



MAITLAND GROSSMANN
HIGH SCHOOL

12

2008

HALF-YEARLY EXAMINATION
HIGHER SCHOOL CERTIFICATE COURSE

General Mathematics

General Instructions

- Reading time – 5 minutes
- Working time – 2 hours
- Write using black or blue pen
- Calculators may be used
- A formulae sheet is provided at the back of this paper
- Marks will be deducted for careless or badly arranged work

Total marks - 85

Section I Pages 2 – 8

20 marks

- Attempt Questions 1 – 20
- Allow about 30 minutes
- Multiple choice
- Answer on the sheet provided.
- Use blue or black pen.

Section II Pages 9 – 13

65 marks

- Attempt Questions 21 – 25
- Use blue or black pen.
- Use pencil for diagrams only
- Show all necessary working
- Use only one side of the page
- Do not work in columns
- Start each question on a new page
- Allow about $1\frac{1}{2}$ hours for this section

Section I

20 marks

Attempt questions 1 – 20

Allow about 30 minutes for this section

Use the multiple-choice answer sheet for Questions 1 - 20

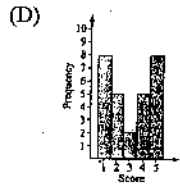
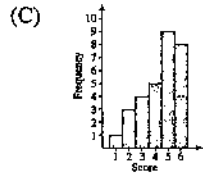
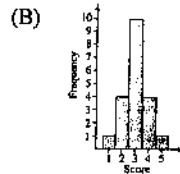
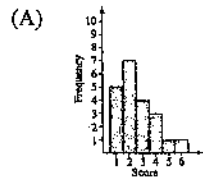
- 1 The total value of an investment of \$7 000 after 2 years and 6 months if simple interest is paid at the rate of 5% per annum, is:
- (A) \$875.00
(B) \$1 652.50
(C) \$7 875
(D) \$7 951.00
- 2 Written in scientific notation and correct to two significant figures, the number 19 190 172 is:
- (A) 1.9×10^7
(B) 1.9×10^{-7}
(C) 1.92×10^7
(D) 1.92×10^{-7}
- 3 The following frequency table shows Jake's scores on a number of quizzes.

<i>score</i>	<i>frequency</i>
1	2
2	3
3	5
4	2

Which expression gives Jake's mean score?

- (A) $\frac{2+6+15+8}{12}$ (B) $\frac{2+6+15+8}{4}$
(C) $\frac{1+2+3+4}{12}$ (D) $\frac{1+2+3+4}{4}$

4 Which of these data sets is negatively skewed?



5 The price of a jacket, originally marked at \$200, was discounted by 10%. A few weeks later, the price was again decreased by 10%. What was the price after these two discounts?

- (A) \$160
- (B) \$180
- (C) \$162
- (D) \$170.50

6 A rectangular block of land is measured (to the nearest metre) as 16 m × 50 m. The greatest possible actual area, to the nearest square metre, is:

- (A) 767 m²
- (B) 800 m²
- (C) 827 m²
- (D) 833 m²

7 A triangular pyramid and a square pyramid both have a base area of 30 cm² and a height of 12 cm. Which has the greater volume?

- (A) triangular pyramid
- (B) square pyramid
- (C) both have equal volume
- (D) cannot be calculated as not enough information has been given.

8 Make h the subject of the formula $v = \frac{1}{3} \pi r^2 h$

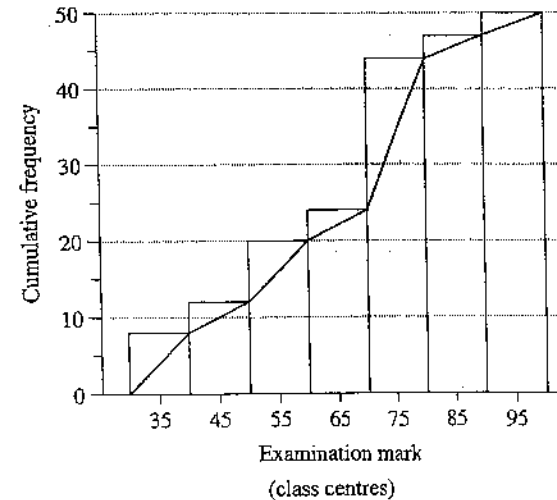
(A) $h = \sqrt{\frac{3v}{\pi r}}$

(B) $h = \frac{3v}{\pi r^2}$

(C) $h = \frac{v \pi r^2}{3}$

(D) $h = \frac{3v}{\sqrt{\pi r}}$

9 A set of examination results is displayed in a cumulative frequency histogram and polygon (ogive).



Of the following, which one is the best estimate of the median?

- (A) 60
- (B) 65
- (C) 70
- (D) 75

10. Groups of boys and girls are given tests. The group of 40 boys has an average score of 76% and the group of 60 girls has an average score of 37%. The average score for the combined groups is:

- (A) 44.8%
- (B) 52.6%
- (C) 56.5%
- (D) 60.4%

11. If $4\sqrt{p} = 9$, then p has the value of:

- (A) $\frac{18}{8}$
- (B) $\frac{81}{16}$
- (C) $\frac{3}{2}$
- (D) 6

12. Rosie invests \$5 000 into an account that offers 4% p.a. compounded quarterly. How many full years will it take Rosie's investment to at least double in value?

- (A) 5 years
- (B) 18 years
- (C) 27 years
- (D) 70 years

13. In a particular Year 12 assessment task, the mean was recorded as 62.5% with a standard deviation of 9%.

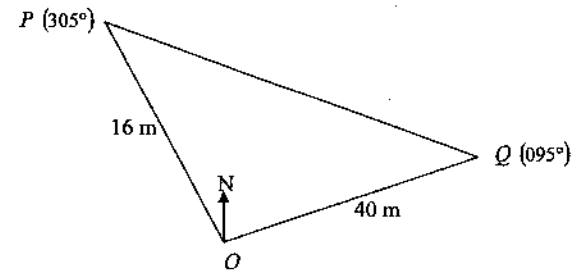
A student's z-score on this task was 2.5.
The student's assessment mark achieved on the task was:

- (A) 60%
- (B) 65%
- (C) 74%
- (D) 85%

14. A triangle has sides of length 8, 10 and 12 centimetres. The size of the smallest angle to the nearest degree, would be:

- (A) 32°
- (B) 83°
- (C) 41°
- (D) 56°

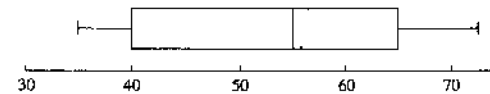
15. The diagram shows a radial survey of a section of land proposed for a childrens' park.



The area of the land POQ is given by:

- (A) $56 \cos 210^\circ$
- (B) $320 \sin 150^\circ$
- (C) $320 \cos 150^\circ$
- (D) $640 \sin 210^\circ$

16. The results of a test are displayed in a box-and-whiskers plot.



Which of the following statements is false?

- (A) 50% of the scores lie between 40 and 65
- (B) 50% of the scores are above 55
- (C) 25% of the scores are below 40
- (D) 95% of the scores are below 65

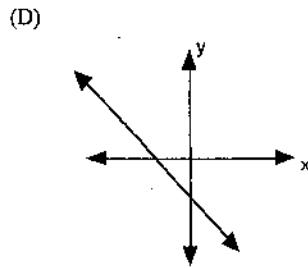
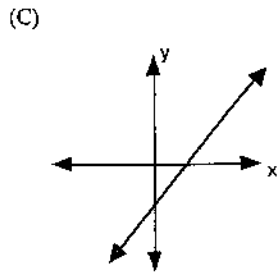
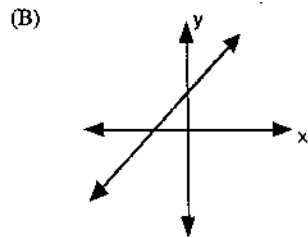
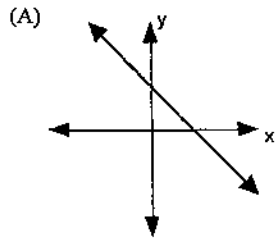
17 The volume of a sphere with a diameter of 2.4 cm is closest to:

- (A) 4.5 cm^3
- (B) 7.2 cm^3
- (C) 18.1 cm^3
- (D) 57.9 cm^3

18 The solution to $3 - \frac{6n}{5} = -7$ is:

- (A) $n = 3\frac{1}{3}$
- (B) $n = -3\frac{1}{3}$
- (C) $n = -8\frac{1}{3}$
- (D) $n = 8\frac{1}{3}$

19 Which of the following could be the graph of the straight line $y = 5 - x$?



20

Monthly repayment on a loan of \$1 000

Term	Interest rate			
	9 %	10 %	11 %	12 %
10	\$12.67	\$13.22	\$13.78	\$14.35
15	\$10.14	\$10.75	\$11.37	\$12.00
20	\$9.00	\$9.65	\$10.32	\$11.01
25	\$8.39	\$9.09	\$9.80	\$10.53

Mr and Mrs Correl borrow \$85 000 to be repaid over 20 years at 10 % p.a. The amount of interest that they pay on the loan is:

- (A) \$8 500
- (B) \$111 860
- (C) \$170 000
- (D) \$196 860

Section II

65 marks

Attempt Questions 21-25

Allow about $1\frac{1}{2}$ hours for this section

Answer each question by starting a new page. Extra writing paper is available.

All necessary working should be shown in every question.

Question 21 (13 marks)

Marks

- (a) Annie has worked 8 hours normal time and 4 hours time-and-a-half. If she earned \$136.50, what was her hourly rate? 2

- (b) Adrian borrowed \$40 000 to buy equipment he needed to start up a new business. The Finance Company charged him 8% p.a. flat rate interest on the loan. Adrian was required to repay the loan plus interest in equal monthly repayments over 4 years.

- (i) Altogether, how much interest does Adrian have to pay on his loan? 2
- (ii) Calculate the size of each monthly repayment. 2

After 30 months Adrian's business was doing so well that he had \$16 000 in the bank.

- (iii) How much did Adrian still owe at the end of 30 months? 2
- (iv) Adrian is considering repaying the balance owing on the loan after 30 months. Do you think this is the right decision? Give a reason for your answer. 1

- (c) The manager of a successful business plans to expand over the next 5 years and estimates future costs will be \$150 000. It is decided to invest \$1 000 each month (an annuity) in an account paying interest at 9% p.a. compounded monthly for the next 5 years.

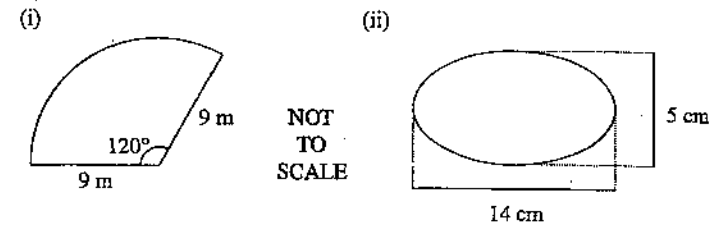
- (i) Calculate the value of this investment at the end of 5 years and whether there will be sufficient funds for the estimated expansion of the business. 2
- (ii) What lump sum would be needed to be invested today at the same interest rate, compounding monthly, so that the expansion of the business can take place in 5 years time? 2

Question 22 (13 marks)

START A NEW PAGE

Marks

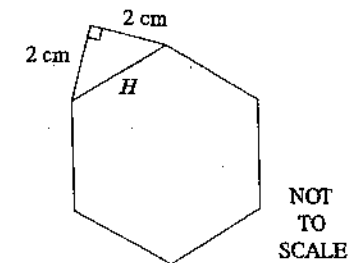
- (a) Find the exact area of the following: 4



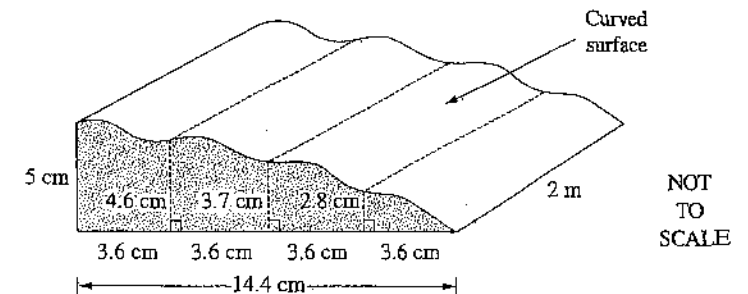
- b) This shape is made up of a right-angled triangle and a regular hexagon. 3

The area of a regular hexagon can be estimated using the formula $A = 2.598H^2$ where H cm is the side length.

Calculate the total area of the shape using this formula.



- (c) A piece of plaster has a uniform cross-section, which has been shaded, and has dimensions as shown. 3



- (i) Use two applications of Simpson's Rule to approximate the area of the cross-section. 3
- (ii) The total surface area of the piece of plaster is 7480.8 cm^2 . Calculate the area of the curved surface as shown on the diagram. 3

Question 23 (13 marks)

START A NEW PAGE

Marks

- (a) Simplify
- (i) $(\frac{1}{8})^{-\frac{1}{3}}$ 1
- (ii) $(10a^3b^4)^3$ 2
- (b) Expand and simplify $5(2x-1) - (3-x)$ 2
- (c) Solve
- (i) $14 - 5p = 9 - 2p$ 2
- (ii) $\frac{t+4}{3} - \frac{1-2t}{5} = 2$ 3
- (d) Cheryl was asked to find an approximate value of n correct to one decimal place if $10^n = 631$
- (i) Explain why the value of n must lie between 2 and 3. 1
- (ii) Use the "guess, check and refine" method to find an approximate value of n correct to one decimal place 2

Question 24 (13 marks)

START A NEW PAGE

Marks

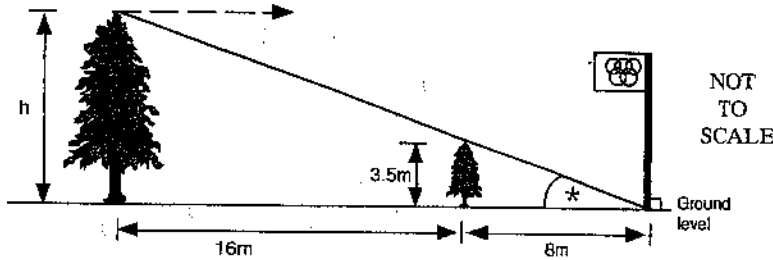
- (a) 400 athletes are tested for performance enhancing drugs using urine samples. The results are shown in the table below.

	Positive urine sample	Negative urine sample	TOTAL
Male athletes	28	216	244
Female athletes	A	138	156
TOTAL	46	354	400

- (i) Determine the value of A in the table. 1
- (ii) What percentage of the female athletes tested positive? Give your answer to two decimal places 2
- (b) For a fortnight two local cafés in Inner Sydney kept a record of the number of Coffees they sold to customers to determine Sydney's best café.
- The results for each day are displayed in the back-to-back stem-and-leaf plot below.
- | Coffee Bean | | Café Coffee |
|-------------|----|-------------|
| | 6 | 4 5 |
| 7 5 2 2 0 | 7 | 1 6 7 8 |
| 7 4 2 2 1 | 8 | 8 8 9 9 9 |
| | 9 | 0 1 3 |
| 2 0 | 10 | |
- (i) Determine the median for each café. 2
- (ii) Calculate the mean and population standard deviation for each café. 2
- (iii) Using your answers from (i) and (ii) either support or reject the statement: "The best café in Sydney is the Coffee Bean." 2
- (c) The period from conception to delivery of a baby is called the gestation period. The gestation period for humans is approximately normally distributed with a mean of 266 days and a standard deviation of 16 days.
- (i) What percentage of pregnancies will last more than 282 days? 1
- (ii) Between what two values will 95% of gestation periods lie? 1
- (iii) Is it possible to have a gestation period of 320 days? Justify your answer. 2

(a) Find the size of θ to the nearest minute if $\cos \theta = -0.58$ 1

(b) Two similar trees on Olympic Park Drive are 16m apart on level ground and stand at right angles to the ground. The smaller tree of height 3.5m stands 8m from a flag pole.



NOT TO SCALE

Using your knowledge of similar triangles,

(i) What is the factor of enlargement in the diagram that would allow you to calculate the height of the taller tree? 1

(ii) Calculate the value of h in the diagram. 1

(iii) Use trigonometry to calculate the angle of elevation marked $*$ in the diagram. Give your answer to the nearest minute. 2

(iv) There is a 2 metre vertical difference between the top of the flag pole and the top of the taller tree. 2

Calculate the angle of depression from the top of this tree to the top of the flag pole, to the nearest minute.

(c) Ian sails on a bearing of 163° from A to B for 31 nautical miles. He then sails on a bearing of 195° to C , where he is directly south of A .

(i) Draw a triangle ABC showing all of the information given. 2

(ii) Explain why $\angle ABC = 148^\circ$. 2

(iii) Calculate how far south Ian has travelled, to the nearest nautical mile. 2

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

$$c) i) A = M \left\{ \frac{(1+r)^n - 1}{r} \right\} \quad 0.09 \div 12 = 0.0075$$

$$= 1000 \left\{ \frac{1 - 0.0075^{60} - 1}{0.0075} \right\}$$

$$= 75424.1369 \dots$$

$$= 75424.14 \text{ (2dp)}$$

Investment with amount to \$75424 over 5 years, and will not be enough for the estimated expansion

Question 21

$$3h + 4 \times 1.5h = 14h$$

$$\text{Hourly rate} = \$136.50 \div 14 = \$9.75$$

\therefore Annie's hourly rate was \$9.75

$$ii) N = A \text{ or } A = P(1+r)^n$$

$$= \frac{150000}{(1.0075)^{60}}$$

$$= 95804.9547 \dots$$

$$= 95804.95 \text{ (2dp)}$$

\$95804.95 needs to be invested.

$$b) i) I = Prn \quad 0.08 \times 40000 \times 4 = 12800$$

$$ii) \text{Loan + interest} = \$40000 + \$12800 = \$52800$$

$$\text{monthly repayment} = \$52800 \div 48 = \$1100$$

$$iii) \text{From (ii) loan + interest} = \$52800$$

$$\text{Amt owing after 30 months} = \text{Loan + interest} - \text{repayments}$$

$$= \$52800 - 30 \times \$1100 = \$19800$$

iv) He will not have sufficient funds to repay the balance. However, he could pay \$6000 off the loan to reduce the length of the loan, keeping \$6000 for running costs. etc...

Question 22

$$a) i) A = \frac{120}{360} \pi \times 9^2 = \frac{1}{3} \pi \times 81 = 81\pi$$

\therefore Exact area is $81\pi \text{ m}^2$

$$ii) A = \pi ab = \pi \times 7 \times 2.5 = 17.5\pi \text{ or } \frac{35\pi}{2}$$

\therefore Exact area is $17.5\pi \text{ cm}^2$

$$b) A = \frac{1}{2}bh + 2.598H^2 = \frac{1}{2} \times 2 \times 2 + 2.598 \times (\sqrt{8})^2 = 22.784$$

$$\therefore \text{Total area is } 22.784 \text{ cm}^2$$

Using Pythagoras' Theorem: $H^2 = 2^2 + 2^2$
 $H = \sqrt{8}$

Question 22 continued

(i) $A \approx \frac{1}{3}(d_f + 4d_m + d_c)$

$A \approx \frac{1}{3}(5 + 4 \times 4.6 + 3.7) + \frac{1}{3}(3.7 + 4 \times 2.9 + 0)$
 $= 50.4 \quad (32.52 + 17.88)$

Area of cross-section approx 50.4 cm²

(ii) 5 surfaces = 4 flat + 1 curved

$SA \approx 2 \times 50.4 + 5 \times 200 + 200 \times 14.4$
 ≈ 3980.8

$7480.8 - 3980.8 = 3500$

Curved surface area is approx 3500 cm²

Question 23

a) (i) $(\frac{1}{8})^{-3} = (2^{-3})^{-3}$
 $= 2$ answer only required.

(ii) $(10a^3b^4)^3 = 10^3 a^9 b^{12}$
 $= 1000 a^9 b^{12}$

b) $5(2x-1) - (3-x) = 10x - 5 - 3 + x$
 $= 11x - 8$

c) (i) $14 - 5p = 9 - 2p$
 $14 - 9 = 5p - 2p$
 $3p = 5$
 $p = \frac{5}{3}$
 $= 1\frac{2}{3}$

(ii) $\frac{t+4}{3} - \frac{1-2t}{5} = 2$

$15 \times \frac{t+4}{3} - 15 \times \frac{1-2t}{5} = 15 \times 2$

$5t + 20 - 3 + 6t = 30$

$11t + 17 = 30$

$11t = 30 - 17$

$11t = 13$

$t = \frac{13}{11}$

$= 1\frac{2}{11}$

$d \times 10^2 = 100 \quad 10^3 = 1000$

since $10^n = 631 \therefore 2 < n < 3$

try $n = 2.6 \quad 10^{2.6} = 398.10...$

$n = 2.7 \quad 10^{2.7} = 501.1...$

$10^{2.8} = 630.95...$

$\therefore n \approx 2.8$

Question 24

a) (i) $A = 46 - 28$ or $156 - 138$
 $= 18$

(ii) $\frac{18}{156} \times 100\% = 11.5384... \%$
 $= 11.54\% \quad (2dp)$

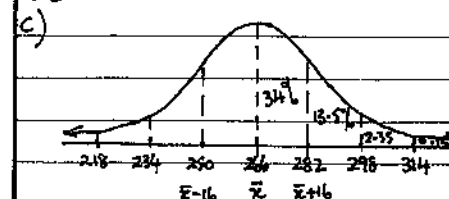
b) (i) median "Bean" = 82 cafe coffee 88

(ii) mean " " = 84.357... 82

std dev. " = 10.820... 9.621...

(iii) support since coffee bean has higher mean
 reject since cafe coffee more consistent due to smaller std. deviation.

Question 24 continued



(i) $(13.5 + 13.5 + 0.15) \%$ = 27%
 or $50\% - 23\% = 27\%$

(ii) $\bar{x} \pm 2 \times 16 = 266 \pm 32$
 i.e. 234 to 298 days

(iii) Yes, it is possible, but the possibility will be less than 0.15%.

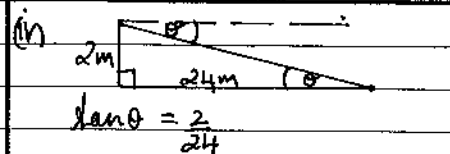
Question 25

a) $\cos \theta = -0.58$
 $\theta = \cos^{-1}(-0.58)$
 $= 125^\circ 27' 1.95''$
 $= 125^\circ 27'$ nearest min

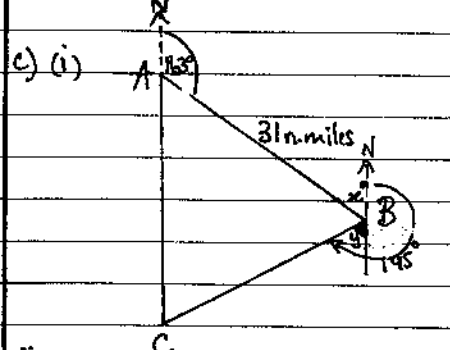
b) (i) 8m : 8m + 16m = 8 : 24
 $= 1 : 3$ enlargement factor is 3

(ii) $h = 3.5 \times 3$
 $= 10.5$

(iii) $\tan \theta = \frac{3.5}{8}$ or $\frac{10.5}{24}$
 $\theta = \tan^{-1}(\frac{3.5}{8})$
 $= 23^\circ 37' 45.76''$
 $= 23^\circ 38'$ nearest min



(iv) $\tan \theta = \frac{2}{24}$
 $\theta = \tan^{-1}(\frac{1}{12})$
 $= 4^\circ 45' 49.11''$
 $= 4^\circ 46'$ nearest min.



(ii) $\angle CAB = 180^\circ - 163^\circ$, straight L
 $= 17^\circ$
 $x = 17$, alternate, || lines
 $y = 195 - 180$
 $= 15$

$\angle ABC = 180^\circ - 17^\circ - 15^\circ$, str. L
 $= 148^\circ$

or $\angle ABC = 360^\circ - 195^\circ - 17^\circ$, complete ref.

(iii) $\frac{AC}{\sin 148^\circ} = \frac{31}{\sin (180 - 17 - 148)^\circ}$

$AC = \frac{31 \sin 148^\circ}{\sin 15^\circ}$
 $= 63.4709...$
 $= 63$ nearest whole no.
 \therefore Lan has travelled approx 63 n. miles with.

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

c) i) $A = M \left\{ \frac{(1+r)^n - 1}{r} \right\}$ $0.09 \div 12 = 0.0075$
 $= 1000 \left\{ \frac{1.0075^{60} - 1}{0.0075} \right\}$
 $= 75424.1369 \dots$
 $= 75424.14$ (2dp)

Investment will amount to \$75424 over 5 years, and will not be enough for the estimated expansion

ii) $N = \frac{A}{(1+r)^n}$ or $A = P(1+r)^n$
 $= \frac{150000}{(1.0075)^{60}}$
 $= 95804.9547 \dots$
 $= 95804.95$ (2dp)

\$95804.95 needs to be invested.

Question 22
 a) i) $A = \frac{120\pi \times 9^2}{360}$
 $= \frac{1}{3}\pi \times 81$
 $= 81\pi$

ii) $A = \pi ab$
 $= \pi \times 7 \times 2.5$
 $= 17.5\pi$ or $\frac{35\pi}{2}$
 \therefore Exact area is 17.5π cm²

b) $A = \frac{1}{2}bh + 2.598H^2$
 $= \frac{1}{2} \times 2 \times 2 + 2.598 \times (\sqrt{8})^2$
 $= 22.784$
 \therefore Total area is 22.784 cm²

Using Pythagoras's theorem: $H^2 = 2^2 + 2^2$
 $H = \sqrt{8}$

Question 21
 $30h + 4 \times 1.5h = 14h$
 Hourly rate = $\$136.50 \div 14$
 $= \$9.75$
 \therefore Annie's hourly rate was \$9.75

b) i) $I = Prn$ or $10 \times 0.08 \times 4$
 $= 40000 \times 0.08 \times 4 \times \frac{1}{12}$
 $= 12800$

ii) Loan + interest = $\$40000 + \12800
 $= \$52800$
 Monthly repayment = $\$52800 \div 48$
 $= \$1100$

iii) From (ii) loan + interest = $\$52800$

Amt owing after 30 months
 $=$ Loan + interest - repayments
 $= \$52800 - 30 \times \1100
 $= \$19800$

iv) He will not have sufficient funds to repay the balance. However, he could pay \$10000 off the loan to reduce the length of the loan, keeping \$6000 for running costs, etc...

Question 22 continued
 i) $A = \frac{1}{3}(d_f + 4d_m + d_c)$

$A = \frac{1}{3}(5 + 4 \times 4 + 6 + 37) + \frac{1}{3}(37 + 4 \times 2 + 9 + 0)$
 $= 50.4$ (32.52 + 17.88)

Area of cross-section approx 50.4 cm²

ii) 5 surfaces = 4 flat + 1 curved
 $SA = 2 \times 50.4 + 5 \times 200 + 200 \times 14 \times 4$
 $= 3980.8$

$7480.8 - 3980.8 = 3500$

Curved surface area is approx 3500 cm²

Question 23
 a) i) $\left(\frac{1}{2}\right)^{-3} = (2^{-3})^{-3}$
 $= 2$ answer only required.

ii) $(10a^3b^4)^3 = 10^3 a^9 b^{12}$
 $= 1000 a^9 b^{12}$

b) $5(2x-1) - (3-x) = 10x - 5 - 3 + x$
 $= 11x - 8$

c) i) $14 - 5p = 9 - 2p$
 $14 - 9 = 5p - 2p$
 $3p = 5$
 $p = \frac{5}{3}$
 $= 1\frac{2}{3}$

ii) $\frac{t+4}{3} - \frac{1-2t}{5} = 2$

$15^5 \times \frac{(t+4)}{3} - 15^3 \times \frac{(1-2t)}{5} = 15 \times 2$

$5t + 20 - 3 + 6t = 30$

$11t + 17 = 30$

$11t = 30 - 17$

$11t = 13$

$t = \frac{13}{11}$

$= 1\frac{2}{11}$

$d^2 \times 10^2 = 100$ $10^3 = 1000$

Since $10^7 = 631 \therefore 2 < n < 3$

ii) try $n = 2.6$ $10^{2.6} = 398.10 \dots$

$n = 2.7$ $10^{2.7} = 501.1 \dots$

$10^{2.8} = 630.95 \dots$

$\therefore n \approx 2.8$

Question 24

a) i) $A = 46 - 28$ or $156 - 138$
 $= 18$

ii) $\frac{18}{156} \times 100\% = 11.5384 \dots \%$
 $= 11.54\%$ (2dp)

b) i) median "Bean" = 82 Cafe coffee 88

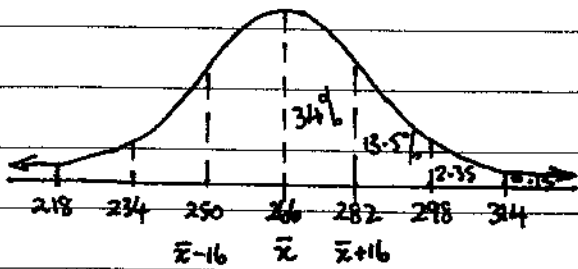
ii) mean " " = 84.357... 82

std dev. " " = 10.820... 9.621...

iii) support since Coffee bean has higher mean
 \therefore reject since Cafe coffee more consistent due to smaller std. deviation.

Question 24 continued

c)



(i) $(13.5 + 2.35 + 0.15) \%$ = 16%
 or $50\% - 34\% = 16\%$

(ii) $\bar{x} \pm 2 \times 16 = 266 \pm 32$
 i.e. 234 to 298 days

(iii) Yes, it is possible, but the possibility will be less than 0.15%.

Question 25

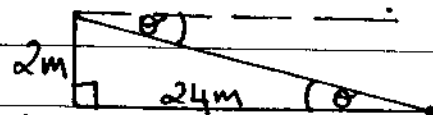
a) $\cos \theta = -0.58$
 $\theta = \cos^{-1}(-0.58)$
 $= 125^\circ 27' 1.95''$
 $= 125^\circ 27'$ nearest min

b) (i) $8m : 8m + 16m = 8 : 24$
 $= 1 : 3$ enlargement factor is 3

(ii) $h = 3.5 \times 3$
 $= 10.5$

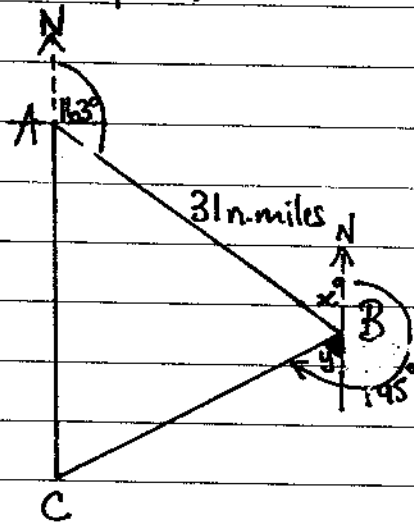
(iii) $\tan \theta = \frac{3.5}{8}$ or $\frac{10.5}{24}$
 $\theta = \tan^{-1}\left(\frac{3.5}{8}\right)$
 $= 23^\circ 37' 45.76''$
 $= 23^\circ 38'$ nearest min

(iv)



$\tan \theta = \frac{2}{24}$
 $\theta = \tan^{-1}\left(\frac{1}{12}\right)$
 $= 4^\circ 45' 49.11''$
 $= 4^\circ 46'$ nearest min.

c) (i)



(ii)

$\angle CAB = 180^\circ - 163^\circ$, straight L
 $= 17^\circ$
 $x = 17$, alternate, || lines
 $y = 195 - 180$
 $= 15$
 $\angle ABC = 180^\circ - 17^\circ - 15^\circ$, str. L
 $= 148^\circ$
 or $\angle ABC = 360^\circ - 195^\circ - 17^\circ$, complete ref.

(iii) $\frac{AC}{\sin 148^\circ} = \frac{31}{\sin (180 - 17 - 148)^\circ}$
 $AC = \frac{31 \sin 148^\circ}{\sin 15^\circ}$

$= 63.4709...$
 $= 63$ nearest whole no.
 \therefore Lan has travelled approx 63 n.miles SWth.