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Centre Number

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Student Number



CATHOLIC SECONDARY SCHOOLS  
ASSOCIATION OF NEW SOUTH WALES

**2001**  
**TRIAL HIGHER SCHOOL CERTIFICATE**  
**EXAMINATION**

# General Mathematics

Morning Session  
Wednesday 8 August 2001

**\* General Instructions**

- Reading time – 5 minutes
- Working time – 2½ hours
- Write using blue or black pen
- Calculators may be used
- Use Multiple Choice Answer Sheet provided
- A separate Formula Sheet is provided

**Section I** Pages 3 – 9

- Total marks (22)
- Attempt Questions 1 – 22
  - Allow about 30 minutes for this section

**Section II** Pages 11 – 24

- Total marks (78)
- Attempt ONE question from Questions 23 – 28
  - Allow about 2 hours for this section

**Disclaimer**

Every effort has been made to prepare these 'Trial' Higher School Certificate Examinations in accordance with the Board of Studies documents, *Principles for Setting HSC Examinations in a Standards-Referenced Framework* (BOS Bulletin, Vol 8, No 9, Nov/Dec 1999), and *Principles for Developing Marking Guidelines Examinations in a Standards Referenced Framework* (BOS Bulletin, Vol 9, No 3, May 2000). No guarantee or warranty is made or implied that the 'Trial' Examination papers mirror in every respect the actual HSC Examination question paper in any or all courses to be examined. These papers do not constitute 'advice' nor can they be construed as authoritative interpretations of Board of Studies intentions. The CSSA accepts no liability for any reliance use or purpose related to these 'Trial' question papers. Advice on HSC examination issues is only to be obtained from the NSW Board of Studies.

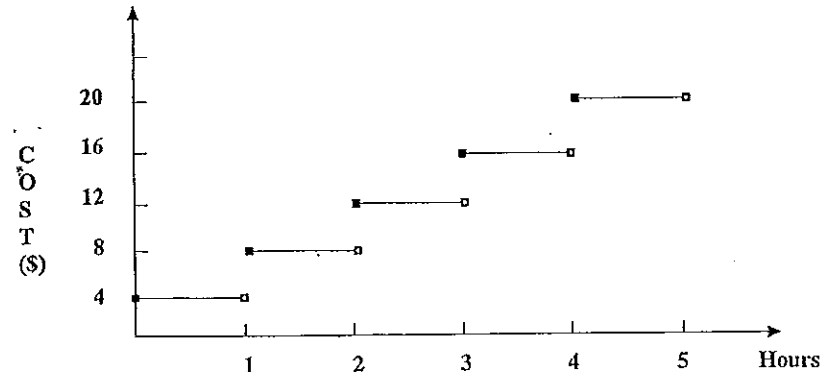
**Section I**

Total marks (22)  
Attempt Questions 1–22  
Allow about 30 minutes for this section

Use the Multiple Choice Answer Sheet provided

- 1 Use the formula  $C = \frac{5}{9}(F - 32)$  to find the value of C (correct to one decimal place) if  $F = 110$ .
- (A) 29.1  
(B) 43.3  
(C) 57.6  
(D) 92.2

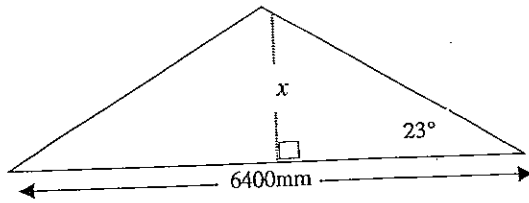
- 2 The graph shows parking at Cinema Parking Station is charged at \$4 per hour, or part thereof, with a maximum of \$ 20 per day.



Lynne parks for 3 ½ hours. Her parking costs will be:

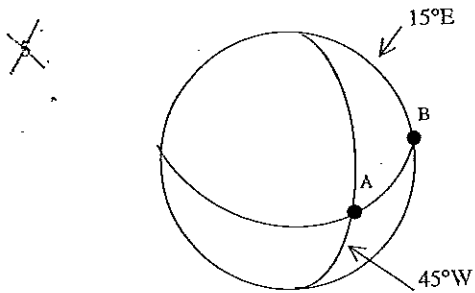
- (A) \$4  
(B) \$12  
(C) \$16  
(D) \$20

- 3 The pitch of the roof drawn is  $23^\circ$  and the distance between the eaves is 6400mm.



The height of the roof,  $x$ , above the ceiling is closest to:

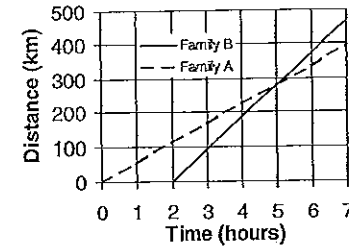
- (A) 1 358 mm  
 (B) 2 717mm  
 (C) 2 946mm  
 (D) 7 539mm
- 4 Which of the following is an example of discrete data?
- (A) the height of Year 9 students  
 (B) the colour of hair of the students of a Year 12 Maths class  
 (C) the time taken to complete an assignment  
 (D) the number of cars stolen each year



At B it is 10 am. The time at A is:

- (A) 6 am  
 (B) 8 am  
 (C) Midday  
 (D) 2 pm

- 6 Two families are travelling on holidays. Family B leaves two hours later than Family A travelling at a faster speed.



How soon after Family B's departure will they meet Family A?

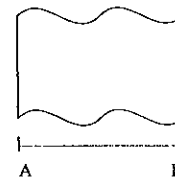
- (A) 2 hours  
 (B) 3 hours  
 (C) 5 hours  
 (D) 7 hours

~~The fishing authorities are concerned about the number of fish in a certain lake. To investigate this they use the "capture-recapture" method. They capture 70 fish, tag them and release them. The following day they return and take a sample of 20 fish from the lake, noting that 3 of these are tagged.~~

Estimate the number of fish in the lake.

- (A) 93  
 (B) 210  
 (C) 467  
 (D) 4 200

- 8 The diagram shows a design which has been drawn using a scale of 5:2.



Find the length, AB, of the actual design.

- (A) 1.2 cm  
 (B) 2 cm  
 (C) 3.3 cm  
 (D) 7.5 cm

- 9 Three cards are labelled with the digits 4, 6 and 9. A two-digit number is formed. The probability of forming an even number can best be described as:

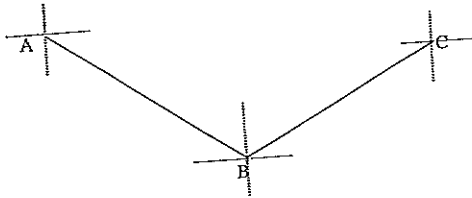
- (A) unlikely
- (B) even chance
- (C) very likely
- (D) almost certain

- 10 A label needs to be made to cover the curved surface of a cylinder (with no overlap). The cylinder has a radius of 5 cm and a height of 12 cm.

The area of the label is closest to:

- (A) 377 cm<sup>2</sup>
- (B) 456 cm<sup>2</sup>
- (C) 534 cm<sup>2</sup>
- (D) 942 cm<sup>2</sup>

11



Julie walks on a bearing of 157° from A to B and then on a bearing of 038° to C.

What is the bearing of B from C?

- (A) 038°
- (B) 195°
- (C) 218°
- (D) 232°

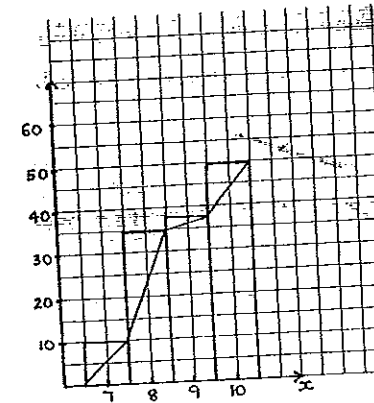
- 12 Which of the following would you expect to have a high positive correlation?

- (A) the number of builders and the time taken to build a house
- (B) weather and shoe size
- (C) hand span and shoe size
- (D) cloud cover and rainfall

- 13 Simplify  $3(2x-4) - 2(1-4x)$

- (A) -14
- (B)  $-2x-14$
- (C)  $2x-6$
- (D)  $14x-14$

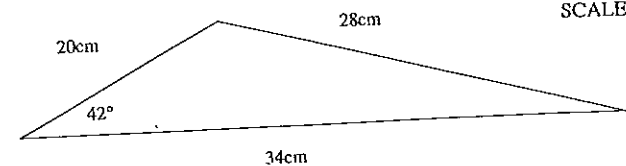
- 14 For the distribution shown in the cumulative frequency histogram and polygon, the median is:



- (A) 7.5
- (B) 8
- (C) 8.5
- (D) 9

- 15 The area of the triangle drawn is given by:

- (A)  $\frac{1}{2} \times 34 \times 28$
- (B)  $\frac{1}{2} \times 34 \times 28 \times \sin 42^\circ$
- (C)  $\frac{1}{2} \times 20 \times 28 \times \sin 42^\circ$
- (D)  $\frac{1}{2} \times 20 \times 34 \times \sin 42^\circ$



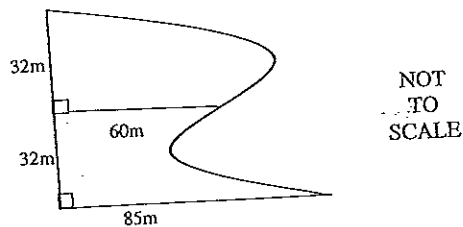
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- 16 Rodney wishes to buy a large stainless steel barbecue priced at \$ 1450. He chooses to buy it on terms by paying a 15% deposit and borrowing the balance. Interest is charged at 9.5% p.a. on the amount borrowed. Rodney makes fortnightly repayments over 2 years.

Calculate his fortnightly repayments.

- (A) \$ 25.95  
 (B) \$ 28.21  
 (C) \$ 33.18  
 (D) \$ 51.91

17



Use Simpson's Rule to find the area of this field to the nearest square metre.

- (A) 1 547  
 (B) 3 467  
 (C) 4 267  
 (D) 6 933

- 18 In a particular friendship group there are 5 boys and 3 girls. From this group, the teacher chooses one boy and one girl to demonstrate a dance.

What is the probability that Barbara and Rod will be demonstrating?

- (A)  $\frac{8}{15}$   
 (B)  $\frac{2}{8}$   
 (C)  $\frac{1}{8}$   
 (D)  $\frac{1}{15}$

- 19 A set of scores with a normal distribution has a mean of 55 and a standard deviation of 12.

What percentage of the scores lies above 79?

- (A) 16%  
 (B) 5%  
 (C) 2.5%  
 (D) 1%

- 20 From a gelato bar offering 8 flavours, Mario chooses 2 flavours in a cup.

How many different possible choices could he make?

- (A) 56  
 (B) 28  
 (C) 16  
 (D) 2

- 21 Kwon buys a packet of cashews weighing 375 grams measured correct to the nearest 5 grams.

Calculate the percentage error in this measurement, correct to the nearest 0.1%.

- (A) 0.7  
 (B) 1.3  
 (C) 2.5  
 (D) 5.0

- 22 If it takes 12 students 50 minutes to inflate 200 helium balloons, how long will it take 7 students working at the same rate (to the nearest minute)?

- (A) 2  
 (B) 28  
 (C) 86  
 (D) 117

**Section II**

Total marks (78)

Attempt Questions 23 – 28

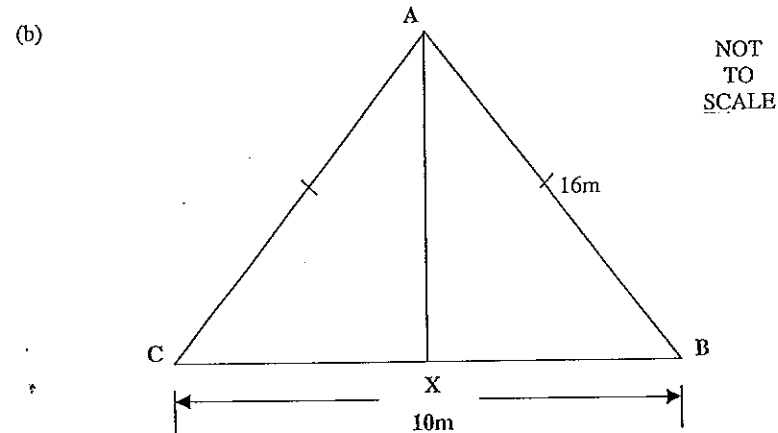
Allow about 2 hours for this section

Answer each question in a SEPARATE writing booklet.

**Question 23 (13 marks)**

**Marks**

- (a) A tap drips 3mL per 10 seconds. Calculate the number of millilitres lost in one hour 1



If triangle ABC is an isosceles triangle, calculate the perpendicular height AX, correct to 3 significant figures. 2

- (c) The semi-major axis of an ellipse is  $8.9 \times 10^5$  m long and its area is  $1.026 \times 10^9$  m<sup>2</sup>. Calculate the length of the minor axis of this ellipse. Give your answer correct to 2 significant figures in standard form. 2

Question 23 continues on page 12

**Question 23 (continued)**

**Marks**

- (d) Five contestants Sonia, Julie, Lynne, Miguel and Chandni are remaining in a game show. Of these only two contestants will make it to the next and final round. All contestants have an equal chance of being selected and finally winning the game.

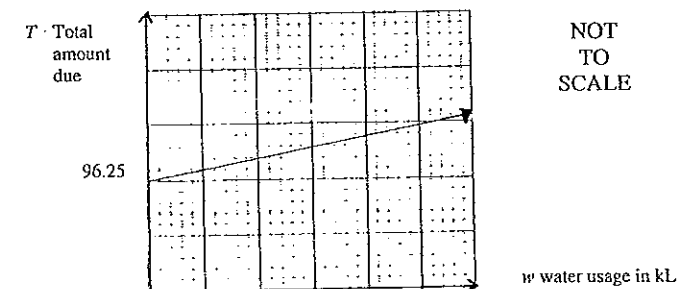
- (i) List all the possible pairs of contestants remaining in the final round. 1  
 (ii) What is the probability that Miguel and Julie will be in the final round? 1  
 (iii) What is the probability that Chandni makes it to the final round and wins? 2

- (e) A portion of the water bill from “Clear Water” is shown below:

<i>Clear Water Pty Ltd</i>	
Charges - GST free	\$
Water service	18.75
Sewerage service	77.50
Water usage <span style="background-color: #cccccc; display: inline-block; width: 40px; height: 15px;"></span> kilolitres @ 92.5 cents per kilolitre	<span style="background-color: #cccccc; display: inline-block; width: 40px; height: 15px;"></span>
<b>Total amount due \$149.90</b>	

- (i) The total of the bill is \$149.90. Calculate the amount of water used for this period. 2

The graph below represents *Clear Water’s* calculation of “total amount due”. The equation of the line drawn is:  $T = mw + 96.25$



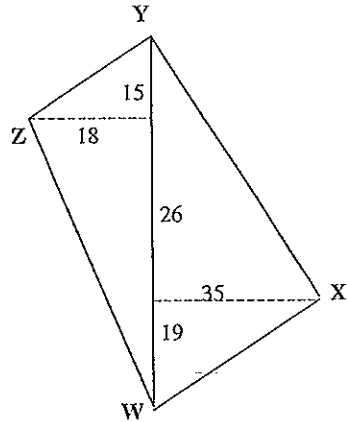
- (ii) Explain why the y intercept is 96.25. 1  
 (iii) Find the value of  $m$ . 1

End of Question 23

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

Marks

- (a) An offset survey of a paddock was conducted. A sketch of the paddock is shown below. ALL MEASUREMENTS ARE IN METRES.



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- (i) Construct a notebook entry for this offset survey  
(ii) Using the diagram above calculate the area of the field WXYZ.

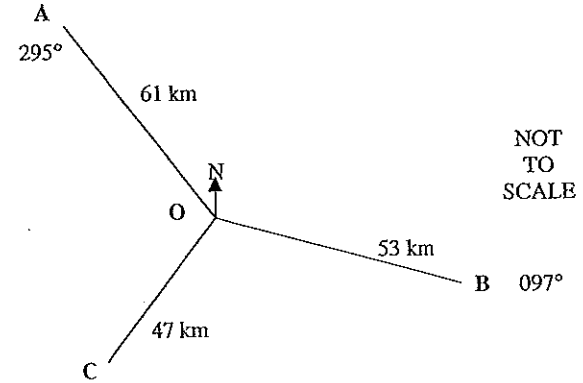
2  
2

Question 24 continues on page 14

Question 24 (continued)

Marks

- (b) The compass radial survey shown below illustrates three desert oases which are located at the points A, B and C



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SCALE

- (i) Given that  $\angle BOC$  is  $94^\circ$ , find the bearing of C from O.  
(ii) Calculate the distance BC, using the cosine rule, correct to the nearest kilometre.  
(iii) Which oasis is the closest to oasis C?  
Explain the reasonableness of your answer.

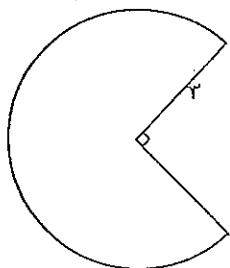
1  
2  
2

Question 24 continued on page 15

Question 24 (continued)

Marks

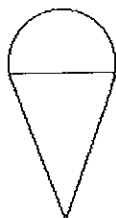
(c) The figure below is the net of a "SNOCCONE".



NOT  
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SCALE

- (i) Calculate the length of the arc given that the radius is 7 cm. ... 1
- (ii) Show that the radius of the SNOCCONE formed from this net is 5.25cm. 1
- (iii) The NICE ICE Company's regulations state that each SNOCCONE made must have crushed ice filling the container and a perfect hemisphere of at least 5.25 cm in radius on top of the filled container, as shown in the diagram below. The height of the cone is 4.6cm.

Find the minimum volume of crushed ice required for a regulation SNOCCONE. 2



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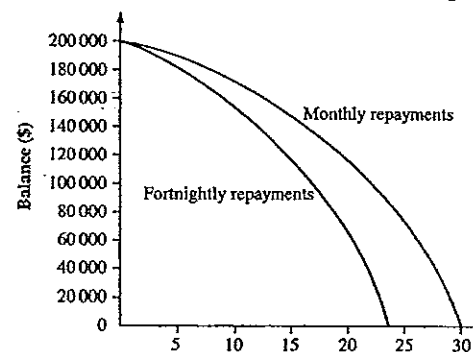
End of Question 24

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

Marks

- (a) Monica's friend asked her how old her mother was. Monica's reply was "triple my age less seven".
- (i) Write an algebraic expression for Monica's mother's age ( $Y$ ), using Monica's age ( $x$ ). 1
- (ii) If Monica's mother is 41 years old, how old is Monica? 1
- (b) The graph compares the progress of a \$ 200 000 loan when repayments are made monthly and fortnightly.

Reducing balance loan (interest 6.7% p.a.)



- (i) Estimate the amount owing on the loan after 10 years if repayments are made monthly. 1
- (ii) Estimate the number of years it takes to reduce the balance to \$100 000 if the repayments are made fortnightly. 1
- (iii) What are two benefits of paying fortnightly instead of monthly? 2

Question 25 continues on page 17

Question 25 (continues)

Marks

- (c) *Saber Scooters* has found that the cost of making its scooters depends on the number of scooters made each day.

The cost ( $C$  dollars) per scooter can be calculated using the formula

$C = 2x^2 - 11x + 30$  where  $x$  is the number of scooters (in hundreds) made per day.

- (i) Graph  $C = 2x^2 - 11x + 30$  on the graph paper provided for  $x$  between 0 and 8. 2
- (ii) When 400 scooters are produced in a day, what is the cost per scooter? 1
- (iii) Last Wednesday, the records showed that it cost \$36 to produce a scooter.  
How many scooters did the company produce last Wednesday? 1
- (iv) The company sells the scooters for \$99.

Two executives are discussing the number of scooters to be made Each day so as to give the greatest profit.

**Executive 1** says "Make 275 scooters per day as this gives the lowest cost of manufacturing per scooter".

**Executive 2** says "Make 600 scooters per day as this gives the company the greatest overall profit".

Consider both arguments and decide which executive you would support.

In your answer show calculations of the profit achieved in each case. 3

End of Question 25

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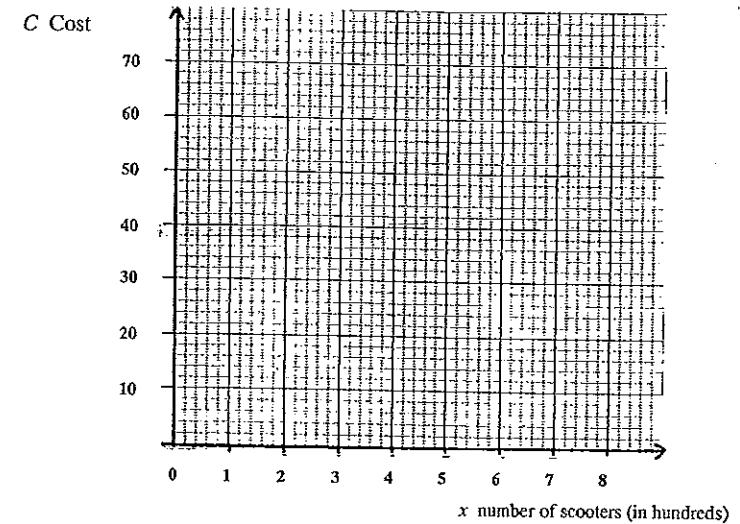
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This page is to be detached, completed and attached to your writing booklet for Question 25.

Question 25 (c) (i)





Question 26 (13 marks). Use a SEPARATE Writing Booklet.

Marks

- (a) A large number of people were tested for AIDS. The test is not always accurate. Not all subjects were infected with the AIDS virus.

	Test Positive	Test Negative	Total
AIDS	977	23	1000
No AIDS	73 926	925 074	999000
Totals	74 903	925 097	1000000

- (i) How many people were tested? 1
- (ii) For how many people were the test results inaccurate? 1
- (iii) What percentage of test results indicated the presence of AIDS? 1
- (iv) One person is selected at random from the group that the test indicated had AIDS. What is the probability that this person had the disease. 2

(b)

Interest rate (%)	Term in years		
	10	20	30
5	10.61	6.60	5.37
6	11.10	7.16	6.00
7	11.61	7.75	6.65
8	12.13	8.36	7.34
9	12.67	9.00	8.05
10	13.22	9.65	8.78
11	13.77	10.32	9.52
12	14.35	11.01	10.29

The table shows the monthly repayments for a loan of \$1000 for varying reducible interest rates. Mr and Mrs Vince borrow \$250000 at 6% p.a. reducible interest for a term of 20 years.

Find:

- (i) the monthly repayment 1
- (ii) the total amount repaid 1
- (iii) the total interest paid 1
- (iv) the effective flat rate of interest charged per annum for this loan. 2

Question 26,(continued)

Marks

- (c) St Petersburg is approximately  $60^{\circ}$  N,  $30^{\circ}$  E. Johannesburg lies south of St Petersburg on the same meridian of longitude. If the distance between St Petersburg and Johannesburg is 5 100 nautical miles:

- (i) find the angular distance between St Petersburg and Johannesburg 1
- (ii) state the position coordinates of Johannesburg 1
- A plane flight between these two cities takes 12 hours.
- (iii) Calculate the speed of the plane in knots. 1

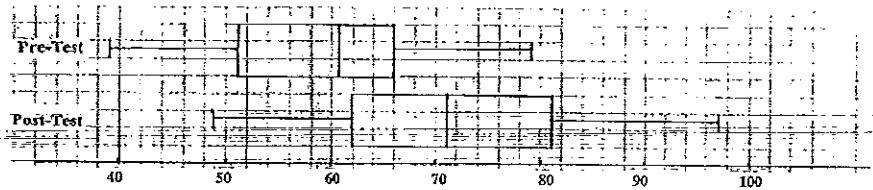
End of Question 26

Question 27 (13 marks). Use a SEPARATE writing booklet.

Marks

The performances of 18 students were recorded on a Pre-Test. A new Mathematics Program was introduced and then a Post-Test was given. The results are recorded below:

Pre-Test					Post-Test						
				9	3						
			8	6	5	4					
		#	3	2	1	5	1	5	7	9	
6	5	3	1	1	0	6	2	3	6	8	
		9	3	2	1	7	0	2	4	7	7
						8	1	4	7		
				9	4	7					



- (i) Write down the range of marks in the Pre-Test 1
- (ii) One entry in the Pre-Test is missing (represented by #). If the mean of these results is 59, what is the value of this score? 2
- (iii) Calculate the mean and sample standard deviation of the marks for the Post-Test. 2
- (iv) A score is selected at random from the Post-Test results. What is the probability that this test result lies within one sample standard deviation of the mean? 2
- (v) Determine the interquartile range for the results of the Post-Test. 1
- (vi) Compare and contrast the displays for the Pre-Test and Post-Test by examining:
  - the shape and skewness of the distribution; and
  - measures of location and spread. 3
- (vii) Use your answer in Part (vi) to support or reject the claim that:
 

*“This Mathematics Program has allowed the student to make large gains in Mathematics”.*

2

End of Question 27

Question 28 (13 marks). Use a SEPARATE Writing Booklet.

Marks

(a) In a particular series of exams Pip scored the following marks:

Subject	Mean	Standard Deviation	Pip's Mark
Mathematics	66	8	80
English	58	14	80

- (i) Calculate Pip's z-score for Mathematics and explain what this means in terms of the mean mark and standard deviation. *better in English or Ma* 2
- (ii) Determine the English mark which is equivalent to Pip's Mathematics mark. Hence, conclude whether Pip performed *better in English or Maths*. 2
- (b) On the day of Isabella's birth, her parents, Mr and Mrs Dange decided to start saving for her education in a private high school. They invested \$ 200 per month in an account which paid 6% p.a. compounded monthly.
  - (i) Show that by Isabella's 5<sup>th</sup> birthday, Mr and Mrs Dange had accumulated approximately \$13954.
  - At this stage, Mr and Mrs Dange decide to stop the regular payments into this savings account but they leave the \$13954 to earn interest and grow for the next 6 years until Isabella's 11<sup>th</sup> birthday.
  - (ii) Calculate the value of this investment after a further 6 years. 1
  - (iii) The private high school charges \$5000 per year. Assuming that Isabella attends school for 6 years, calculate the amount that Mr and Mrs Dange should have invested per month over this 11 year period.
- (c) A company spent \$500000 on equipment 8 years ago. Its current value is \$350000. Using the declining balance method, find the percentage depreciation rate over this period. 3

End of Question 28

End of Paper

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

Surface area of a sphere

$$A = 4\pi r^2$$

Simpson's rule for area approximation

$$A \approx \frac{h}{3}(d_1 + 4d_n + d_7)$$

$h$  = distance between successive measurements  
 $d_1$  = first measurement  
 $d_n$  = middle measurement  
 $d_7$  = last measurement

Volume

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

Cylinder  $V = \pi r^2 h$

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

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

$A$  = area of base  
 $h$  = perpendicular height

Mean of a distribution

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

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

$x$  = individual score  
 $\bar{x}$  = mean

Formula for z-scores

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

$s$  = standard deviation

Probability of an event

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

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

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

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

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

Gradient of a straight line

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

Gradient-intercept form of straight line

$$y = mx + b$$

$m$  = gradient  
 $b$  = y-intercept

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CATHOLIC SECONDARY SCHOOLS ASSOCIATION OF NEW SOUTH WALES  
YEAR 12 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION 2001

GENERAL MATHEMATICS – 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 have changed 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:

A       B  <sup>correct</sup>      C       D

ATTEMPT ALL QUESTIONS

- |          |    |                         |                         |                         |                         |
|----------|----|-------------------------|-------------------------|-------------------------|-------------------------|
| Question | 1  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
|          | 2  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
|          | 3  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
|          | 4  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
|          | 5  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
|          | 6  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
|          | 7  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
|          | 8  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
|          | 9  | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
|          | 10 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
|          | 11 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
|          | 12 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
|          | 13 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
|          | 14 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |

- |    |                         |                         |                         |                         |
|----|-------------------------|-------------------------|-------------------------|-------------------------|
| 15 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 16 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 17 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 18 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 19 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 20 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 21 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |
| 22 | <input type="radio"/> A | <input type="radio"/> B | <input type="radio"/> C | <input type="radio"/> D |



logos:

CATHOLIC SECONDARY SCHOOLS ASSOCIATION

2001 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

GENERAL MATHEMATICS MARKING GUIDELINES/SOLUTIONS

Questions 1-22

1 Mark Each

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

Section I (1 mark each. Must be correct.)

$$1 \quad C = \frac{5}{9}(110 - 32)$$

$$= 43\frac{1}{3}$$

2 \$16

$$3 \quad \tan 23^\circ = \frac{x}{3200}$$

$$x = 3200 \tan 23^\circ$$

$$= 1358.31\dots$$

4 D

5 Long. difference =  $60^\circ$   
Time difference = 4 hours  
A is behind B  
 $\therefore$  It is 6 am

6 3 hours

$$7 \quad \frac{3}{20} \text{ are tagged}$$

$$\frac{70}{x} \text{ are tagged}$$

$$\frac{x}{70} = \frac{20}{3}$$

$$x = \frac{20}{3} \times 70$$

$$\approx 467$$

$$8 \quad \frac{5}{2} = \frac{31\text{mm}}{x}$$

$$5x = 62$$

$$x = 12.4\text{mm}$$

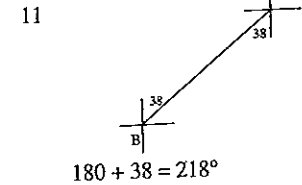
$$\approx 1.2\text{cm}$$

9 C

$$10 \quad A = 2\pi r h$$

$$= 2x \pi \times 5 \times 12$$

$$= 376.99\dots \text{cm}^2$$



12 C

$$13 \quad 3(2x - 4) - 2(1 - 4x)$$

$$= 6x - 12 - 2 + 8x$$

$$= 14x - 14$$

14 B

$$15 \quad A = \frac{1}{2}ab\sin C$$

$$= \frac{1}{2} \times 20 \times 34 \times \sin 42^\circ$$

$$16 \quad \left( \frac{9.5}{100} \times 0.85 \times 1450 \times 2 + 0.85 \times 1450 \right) + 52$$

$$= \$28.21$$

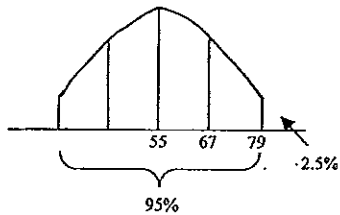
$$17 \quad A = \frac{32}{3} [0 + 4 \times 60 + 85]$$

$$= 3466.6 \text{ m}^2$$

$$\therefore B$$

$$18 \quad \frac{1}{5} \times \frac{1}{3} = \frac{1}{15}$$

19



$$20 \quad \frac{8 \times 7}{2} = 28$$

$$21 \quad \frac{2.5}{375} \times 100$$

$$= 0.66\ldots$$

$$\approx 0.7\%$$

22

$$N = \frac{K}{T}$$

$$12 = \frac{K}{50}$$

$$K = 600$$

$$\therefore 7 = \frac{600}{T}$$

$$T = 85.7$$

Question	Solutions	Marking Guidelines	Outcomes	Marks
23 (a)	3ml/10s 18ml/1 min. 1080ml/60 mins. 1080ml ...1080ml lost in 1h	1 mark for correct answer	(2-3) P2	1
23 (b)	$AX^2 = 16^2 - 5^2$ $= 256 - 25$ $AX = \sqrt{231}$ $AX = 15.19868415$ $\div 15 - 2m \text{ (to 3s-f)}$	1 mark for correct substitution into Pythagoras' Theorem  1 mark for correctly rounding THEIR answer to 3 s.f.	(3-4)  P6, P7	2
23 (c)	$A = \pi ab$  $1.026 \times 10^9 = \pi \times 8.9 \times 10^5 b$  $b = \frac{1.026 \times 10^9}{\pi \times 8.9 \times 10^5}$  $= 366.950498$  ... length minor axis $= 2 \times 366.95 \dots$ $= 733.900996m$ $= 7.3 \times 10^2 m$	1 mark for a correct expression for b  1 mark for multiplying their answer for b. by 2  (Ignore rounding)	(3-5)  H7, H6	2
23 (d)	(i) L.S, LM, LJ, LC, SJ, SM, SC, JM, JC, MC (only 10 matchings)  (ii) $\frac{1}{10}$  (iii) Makes to final round $\frac{4}{10} = \frac{2}{5}$ Wins final round $\frac{2}{5} \times \frac{1}{2} = \frac{1}{5}$	1 mark for correct answer  1 mark for correct answer  1 mark for identifying probability of Chandni being in final round  1 mark for correct answer	H10 (2-3)  P10 (3-4)  H2, H10 (5-6)	1  1  2
23 (e)	(i) \$149.90 - \$18.75 - \$77.50 = \$53.65  \$53.65 $\times$ 0.925 = \$58kl  (ii) The fixed costs = \$96.25  (iii) The gradient $m=0.925$ <b>Must be in correct units</b>	1 mark for calculation of water cost  1 mark for division resulting in kilo-litres used  1 mark for correct reasoning  1 mark for correct answer	P2, P8 (3-4)  P5 (4-6)  P5 (4-6)	2  1  1

Question	Solutions	Marking Guidelines	Outcomes	Marks
24 (a) (i)	$\begin{array}{c} Y \\ Z \ 18 \quad \left  \begin{array}{c} 60 \\ 45 \\ 19 \\ 0 \\ W \end{array} \right. \quad (b) \quad 35 \ X \end{array}$	<p>1 mark for "60" or correct from addition of "b" plus 15</p> <p>1 mark for 18 next to 45 AND 35 next to 19 on correct sides</p>	(2-3) H6	2
(ii)	$A = \frac{1}{2} \times 60 \times 18 + \frac{1}{2} \times 60 \times 35 = 1590m^2$	<p>2 marks for correct answer or correct from THEIR (i). 1 mark for any correct area of triangle</p>	(2-4) H6	2
(b) (i)	Bearing = $97 + 94 = 191^\circ$	1 mark for $191^\circ$	(2-3) H6	1
(ii)	$BC^2 = 53^2 + 47^2 - 2 \times 53 \times 47 \times \cos 94^\circ = 5365.526752$ $BC = \sqrt{5365.526752} = 73.2497 \dots \approx 73 \text{ km (to nearest km)}$	<p>1 mark for correct substitution into cosine rule</p> <p>1 mark for correct calculation of BC from their substitution into cosine rule</p>	M6 (3-4)  H7	2
(iii)	B since $\angle BOC$ is smaller than $\angle COA (104^\circ)$ and the length of side OB is smaller than OA. $(AC = 85.54051759) \div 86 \text{ km}$	<p>1 mark for B</p> <p>1 mark for valid explanation</p>	H7 H11	2
4 (c) (i)	$\ell = \frac{\theta}{360} \times 2 \times \pi \times r = \frac{270}{360} \times 2 \times \pi \times 7 = 32.98672286 \approx 33 \text{ cm}$	<p>1 mark for correct answer</p> <p>1 mark for correct working</p>	H6, H7 (2-3)  H6, H7 (3-5)	1
(ii)	$C = 2 \pi r = 32.986 \dots = 2 \times \pi \times r$ $r = \frac{32.98672286}{2\pi} = 5.25 \text{ cm}$			1
(i)	$V_1 = \frac{1}{3} \pi r^2 h = \frac{1}{3} \times \pi \times (5.25)^2 \times 4.6 = 132.7715595$ $V_2 = \frac{1}{2} \times 4 \frac{1}{3} \pi r^3 = \frac{1}{2} \times 4 \frac{1}{3} \times \pi \times (5.25)^3 = 303.0655163$ $V_{\text{total}} = 132.7715595 + 303.0655163 = 435.8370758 = 436 \text{ cm}^3 \text{ (to nearest whole number)}$	<p>Full marks for correct answer OR</p> <p>1 mark for volume each solid</p>	H6, H7 (3-5)	2

Question	Solutions	Marking Guidelines	Outcomes	Marks
25 (a)	(i) $Y = 3x - 7$	1 mark for correct answer	P3 (3-4)	1
	(ii) $41 = 3x - 7$ $3x = 48$ $x = 16$ Monica is 16 yrs old.	<p>1 mark for correct answer</p> <p>1 mark for reading from graph. (Accept from \$170-175,000)</p>	P5 (3-4)	1
25 (b)	(i) $\approx \$175,000$	1 mark -- reading from graph (Accept 16-18y)	H2 (2-3)	1
	(ii) $\approx 17$ years	<p>1 mark -- length</p> <p>1 mark -- interest</p>	H2 (2-3)	1
	(iii) Finly reduces the length of the term and also the amount of interest		H1, H5, H8 (3-5)	2
25 (c)	(i) Graph	<p>2 marks for correct graph OR</p> <p>1 mark for showing CURVE cuts y axis at 30. OR</p> <p>1 mark for a function table which has <u>at least</u> 3 correct points.</p>	H3, H5 (3-5)	2
	(ii) Answer from either graph or substitution into $C = 2x^2 - 11x + 30$ (NB: $x = 4$ ) $C = \$18$ per scooter.	<p>1 mark correct answer. OR</p> <p>1 mark for correct answer from <u>their</u> graph.</p> <p>Answer from substitution OR</p> <p>Correct answer from their graph</p>	H5 (2-4)	1
	(iii) Answer = 6		H3 (3-4)	1
	(iv) <span style="border: 1px solid black; padding: 2px;">Case 1:</span>  $x = 2.75$ $c = \$14.875$ per scooter Profit = $\$99 - \$14.88 = \$84.125$ Total Profit = $\$84.125 \times 275 = \$23134.375$ <span style="border: 1px solid black; padding: 2px;">Case 2:</span> $x = 6.0$  $c = \$36.00$ per scooter Profit = $\$99 - \$36.00 = \$63.00$ Total Profit = $\$63 \times 600 = \$37,800$	<ul style="list-style-type: none"> <li>1 mark for profit per scooter for either <math>x = 2.75</math> or <math>x = 6</math></li> <li>1 mark for profit in either Case 1 or Case 2</li> <li>1 mark for any reasonable justification</li> </ul>	H5  H6  H8 (4-6)	3

Question	Solutions	Marking Guidelines	Outcomes	Marks
25 (c)	We agree with Case 2 Executive even though you make less profit per scooter your total profit is increased.			
26 (a)	(i) 1 million	• 1 mark for correct answer	H4 (2-3)	1
	(ii) $23 + 73926 = 73949$	• 1 mark for correct answer	H4 (5-6)	1
	(iii) $\frac{74903 \times 100}{1000000} = 7.5\%$	• 1 mark for correct answer	H4 (3-4)	1
	(iv) P (E) $\frac{977}{74903} = 0.013$ 74903 OR • 1 mark for correct number having disease • 1 mark for correct sample size • 2 marks for correct answer		H4, H10 (4-6)	2
26 (b)	(i) $7.16 \times 250 = \$1790$	• 1 mark for correct answer	H5 (2-3)	1
	(ii) $\$1790 \times 12 \times 20 = \$429600$	• 1 mark for correct multiplication of answer (i) $\times 12 \times 20$	H5 (2-4)	1
	(iii) $\$429600 - \$250000 = \$179600$	1 mark for answer (ii) - $\$250000$	H5 (2-4)	1
	(iv) $I = Prn$ $\$179600 = \$250000 \times r \times 20$ $r = 0.03592$ $\therefore r = 3.592\%$	• 1 mark for dividing interests over 20 years • 1 mark for correct answer based on their answer from (iii)	H3 H5 (4-6)	2
26 (c)	(i) Angular distance $= 5100 \div 60 = 85^\circ$	• 1 mark for correct answer	H6 (2-4)	1
	(ii) $85^\circ$ south of $60^\circ$ north is $25^\circ$ south $\therefore$ position coordinates ( $25^\circ$ S, $30^\circ$ E)	• 1 mark for correct answer (based on (i) for the latitude only)	H6 H7 (3-5)	1
	(iii) Speed = $5100 \div 12 = 425$ nm/h = 425 knots	• 1 mark for correct answer	H2 (2-4)	1

Question	Solutions	Marking Guidelines	Outcomes	Marks
27 (a)	(i) Range = $79 - 39 = 40$	• 1 mark for correct answer.	H9 (3-4)	1
	(ii) sum of scores = $59 \times 18 = 1062$ $1062 - 1005 = 57$	• 1 mark for correct sum of scores • 1 mark for correct process to calculate	H4, H9 (4-6)	2
	(iii) Use calculator $\bar{x} = 71.8$  SD = 13.23	• 1 mark for $\bar{x}$ • 1 mark for SD	H9 (3-5)	2
	(iv) $71.8 \pm 13.23$ $\therefore = 85.1$ and $= 58.7$ $P(E) = \frac{12}{18} = \frac{2}{3}$	• 1 mark for calculation for both values • 1 mark for correct probability	H2 H10 (4-6)	2
	(v) From Box and Whisker plot $= 81 - 62 = 19$	• 1 mark for correct answer	H9 (3-4)	1
	(vi) • Pre test is slightly negatively skewed • In the post-test the mean and median are significantly higher • In the post-test the range and interquartile range are slightly larger	• 1 mark each for a valid statement regarding: (i) shape (ii) location (iii) spread	H4, H9 (3-6)	3
	(vii) We support the claim because of the significant difference in the mean and median of the post-test. The overall results of the post-test have improved significantly for the whole group.	• 2 marks if the student supports the claim and refers to the distribution (spread and location) • 1 mark if the student only refers to either spread OR distribution	H4, H11 (5-6)	2
28 (a)	(i) $z = \frac{x - \bar{x}}{s}$  $= \frac{80 - 66}{8}$  $= 1.75$  Pip is 1.75. S.D. above the mean	• 1 mark for correct working for z score • 1 mark for explanation	H4, H9, H11 (4-6)	2



Question	Solutions	Marking Guidelines	Outcomes :	Marks
28(a)	(ii) $1.75 = \frac{x - 58}{14}$ $x - 58 = 24.5$ $x = 82.5$ Pip performed better in Maths than English because her English result was only 80% rather than the 82.5% she needed to be 1.75 S.D. above the mean	<ul style="list-style-type: none"> <li>1 mark for correct working of English mark</li> <li>1 mark for correct explanation</li> </ul>	H2, H9 (4-6)	2
28 (b)	(i) $r = 6\% \div 12$ $= 0.5\%$ $n = 5 \times 12 = 60$ $\therefore r = 0.5 \div 100$ $= 0.005$ $A = M \left[ \frac{(1 + r)^n - 1}{r} \right]$ $= 200 \left[ \frac{(1.005)^{60} - 1}{0.005} \right]$ $= \$13954$	<ul style="list-style-type: none"> <li>1 mark for the correct values of r and "n"</li> <li>1 mark for substituting into correct formula</li> <li>1 mark for correct calculation of THEIR substitution into correct formula</li> </ul>	H8 (4-6)	3
	(ii) $(n = 12 \times 6 = 72)$ $A = 13954 (1 + 0.005)^{72}$ $= \$19982.75$	<ul style="list-style-type: none"> <li>1 mark for correct substitution and answer</li> </ul>	P2, p8 (2-3)	1
	(iii) $30000 = M \left[ \frac{(1 + 0.005)^{132} - 1}{0.005} \right]$ $M = \frac{30000}{186.32263}$ $M = \$161$	<ul style="list-style-type: none"> <li>1 mark for correct values of r and "n"</li> <li>OR</li> <li>1 mark for substitution into the correct formula regardless of the r and "n" values</li> <li>2 marks for correct answer</li> </ul>	H8 (4-6)	2
28 (c)	$S = V_0(1 - r)^t$ $350000 = 500000 (1 - r)^8$ $(1 - r)^2 = 0.7$ $1 - r = \sqrt[2]{0.7}$ $1 - r = 0.956394908$ $-r = -0.043605092$ $\therefore r = 0.0436$ $\% = 4.36\%$	<ul style="list-style-type: none"> <li>1 mark for correct substitution into correct formula</li> <li>1 mark for the correct value of 1-r based on their substitution</li> <li>1 mark for correct r as a percentage taken from their equation</li> </ul>	H2, H5 (4-6)	3