ABBOTSLEIGH

AUGUST 2004

YEAR 12
ASSESSMENT 4
TRIAL HIGHER SCHOOL CERTIFICATE
EXAMINATION

General Mathematics

General Instructions

- Reading time – 5 minutes.
- Working time – 2½ hours.
- Write using blue or black pen.
- Calculators may be used.
- A Formulae Sheet is provided with this paper.

Total marks – 100

Section I
22 marks
- Attempt Questions 1-22.
- Allow about 30 minutes for this section.
- Give your answers on the multiple choice answer sheet.

Section II
78 marks
- Attempt Questions 23-28.
- Allow about 2 hours for this section.

SECTION I

22 marks
Attempt Questions 1-22
Allow about 30 minutes for this section.

Use the multiple-choice answer sheet.

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

Sample 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9

A ○ B ● C ○ D ○

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

A ● B ⊗ C ○ D ○

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

correct ↙

A ⊗ B ⊗ C ○ D ○

1 Which one of these is an example of <u>discrete</u> data?

(A) The capacity of Warragamba Dam.
(B) The number of goals scored by a netball team in a year.
(C) The times taken to swim 100m at the Olympic Games.
(D) The temperature during today.

2 The expression $3a^2b - 5a^2b$ is equivalent to

(A) -2 (B) $2a^0b^0$ (C) $2a^2b$ (D) $-2a^2b$

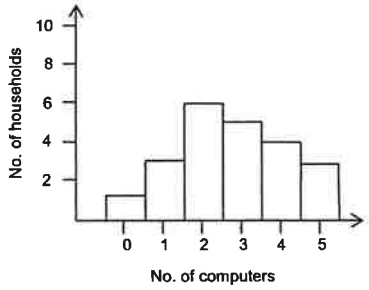
3 A cylindrical container has a base of diameter 2 m and a length of 10 m.

Correct to the nearest m^3, what is the volume of the container?

(A) 10 m^3 (B) 31 m^3 (C) 42 m^3 (D) 126 m^3

4 This frequency histogram shows the results of a survey of the number of computers in a household.

How many households were surveyed?



(A) 6 (B) 15 (C) 21 (D) 22

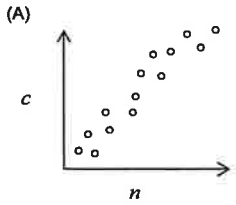
5 Solve $2(3x-4)=16$

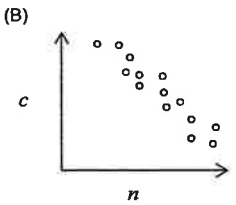
(A) $x=\frac{4}{3}$ (B) $x=\frac{10}{3}$ (C) $x=4$ (D) $x=18$

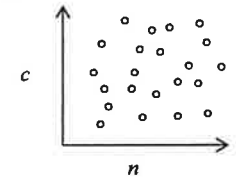
6 In a particular Year 12 assessment task, the mean was recorded as 62.5% with a standard deviation of 9%. A student's z-score on this task was 2.5. The student's mark on the assessment task was

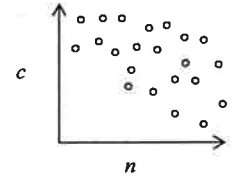
(A) 56% (B) 60% (C) 74% (D) 85%

7 It is found that there is a positive correlation between the number of hours spent working in the sun (n) and the incidence of skin cancer (c). Which of the following graphs best represents this information?

(A)


(B)


(C)


(D)


8 Seventy tagged fish were released into a lake as part of an attempt to estimate the number of fish in the lake. Three weeks later forty fish were netted, of which eight were tagged. Which is the best estimate for the fish population of the lake?

(A) 320 (B) 560 (C) 350 (D) 2800

9 Nine people were on standby at London airport waiting for a flight to Paris. Three standby seats became available. How many groups of three people could be chosen to fill these three seats?

(A) 84 (B) 504 (C) 729 (D) 9

10 Rebecca has shares with a current market value of \$7.35 each. She has received a cheque for the total dividend of \$512. If she owns 450 of these shares, calculate her current dividend yield on these shares.

(A) 0.15% (B) 6.46% (C) 8.36% (D) 15.48%

11 A doctor prescribes 4 mg of morphine to relieve a patient's pain. The available solution of this drug contains 10 mg/mL. How many mL of this solution should be given to the patient?

(A) 40 mL (B) 2.5 mL (C) 0.4 mL (D) 4 mL

12 Use the formula $s = ut + \frac{1}{2}at^2$ to find s if $u = 5, t = 10$ and $a = 4$.

(A) 250 (B) 210 (C) 410 (D) 810

13 Workers at a factory were surveyed to find the number of hours they worked last week and the results are given in the table.

Number of Hours Worked	Cumulative Frequency
39	20
40	24
41	30
42	32
43	40
44	50

According to the information in the table, which of the following statements is incorrect?

(A) The mode number of hours worked is 39.
(B) The median number of hours worked is 41.
(C) 30 workers surveyed worked 41 hours last week.
(D) 20% of the workers surveyed worked 44 hours last week.

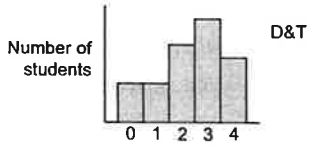
14 At a tropical holiday resort, the probability of rain on any day is 0.8. The probability that it will rain on a particular weekend is

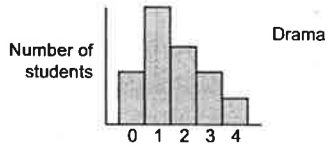
(A) 0.16 (B) 0.64 (C) 0.96 (D) 1.6

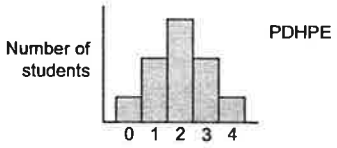
15 Making x the subject of the formula $S = 2a^3 - 4ax$ gives the equation

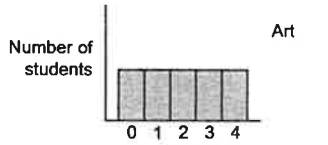
(A) $x = \frac{S - 2a^3}{4a}$ (B) $x = \frac{2a^2 - S}{4}$ (C) $x = \frac{S - 2a^2}{4}$ (D) $x = \frac{2a^3 - S}{4a}$

16 Thirty students sat for tests in four different subjects. Each test was marked out of four. The histogram of the results for each subject is shown below. Which of the results is negatively skewed?

(A)


(B)


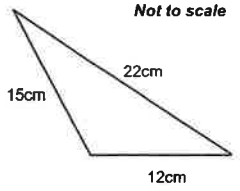
(C)


(D)


17 The 5 member committee of a club to which Sue belongs has decided to have its photograph taken seated in a row. Sue is a member of the committee. What is the probability that, in the photograph, Sue will be sitting at either end?

(A) $\frac{1}{5}$ (B) $\frac{2}{5}$ (C) $\frac{1}{2}$ (D) $\frac{1}{4}$

18 The size of the smallest angle, α, in this triangle can be found by using



(A) $\sin\alpha = 12^2 + 15^2 - 22$

(B) $\cos\alpha = \frac{15^2 + 12^2 - 22^2}{2 \times 15 \times 12}$

(C) $\cos\alpha = \frac{15^2 + 22^2 - 12^2}{2 \times 15 \times 22}$

(D) $\sin\alpha = 0.5 \times 15 \times 2 - 12$

19 In a study of 2000 calls to insurance companies, it is found that it takes an average of 4 minutes 20 seconds for an operator to answer the phone. If the standard deviation was 40 seconds, for how many calls did the telephone operators take more than 5 minutes 40 seconds to answer the phone?

(A) 100 (B) 50 (C) 6 (D) 3

20 At the end of the 2003/2004 financial year, Catherine's total income was $78 000. If she was required to pay a total of $18 945 in taxation for the 2003/2004 financial year, what amount (to the nearest dollar) did Catherine claim in tax deductions?

Taxable Income	Tax Payable
$0 - $6 000	Nil
$6 001 - $21 600	Nil plus 17¢ for each dollar over $6 000
$21 601 - $58 000	$2652 plus 30¢ for each dollar over $21 600
$58 001 - $70 000	$13 572 plus 42¢ for each dollar over $58 000
$70 001 and over	$18 612 plus 47¢ for each dollar over $70 000

(A) $333 (B) $709 (C) $3427 (D) $7291

21 Marsha wants to enlarge her original document by 120% but accidentally keys in a factor of 160% on the photocopier. What factor should she now key in to reduce this copy to 120% of the original?

(A) 33% (B) 40% (C) 75% (D) 133%

22 Frank has a credit card with an interest rate of 0.045% per day and no interest-free period. Frank used the credit card to pay for car repairs costing $575. He paid the credit card account 15 days later. What is the total amount (including interest) that he paid for the repairs?

(A) $578.88 (B) $388.13 (C) $963.13 (D) $575.26

END OF SECTION I

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) Angela bought a computer set-up valued at $3495, using the deferred payment method. There was no deposit, nothing to pay for 6 months, then 18 monthly payments of $235.

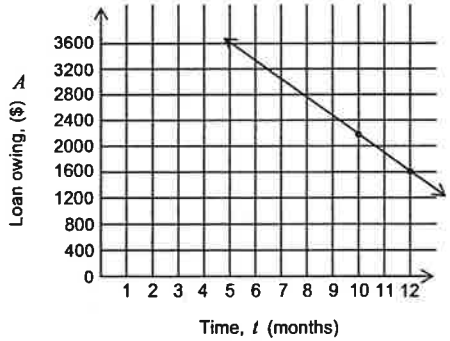
Calculate

(i) the total cost of the computer set-up. **1**

(ii) the interest charged. **1**

(iii) the equivalent flat rate of interest per annum. **1**

(b) This graph shows the amount of a loan, A, decreasing over time as it is paid off monthly, where t represents the number of months.



(i) Complete the axes of the graph on the enlarged graph drawn on the separate page provided with this paper and extend the line to cut each axis. **1**

(ii) After how many months is the loan repaid? Answer to the nearest month. **1**

(iii) What is the vertical intercept (to the nearest hundred) and what does it represent? **2**

(iv) Write down the equation of the loan owing, A, as a function of time, t. **1**

(v) Find from your graph the amount still owing after 15 months (to the nearest hundred). **1**

Question 23 continues on the next page

Question 23 (continued) **Marks**

(c) Carolyn goes to the Norgen-Vaaz ice cream shop and wants to buy a double-decker cone with 2 different flavours. She has three favourite flavours which she always chooses: Chocolate, Honeycomb and Mango.

(i) Draw a tree diagram to show how many different double-decker cones are possible and list the outcomes. **2**

(ii) How many of the cones will have Mango on top? **1**

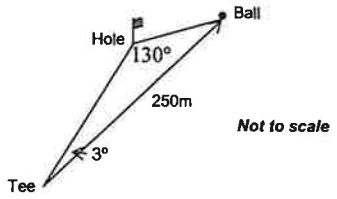
(iii) What is the probability that Carolyn's double-decker cone will be a combination of Mango and Chocolate? **1**

End of Question 23

Question 24 (13 marks) Use a separate writing booklet. **Marks**

(a) A golfer drives the ball 250 m from the tee at an angle 3° off-centre to the line of the hole. The angle at the hole as shown is 130°. The diagram below represents what has happened.

How far from the hole has the ball landed? Answer to the nearest metre. **3**



Not to scale

(b) A tractor is purchased for $340 000. For taxation purposes its depreciation each year is 9% of its purchase price. Using the straight line depreciation method calculate the salvage value of the tractor after 4 years. **2**

(c) Last week, without telling his mother, Greg put his dark blue T-shirt into the washing machine with the sheets and towels. Everything was completely stained with blue dye. His mother has found a product which guarantees to remove 34% of a stain with each wash.

(i) Show that the percentage of the stain which would remain after a number of washes is given by $A = 100(0.66)^w$ where w is the number of washes. **1**

(ii) What percentage of the original stain will remain after 5 washes? Answer correct to 1 decimal place. **1**

(iii) What is the least number of washes required so that less than 5% of the original stain remains? Justify your answer. **2**

Question 24 continues on the next page

Question 24 (continued) **Marks**

(d) The following Home Loan Table shows how the repayments of a home loan progress. The loan is $290 000 to be repaid over 25 years in equal monthly repayments with interest fixed at 7.8% per annum calculated monthly. The monthly repayments are $2200.

Amount of Loan - $290 000			**Interest = rate/12 x principal**	
Annual interest rate = 7.8%				
Monthly repayment (R) = $2200				
N	*Principal (P)*	*Interest (I)*	*P + I*	*P + I – R*
1	$290 000.00	$1885.00	$291 885.00	$289 685.00
2	$289 685.00	$1882.95	**A**	$289 367.95
3	$289 367.95	$1880.89	$291 248.84	$289 048.84
4	$289 048.84	**B**	$290 927.66	$288 727.66
5	$288 727.66	$1876.73	$290 604.39	$288 404.39
6	$288 404.39	$1874.63	$290 279.02	$288 079.02

(i) Calculate the missing amounts marked **A** and **B**. **2**

(ii) What is the total amount that has been repaid at the end of six months? **1**

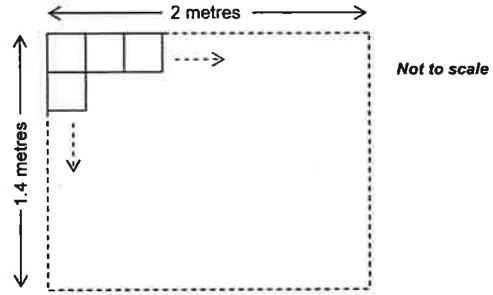
(iii) How much has been paid off the loan at the end of six months? **1**

End of Question 24

Question 25 (13 marks) Use a separate writing booklet. **Marks**

(a) As their Service activity, Year 9 girls decide to knit 10 cm squares to be made into rugs for their local children's hospital.

It is planned to make each rug to measure 2 m by 1.4 m, as shown in the diagram, so that it fits a hospital bed.



(i) How many squares will be required to make 20 complete rugs? **3**

(ii) Alison suggests that if they double the size of the squares by making 20 cm squares instead of 10 cm squares, that they will only need to make half as many squares and still be able to make the same number of rugs.

Do you agree with her? Justify your answer. **2**

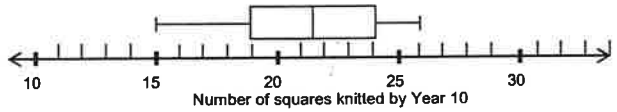
(iii) The numbers of squares knitted per week by Year 9 are shown below.

Year 9	17	25	23	14	18	24	19	28	24	20

(1) Find the five number summary for the number of squares knitted per week by Year 9. **2**

(2) Construct a box and whisker plot for the number of squares knitted per week by Year 9. **2**

(3) Year 10 classes were also knitting squares. The box and whisker plot below shows the five number summary for the number of squares knitted per week by Year 10.

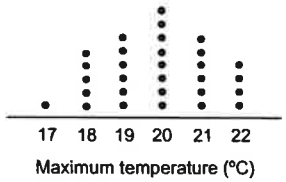


Use your answers to (1) and (2) to compare briefly the performances of Years 9 and 10. **1**

Question 25 continues on the next page

Question 25 (continued) **Marks**

(b) The maximum temperature in Wanganella for each day in April is illustrated in the dot plot.



(i) Describe the shape of this distribution. **1**

(ii) Write down the range of maximum temperatures in Wanganella for April. **1**

(iii) Calculate the mean maximum temperature in Wanganella for April correct to 1 decimal place. **1**

End of Question 25

Question 26 (13 marks) Use a separate writing booklet. **Marks**

(a) Recently, after travelling for 7 years after its launch from Earth, the space probe, Cassini-Huygens passed through the rings which surround the planet Saturn.

(i) The distance travelled by Cassini-Huygens was 1.2774×10^{9} km and the space vehicle travelled at a constant speed.

Calculate, in km/h, the average speed of Cassini-Huygens on its journey. **2**

(ii) There are hundreds of circular rings around Saturn, composed of billions of ice and rock particles. The inner and outer rings of Saturn are 67 000 km and 140 200 km respectively from its surface and Saturn's diameter is 1.2×10^{6} km.

(1) A diagram which represents a bird's eye view of Saturn and its rings is shown on a separate page of this paper. Mark the above measurements on that page. Show clearly what each measurement represents. **2**

(2) Calculate the area occupied by the material comprising the rings of Saturn. **3**

(b) The table below shows the approximate location for several places.

City	Latitude	Longitude
Townsville (Australia)	19°S	147°E
Hobart (Australia)	43°S	147°E
Sydney (Australia)	35°S	150°E
London (UK)	50°N	0°

(i) Kate leaves Sydney at 5.00pm on Monday, to fly to London, a trip lasting 22 hours. What is the day and time in London when Kate arrives? **3**

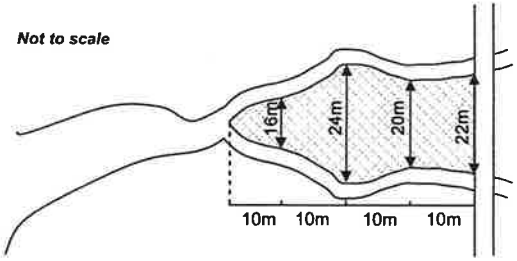
(ii) What is the angular distance between Hobart and Townsville? **1**

(iii) Using the radius of the Earth as 6400 km, calculate the shortest distance between Hobart and Townsville. **2**

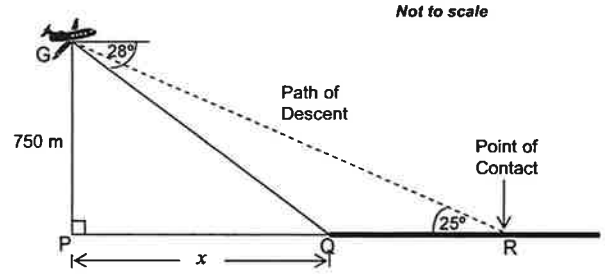
End of Question 26

Question 27 (13 marks) Use a separate writing booklet. **Marks**

(a) Use Simpson's Rule to calculate the approximate area of this field (shown shaded) which is located between the two branches of a river and a road. Answer to the nearest square metre. **3**



(b) A glider, G, is coming in to land at an airstrip. When the glider is at an altitude of 750 metres, the angle of depression from the glider to the start of the airstrip, Q, is 28°. The glider's path of descent is along a straight line which makes an angle of 25° with the horizontal.



(i) Show that the horizontal distance, PQ, of the glider from the start of the airstrip, is given by $x = \dfrac{750}{\tan 28°}$ and find x. **2**

(ii) How far from the start of the airstrip does the glider touch the ground? **3**

Question 27 continues on the next page

Question 27 (continued) **Marks**

(c) In an assessment task Annette's results were as follows:

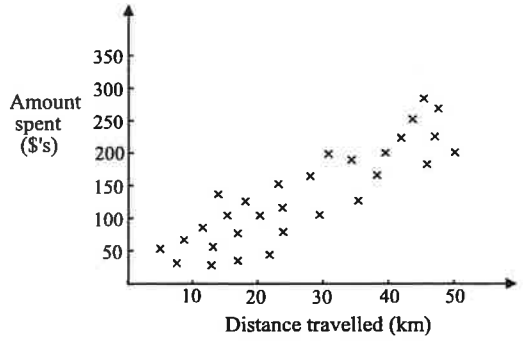
Subject	Annette's Mark	Course Average	Course Standard Deviation
English	62	70	12
Ancient History	62	70	16

(i) Express Annette's English mark as a z-score. **1**

(ii) Annette claims that statistically her Ancient History result is better than her English result. Briefly explain why her claim is correct. **2**

(d) In a survey of shoppers at the Bathurst shopping centre, they were asked the distance they had travelled from home to reach the centre and the amount they had spent at the centre.

The results are displayed on the scatter graph below.



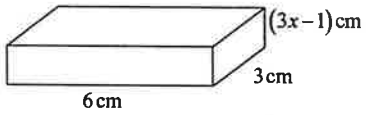
(i) Describe the correlation between the distance travelled by shoppers and the amount they spent. **1**

(ii) Briefly comment on the validity of the statement "the distance travelled by shoppers to reach Bathurst caused them to spend more at the shopping centre." **1**

End of Question 27

Question 28 (13 marks) Use a separate writing booklet. **Marks**

(a) A mini violet crumble bar is made in the shape of a rectangular prism $6\,\text{cm}$ long, $3\,\text{cm}$ wide and $(3x-1)\,\text{cm}$ high.



Not to scale

The volume of this bar is $36\,\text{cm}^3$.

(i) Find the value of x. **3**

(ii) The mini violet crumble bars are to be packed in a party pack in the shape of a rectangular prism with dimensions $15\,\text{cm} \times 6\,\text{cm} \times 10\,\text{cm}$.

What is the volume of the party pack? **1**

(iii) Toby said that the party pack would hold 28 mini violet crumble bars. Is Toby correct? Give a reason for your answer. **2**

(b) A survey of 500 people was conducted at last year's World Cup Final. They were asked two questions:

- Do you support Australia or England?
- Do you live in Australia or overseas?

The responses were recorded in this table.

	Live in Australia	Live overseas	Total
Support Australia	275	97	372
Support England	43	85	128
Total	318	182	500

(i) If one of those surveyed were chosen at random, what is the probability that they support Australia? **1**

(ii) Of those surveyed who support England, what percentage live overseas? Give your answer correct to 1 decimal place. **2**

Question 28 continues on the next page

Question 28 (continued) **Marks**

(c) In a game of dice, two dice are rolled together and the score is found by adding the numbers on each die. The table below shows the possible scores in any one game.

		1st Die					
		1	2	3	4	5	6
2nd Die	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

In this game you win if you score 2, 4 or 11, you lose if you score 7 or 12 and you get to roll again if you score any other number.

(i) What is the probability of winning the game with one roll of the dice? **1**

(ii) What is the probability that there is a result in the game after one roll of the dice? **1**

(iii) Do you think this is a fair game to play? Explain your answer. **2**

END OF PAPER

Graph for Question 23 (b) (i) **Candidate Number _____**

Attach inside your Question 23 Answer booklet

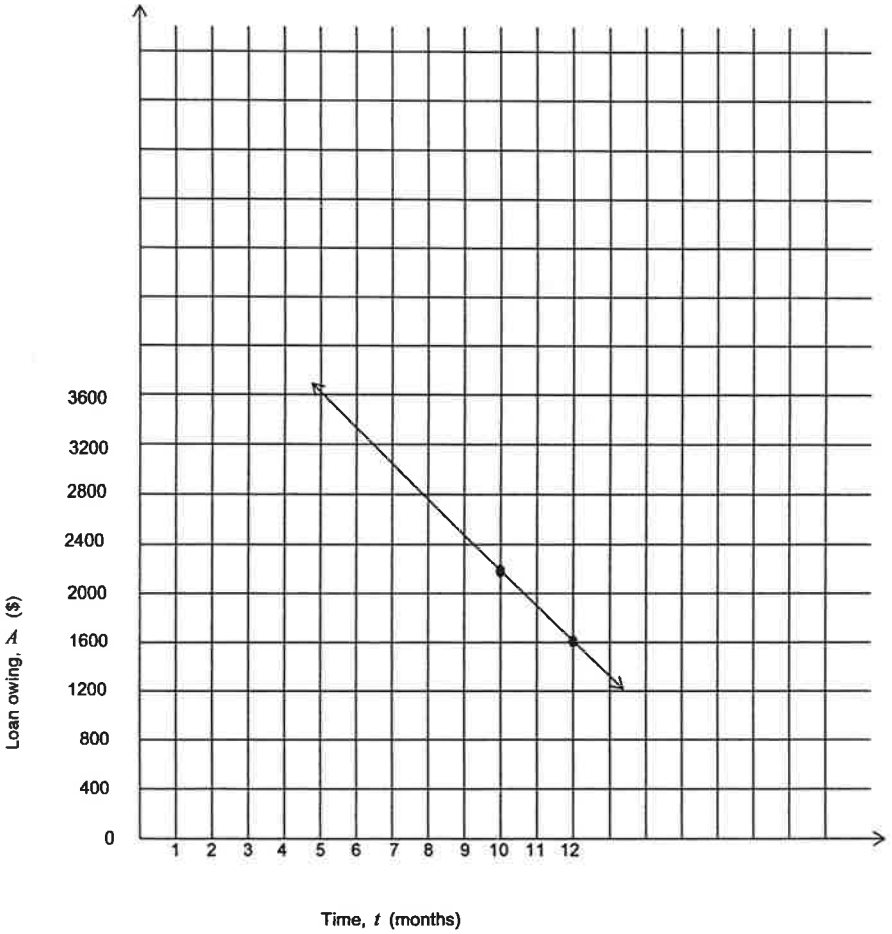
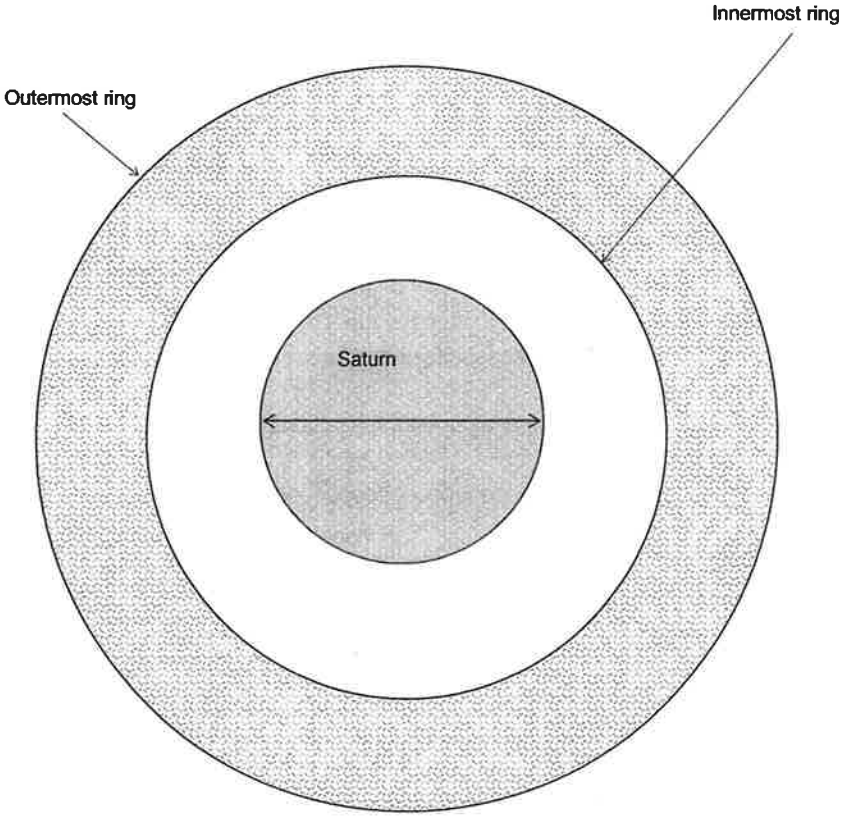


Diagram for Question 26 (a) (ii) (1) **Candidate Number _____**

Attach inside your Question 26 Answer booklet

Not to scale



Abbotsleigh General Maths Trial HSC 2004

SECTION I
Multiple Choice

1. B
2. D
3. B $\pi \times 1^2 \times 10 = V$
4. D
5. C
6. D $2.5 = \frac{x-62.5}{9}$
7. A
8. C $\frac{x}{70} = \frac{40}{8}$
9. A ${}^9C_3$
10. D $\frac{512}{7.35 \times 450} \times 100\%$
11. C $\frac{1}{10} = \frac{x}{4}$
12. A
13. C
14. B 0.8×0.8
15. D
16. A
17. B
18. C
19. B
20. D
21. C $160x = 120$
22. C

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23. (a)(i) $18 \times 235 = \$4230$

(ii) $4230 - 3495 = \$735$

(iii) $\frac{1}{2} \times 735 = \$367.50$ per year

$\frac{367.50}{3495} \times 100\% = 10.5\%$ p.a.

(b)(i) see graph

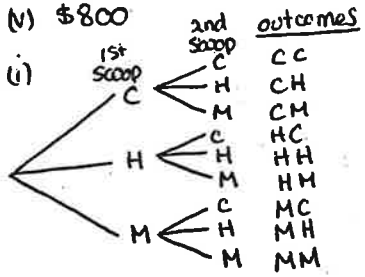
(ii) 17 or 18

(iii) \$5000, it represents the initial amount borrowed.

(iv) $A = -300t + 5000$

(v) \$800

(c)(i)



(ii) 2

(iii) $\frac{2}{6} = \frac{1}{3}$

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24. (a) $\frac{x}{\sin 3} = \frac{250}{\sin 130}$

$x = \frac{250 \sin 3}{\sin 130}$

$x = 17.07 \therefore x = 17m$

(b) $S = 340\,000 - \left(340\,000 \times \frac{9}{100} \times 4\right)$

$= 340\,000 - 122400$

$= \$217600$

(c)(i) Initially $A = 100$ (100% stained)

after 1 wash $A = 100 \times 0.66$

after 2 washes $A = 100 \times 0.66 \times 0.66$

after w washes $A = 100 \times 0.66^w$

(ii) $A = 100 \times 0.66^5 = 12.52\%$

(iii) $5 = 100 \times 0.66^w$

when $w = 7$ $A = 0.054$ → not enough!

when $w = 8$ $A = 0.036$ ∴ 8 washes.

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24. (continued)

(d)(i) $A = 289\,685 + 1882.95$

$= \$291\,567.95$

$B = 289\,048.84 \times \frac{7.8 \div 12}{100}$

$= \$1878.82$

(ii) $2200 \times 6 = \$13200$

(iii) $290\,000 - 288\,079.02$

$= \$1920.98$

25(a)(i) Area of each rug $= 2 \times 1.4 = 2.8m^2$

Area of each square $= (0.1)^2 = 0.01m^2$

20 rugs $= 20 \times 2.8 = 56m^2$

no of squares $= 56 \div 0.01 = 5600$

(ii) Area of each square $= (0.2)^2$

$= 0.04m^2$

no of squares $= 56 \div 0.04 = 1400$

∴ No, only need to make $\frac{1}{4}$ as many

(iii)(1) min = 14

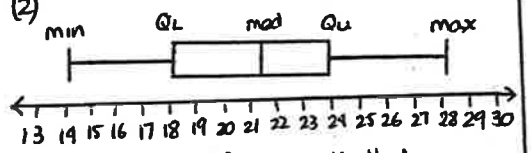
max = 28

median = $21\frac{1}{2}$

$Q_U = 24$

$Q_L = 18$

(2)



Number of Squares Knitted Per Week by Year 9

(3) same median number, similar IQR but a larger range of the number of squares knitted by year 9.

(b)(i) normally distributed

(ii) 22°C − 17°C = 5°C

(iii) $\bar{x} = \frac{595}{30} = 19.8°C$

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26. (a)(i) $S = \frac{1.2774 \times 10^9}{(7 \times 365\frac{1}{4} \times 24)} = 20817 km/h$

(ii)(1) see diagram

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

$= \pi\left[(600000 + 190200)^2 - (600000 + 67000)^2\right]$

$= 3.24 \times 10^{11} km^2$

(b)(i) $150 \div 15 = 10hrs$

7am Sydney Monday + 22hrs = 5am London Tuesday

(ii) 43°S − 19°S = 24°

(iii) $\frac{24}{360} \times 2 \times \pi \times 6400$

$= 2680.8 km$.

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27. (a) $A = \frac{10}{3}(0 + 16 \times 4 + 24) + \frac{10}{3}(24 + 4 \times 20 + 22)$

$A = 713\frac{1}{3}m^2$

(b)(i) $\tan 28° = \frac{750}{x}$

$x \tan 28° = 750$

$x = \frac{750}{\tan 28°}$

$x = 1410.5m$

(ii) $\tan 25° = \frac{750}{PR}$

$PR = \frac{750}{\tan 25°}$

$PR = 1608.4$

$\therefore QR = PR - x$

$= 197.8m$ from the start of airstrip

(c)(i) $z = \frac{62-70}{12} = -\frac{2}{3}$

(ii) $z_{AH} = \frac{62-70}{16} = -\frac{1}{2}$

Ancient History is less below average than E ∴ it is better.

27. (d)(i) weak positive

(ii) partially valid...
not wasting trip
∴ stock up on things like groceries.

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28. (a)(i) $18(3x-1) = 36$

$\div 18 \quad \div 18$

$3x-1 = 2$

$+1 \quad +1$

$3x = 3$

$\div 3 \quad \div 3$

$x = 1$

(ii) $15 \times 6 \times 10 = 900\text{cm}^3$

(iii) Toby is incorrect it only holds $\frac{900}{36} = 25$!

(b)(i) $\frac{372}{500} = \frac{93}{125}$

(ii) $\frac{85}{128} \times 100\% = 66\frac{13}{32}\%$

$= 66.4\%$ (1 d.p)

(c)(i) $\frac{6}{36} = \frac{1}{6}$

(ii) $\frac{13}{36}$

(iii) $\frac{7}{36}$ loose and $\frac{5}{36}$ win

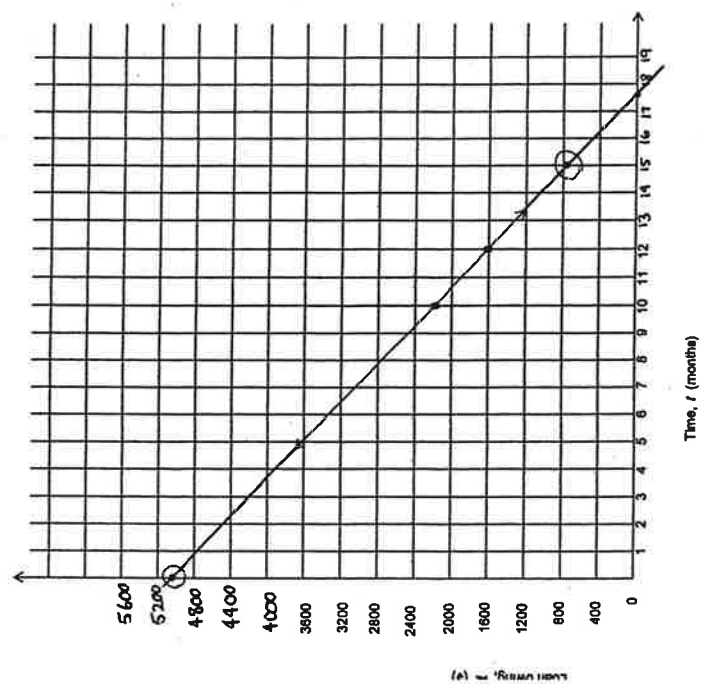
∴ No! greater chance of losing.

END OF EXAM

Candidate Number Solution

Graph for Question 23 (b) (i)

Attach inside your Question 23 Answer booklet



Candidate Number Solution

Diagram for Question 26 (a) (ii) (1)

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