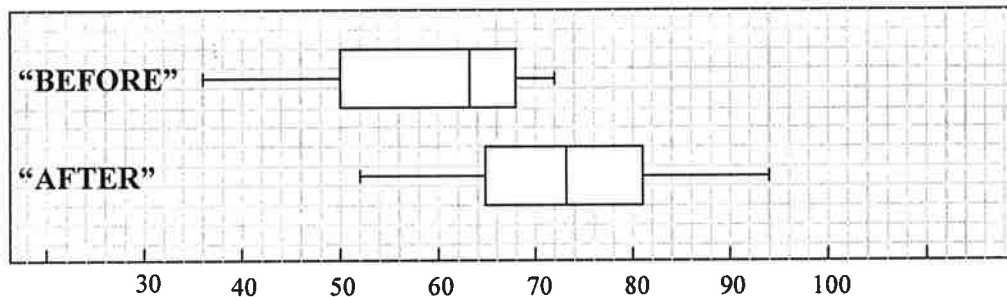
Question 24 continues on the next page

- (c) Alice is one of a pilot group of 100 students chosen to test the “Super-mathematics Computer Tutor”.

All students were tested both before and after using the software package for six months.

The results of the “Before test” and the “After test” for **20 of these** students appear below.

Before	After
8 6	3
8 4 1	4
9 6 3 2	5 2 4
9 9 7 6 6 5 3 3	6 0 0 3 7
2 1 0	7 0 1 3 3 3 8 8 9
	8 2 4 6 8
	9 2 4



- What was the modal score in the “After test” data ? 1
- What is the interquartile range of the “Before test” data ? 1
- Russell finds the mean and standard deviation of both sets of data. Should he use the population or sample standard deviation ? Justify your answer. 1
- Comment briefly on the skew of both sets of data. 2

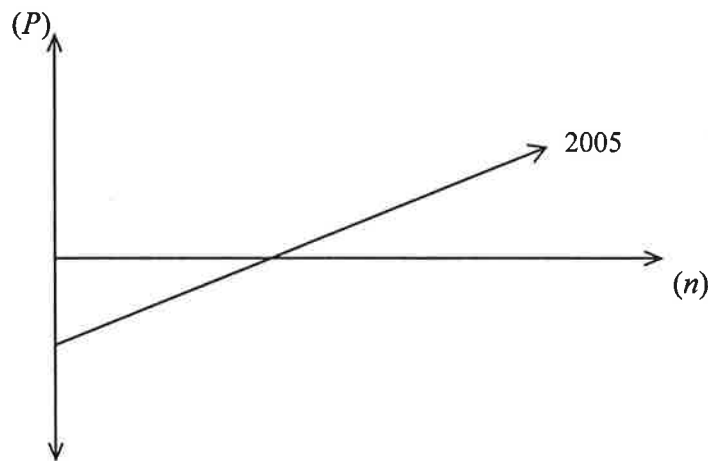
End of Question 24

Question 25 (13 marks) Use a SEPARATE writing booklet.

- (a) A leaking tap is known to drip water at a rate of 4mL per 15 seconds. Express this rate in litres per hour. 1

- (b) A netball club conducts a guessing competition to raise money for its 2005 tour of England. The profit made (P) is modelled by the formula, $P = 2n - 750$, where n represents the number of tickets sold.

- (i) How much profit will be made from the sale of 800 tickets ? 1
- (ii) If the club hopes to make \$1500 in profit, how many tickets must be sold ? 2
- (iii) Susan is the club treasurer. She knows that so far 335 tickets have been sold. Find the amount of profit the club has made so far and briefly explain the practical significance of your result. 2
- (iv) The graph below shows the profit in dollars when n tickets have been sold.



For the 2006 fundraiser, the club's sponsors have covered the costs associated with the guessing competition including all prizes and the cost of printing tickets. The cost of a ticket will also increase for next year's guessing competition.

Copy or trace the graph above into your answer booklet, and on the same axes, show a possible graph for next year's guessing competition profits.

1

Question 25 continues on the next page

- (c) A group of behavioural scientists set out to test the following hypothesis with regards to childhood obesity.

“That childhood obesity is more dependant on genetic factors rather than environmental factors and diet.”

To test their hypothesis, they take a sample of 300 children and their parents.

They found that,

- 105 children were overweight. Of these, 75 had overweight parents.
- 138 did not have an overweight parent.

The incomplete two way table appears below.

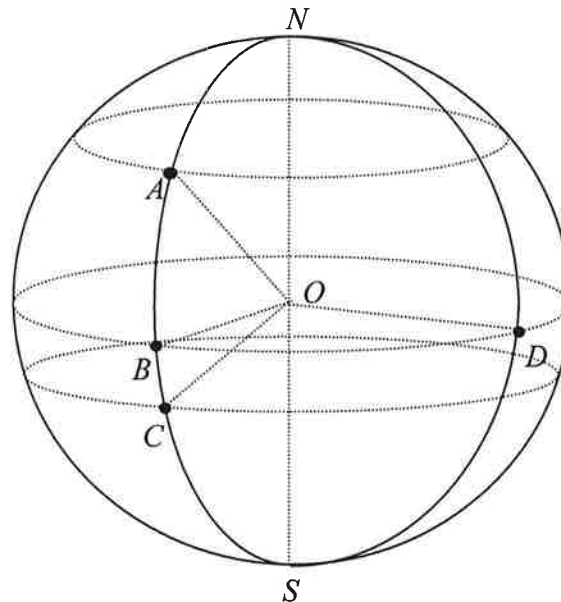
	Child Overweight	Child NOT Overweight	Total
Parents Overweight	A		
Parents NOT Overweight			138
	105		B

- | | | |
|-------|--|----------|
| (i) | Use the findings to find values for A and B. | 2 |
| (ii) | Copy the table into your writing booklet and complete it from the information given. | 2 |
| (iii) | What percentage of the overweight children did not have overweight parents ? (Answer to 1 d.p.) | 1 |
| (iv) | For how many of the families was the hypothesis put forward by the scientists true ? Use your findings to comment briefly on the validity of their hypothesis. | 1 |

End of Question 25

Question 26 (13 marks) Use a SEPARATE writing booklet.

- (a) The diagram below is of the Earth. The point D is both on the prime meridian and the equator.



NOT TO SCALE

- | | | |
|-------|---|---|
| (i) | The point A lies on the 60° N parallel of latitude. If the size of $\angle AOC$ is known to be 70° , on which parallel of latitude does the point C lie? | 1 |
| (ii) | Find the distance from A to C to the nearest kilometre. (You may assume that the radius of the Earth is 6400km and that 1 nautical mile = 1.852 km) | 2 |
| (iii) | The difference in longitude of the points B and D is 100° . If the time at B is 3:20pm, ignoring time zones, what time is it at D ? | 2 |
| (b) | The captain and vice captain of the rowing team are to be randomly selected from a group of nominees. The first name drawn is to be captain and the second is to be vice captain. | 1 |

If it is known that there are 72 different combinations that could be selected, how many nominees are there. Show calculations to support your answer.

Question 26 continues on the next page

Marks

- (c) Joe works as a carpenter and is self employed. He therefore needs to provide for his own retirement.

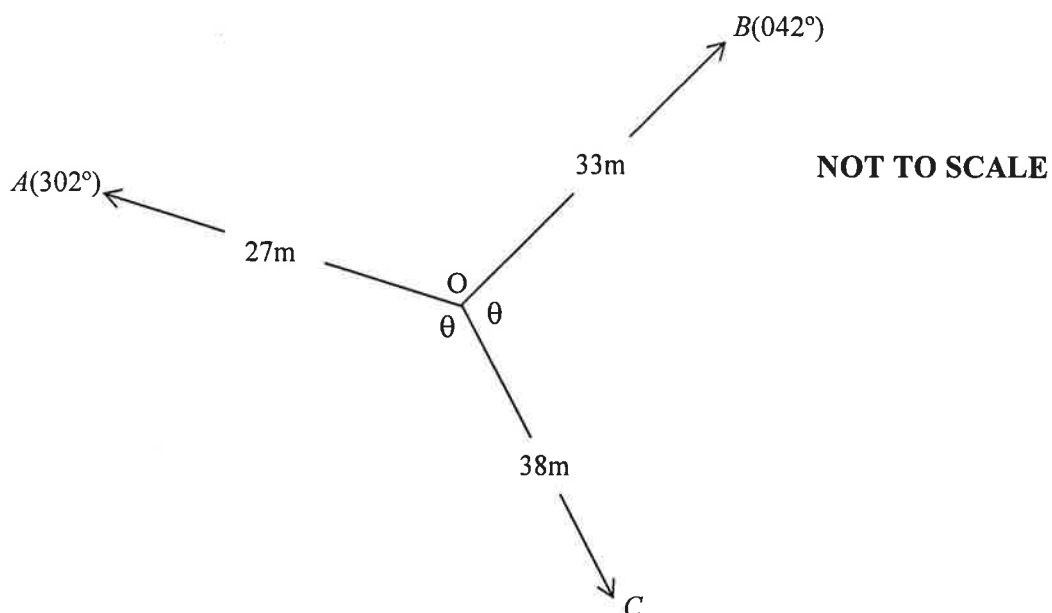
He contributes \$250 per month into a superannuation fund that earns an average of 7.2% per annum compounded monthly.

- | | | |
|-------|---|----------|
| (i) | If the fund runs for 25 years, show that the amount of Joe's lump sum payout upon retirement is \$209 050 to the nearest dollar. | 3 |
| (ii) | When he retires at the age of 65, Joe invests his superannuation payout in a rollover fund which earns 2.25% per quarter compounded quarterly. This fund will pay Joe a pension every quarter for the next 20 years. Find the amount that Joe can expect to receive per quarter on which to live. | 2 |
| (iii) | How much interest has Joe earned from his rollover fund over the 20 years ? | 2 |

End of Question 26

Question 27 (13 marks) Use a SEPARATE writing booklet

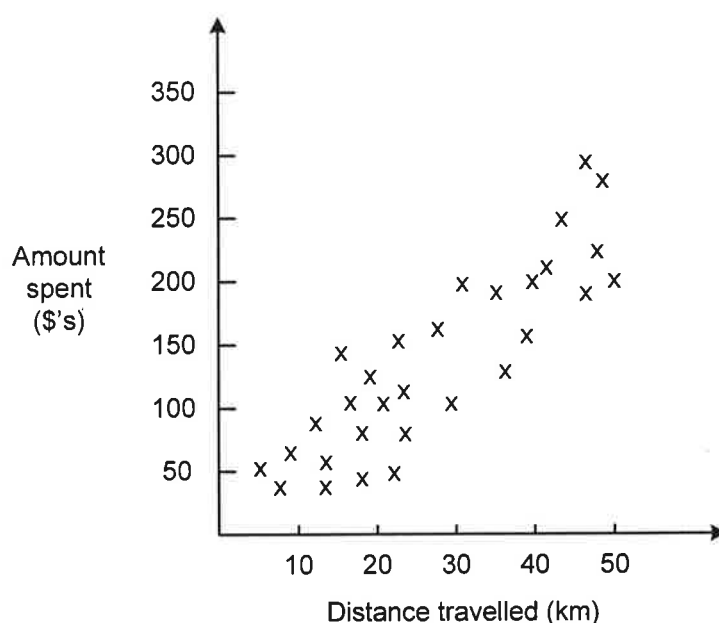
- (a) Cans in a drink factory are filled by machines. The volumes dispensed are known to be normally distributed with a mean of 370ml and a standard deviation of 12ml.
- (i) A randomly selected can has a volume with a negative z-score. What can be said about the volume of drink in this can ? 1
 - (ii) Brett finds that the volume of drink in his can has a z-score of 3. What is the volume of drink in Brett's can ? 1
 - (iii) If the factory produces 26 000 in a day, how many cans would have a volume less than Brett's can ? 1
- (b) Consider the radial survey below.



- (i) It is known that the two angles marked θ are equal in size. Show that the bearing of C from O is 172° . 2
- (ii) Find the length of BC to one decimal place. 2
- (iii) Find the area of $\triangle BOC$ to the nearest square metre. 2

Question 27 continues on the next page

- (c) In a survey of shoppers at a regional shopping centre, shoppers were asked the distance they had travelled from home to reach the centre and the amount they had spent at the centre. The results were displayed on a scatterplot, as shown below.



- | | | |
|-------|---|----------|
| (i) | How many shoppers were surveyed ? | 1 |
| (ii) | How much did the shopper who had travelled the greatest distance spend ? | 1 |
| (iii) | Describe the correlation between the distance travelled by shoppers and the amount they spent. | 1 |
| (iv) | Explain whether or not it is accurate to say that the distance travelled by shoppers to reach the regional shopping centre caused them to spend more at the regional shopping centre. | 1 |

End of Question 27

Question 28 (13 marks) Use a SEPARATE writing booklet.

- (a) Ceramic dishes are made so that the cost (\$ C) varies directly as the square of the radius (r cm). A dish with a radius of 8cm has a value of \$48.
- (i) Write a formula connecting the variable C , r and the constant of variation k . 1
 - (ii) Find k . 1
 - (iii) Maggie claims that “doubling the radius of the dish will increase its value by a factor of 4”. Verify or refute Maggie’s claim using appropriate calculations to support your argument. 2
- (b) Based on the advice of their accountant, Peter and Pauline purchase a Gold Coast apartment in 2005. The formula used by the accountant to describe the value of Peter and Pauline’s apartment, \$ V , n years after the purchase is

$$V = 240000(1.06)^n$$

- (i) How much did Peter and Pauline pay for the apartment ? 1
- (ii) According to this formula, what will be the value of the apartment in 2010 to the nearest thousand dollars ? 2
- (iii) What annual rate of appreciation is the accountant assuming in his formula ? 1

Question 28 continues on the next page

		Marks
(c)	Two furniture manufacturers, <i>Totally Country</i> and <i>Classic Timbers</i> both purchase woodturning machines for their respective factories valued at \$22 000.	
(i)	<i>Totally Country</i> depreciate their machine using the declining balance of depreciation. If the rate of depreciation is 12%, find the salvage value of the machine after 3 years to the nearest dollar.	2
(ii)	<i>Classic Timbers</i> use the straight line method of depreciation to calculate the salvage value of their machine. If the machine is depreciating at a rate of \$2000 per year, find the salvage value after 7 years.	1
(iii)	When the value of the machine falls below \$6000, <i>Classic Timbers</i> donate their machine to a sheltered workshop. If <i>Totally Country</i> do the same, after how many years will their machine be donated to the sheltered workshop ?	2

END OF EXAMINATION

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General Mathematics

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

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

θ = number of degrees in central angle

Arc length of a circle

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

θ = number of degrees in central angle

Simpson's rule for area approximation

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

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

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

FORMULAE SHEET

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:

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

NAME: Solutions

TEACHER: _____

PYMBLE LADIES' COLLEGE

2005 TRIAL HSC GENERAL MATHEMATICS

Multiple Choice Answer Sheet

- | | | | | |
|-----|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| 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) ☐ |

Question 23

$$\begin{aligned} \text{(a) (i) Area} &= \pi r^2 \\ &= \pi \times 2.2^2 \times 1 \\ &= 27.6 \text{ cm}^2 \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{(ii) Volume} &= Ah \\ &= 27.6 \times 0.8 \\ &= 22.08 \quad \checkmark \end{aligned}$$

$$\text{(iii) S.A.} = 2(\text{area of cross section}) + (\text{curved surface})$$

$$\begin{aligned} \text{Curved Surface} &= \frac{684 - 2(27.6)}{10} \\ &= 62.88 \end{aligned}$$

$$\begin{aligned} \therefore \text{S.A.} &= 2(27.6) + 62.88 \\ &= 118.08 \text{ cm}^2 \end{aligned}$$

$$\text{(b) (i) } x = 52 \quad \checkmark \quad y = 14 \quad \checkmark$$

$$\begin{aligned} \text{(ii) } A &= \left(\frac{1}{2} \times 66 \times 26\right) + \left(\frac{1}{2} \times 66 \times 22\right) \quad \checkmark \\ &= 1584 \text{ m}^2 \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{(iii) } AD^2 &= 26^2 + 40^2 \quad \checkmark \\ &= 48 \text{ m} \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{(c) (i) } E &= \frac{1}{2}mv^2 \\ 2E &= mv^2 \\ v^2 &= \frac{2E}{m} \\ v &= \sqrt{\frac{2E}{m}} \quad \checkmark \end{aligned}$$

$$\begin{aligned}
 \text{(iii)} \quad & \frac{2F}{n} \\
 & = \frac{2 \times 50}{25} \\
 & = 4 \quad \checkmark
 \end{aligned}$$

Question 24:

$$(a) \quad (i) \quad \frac{1}{4} \quad \checkmark$$

$$(ii) \quad (\alpha) \quad \frac{1}{2} \times \frac{1}{2} = \frac{1}{4} \quad \checkmark$$

$$(\beta) \quad \left(\frac{1}{2} \times \frac{3}{4} \right) + \left(\frac{3}{4} \times \frac{1}{4} \right) = \frac{3}{8} \quad \checkmark$$

(iii) (at least one star)

$$= 1 - (\text{no stars}) \quad \checkmark$$

$$= 1 - \left(\frac{3}{4} \times \frac{3}{4} \times \frac{3}{4} \right)$$

$$= \frac{37}{64} \quad \checkmark$$

$$(b) \quad \frac{h}{270} = \frac{160}{600} \quad \checkmark$$

$$h = \frac{270 \times 160}{600}$$

$$= 72 \text{ cm} \quad \checkmark$$

$$(c) \quad (i) \quad 73 \quad \checkmark$$

$$(ii) \quad 18 \quad \checkmark$$

(iii) Sample. Because only a sample of the $\checkmark$
100 students are having their results analysed.

(iv) The "Before" data is negatively skewed while
the "After" data is symmetrical.

Question 25:

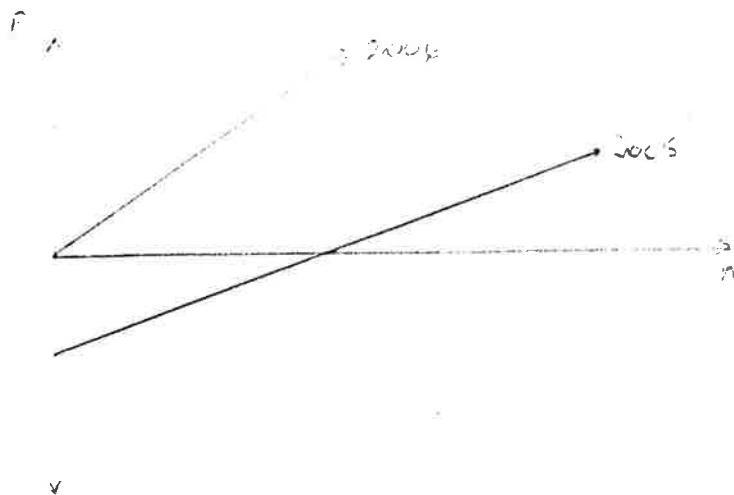
$$\begin{aligned} (a) \quad 4 \text{ ml} / 15 \text{ secs} &= 16 \text{ mL} / \text{min} \\ &= 960 \text{ mL} / \text{hour} \\ &= 0.96 \text{ L} / \text{hour} \end{aligned}$$

$$\begin{aligned} (b) \quad (i) \quad P &= 2n - 750 \\ &= 2(800) - 750 \\ &= 850 \end{aligned}$$

$$\begin{aligned} (ii) \quad P &= 2n - 750 \\ 1500 &= 2n - 750 \\ 2250 &= 2n \\ n &= 1125 \end{aligned}$$

$$\begin{aligned} (iii) \quad P &= 2(335) - 750 \\ &= 670 - 750 \\ &= -80 \end{aligned}$$

The negative result means the club is
currently making an \$80 loss.



- (c) (i) A is 75
B is 300

(ii)

	Child Overweight	Child Not Overweight	Total
Parents Overweight	75	87	162
Parents Not Overweight	30	108	138
	105	195	300

(iii) $\frac{30}{105} \times 100\% = 28.6\%$

- (iv) The hypothesis was true for 105 of the 300 families. This would not be sufficient to claim the hypothesis is valid.

Question 20

$$\begin{aligned} \text{(i)} \quad \text{Distance} &= 70 \times 60 \times 1.852 \\ &= 7776 \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Distance} &= \frac{70}{360} \times 2 \times \pi \times 6400 \\ &= 7819 \text{ km} \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad \text{Difference} &= 100 \times 4 \\ &= 400 \text{ min} \\ &= 6 \text{ hours } 40 \text{ mins} \end{aligned}$$

$$\begin{aligned} \text{Time at D} &= 3:20 + 6 \text{ hours } 40 \text{ mins} \\ &= 10 \text{ pm.} \end{aligned}$$

(b) Since $9 \times 8 = 72$, there must have been 9 nominees.

$$\begin{aligned} \text{(c)} \quad \text{(i)} \quad A &= M \left\{ \frac{(1+r)^n - 1}{r} \right\} \\ &= 250 \left\{ \frac{(1+0.006)^{300} - 1}{0.006} \right\} \\ &= 209,050 \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad N &= M \left\{ \frac{(1+r)^n - 1}{r(1+r)^n} \right\} \\ 209050 &= M \left\{ \frac{(1+0.0225)^{80} - 1}{0.0225(1+0.0225)^{80}} \right\} \end{aligned}$$

$$M = 5657.68$$

$$\begin{aligned} \text{(iii) Interest} &= (.80 \times 5657.68) - 209050 \\ &= \$243564.40 \end{aligned}$$

Question 27

(a) (i) It is less than 370 mL

$$\begin{aligned} \text{(ii) Volume} &= 370 + 3(12) \\ &= 406 \text{ mL} \end{aligned}$$

(iii) Only 0.15% of cans exceed 406 mL
 $\therefore$ 99.85% are less than 406 mL

$$99.85\% \times 26000 = 25961$$

$$\begin{aligned} \text{(b) (i) } \theta &= (302 - 42) \div 2 \\ &= 130 \end{aligned}$$

$\therefore$ The bearing of C from O is $42 + 130$
 $= 172^\circ$

$$\begin{aligned} \text{(ii) } BC^2 &= 33^2 + 38^2 - 2(33)(38) \cos 130^\circ \\ \therefore BC &= 64.4 \text{ m} \end{aligned}$$

$$\begin{aligned} \text{(iii) Area} &= \frac{1}{2} \times 33 \times 38 \times \sin 130 \\ &= 480 \text{ m}^2 \end{aligned}$$

- (c) (i) 30
 (ii) \$200
 (iii) there is a weak positive correlation
 (iv) This is not strictly speaking true.
 Some shoppers who travelled a shorter distance than others spent more money.

Question 28 :

(a) (i) $C = kr^2$

(ii) $C = kr^2$
 $48 = k \cdot 8^2$
 $k = \frac{3}{4}$

(iii) $\therefore C = \frac{3}{4}r^2$

when $r = 16$

$$C = \frac{3}{4} \cdot 16^2$$

$$= \$192$$

$\therefore$ Maggie's claim is correct

(b) (i) \$240,000 (Value of V when $n = 0$)

(ii) $V = 240000 (1.06)^n$

when $n = 5$

$$V = 240,000 (1.06)^5$$

$$= \$321,000$$

(iii) 6%. (Since $1.06 = 1 + 0.06$
 $\& 0.06$ as a percentage is 6%)

$$\begin{aligned}
 \text{(c) (i)} \quad S &= V_0 (1-r)^n \\
 &= 22000 (1-0.12)^3 \\
 &= \$14992
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad S &= V_0 - Dn \\
 &= 22000 - 2000 \times 7 \\
 &= \$8000
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii)} \quad S &= V_0 (1-r)^n \\
 16000 &= 22000 (1-0.12)^n \\
 0.27 &= 0.88^n
 \end{aligned}$$

Guess $n = 5$

$$0.88^5 = 0.5277...$$

$$n = 7$$

$$0.88^7 = 0.408...$$

$$n = 9$$

$$0.88^9 = 0.316...$$

$$n = 10$$

$$0.88^{10} = 0.2785...$$

$$n = 11$$

$$0.88^{11} = 0.245...$$

$\therefore$ after 11 years the machine will be donated.