



CATHOLIC SECONDARY SCHOOLS
ASSOCIATION OF NEW SOUTH WALES

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Centre Number

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Student Number

2006
TRIAL HIGHER SCHOOL CERTIFICATE
EXAMINATION

General Mathematics

Morning Session
Monday 7 August 2006

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
- Write your Centre Number and Student Number at the top of this page

Total marks – 100

Section I Pages 2–10

22 marks

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

Section II Pages 11–20

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.

1 What is the median of the set of scores?

20, 21, 22, 22, 22, 23, 24, 24, 25, 26

- (A) 6
- (B) 22
- (C) 22.5
- (D) 22.9

2 The distance from Port Douglas to Sydney is 2017 km. If 1 nautical mile = 1.852 km, then this distance, in nautical miles, is:

- (A) 1089
- (B) 1090
- (C) 3735
- (D) 3736

3 Simplify: $7 + 3(x - 2)$

- (A) $3x + 1$
- (B) $3x + 13$
- (C) $8x$
- (D) $10x - 2$

Disclaimer

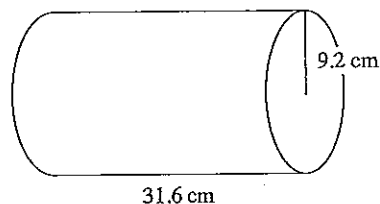
Every effort has been made to prepare these 'Trial' Higher School Certificate Examinations in accordance with the Board of Studies documents, *Principles for Setting HSC Examinations in a Standards-Referenced Framework* (BOS Bulletin, Vol 8, No 9, Nov/Dec 1999), and *Principles for Developing Marking 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.

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4 A piece of A4 paper has a mass of 0.000785 grams. Express this number in scientific notation, correct to 2 significant figures.

- (A) 7.8×10^{-4}
- (B) 7.9×10^{-4}
- (C) 7.8×10^4
- (D) 7.9×10^4

5



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TO
SCALE

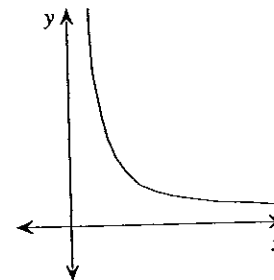
The surface area of this closed cylinder is closest to:

- (A) 1827 cm^2
- (B) 2093 cm^2
- (C) 2358 cm^2
- (D) 8403 cm^2

6 Jenny takes out a flat rate loan of \$6500 and repays the loan with monthly repayments over 3 years. Interest is charged at 9% p.a. The total amount that Jenny must repay is:

- (A) \$229.31
- (B) \$1755
- (C) \$6500
- (D) \$8255

7



Which of the following equations best describes the graph above?

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

8 Five students were given a pre-test before starting a topic. Their scores appear below:

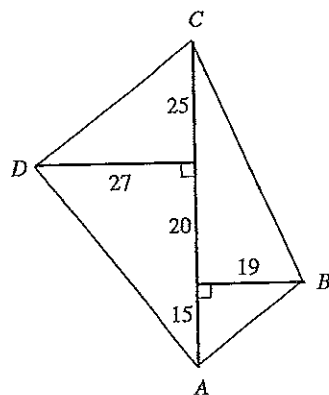
53 41 76 55 28

The same students were tested again at the end of the topic. Each student's mark in the second test was 20 more than their mark in the pre-test. Compared to the scores from the pre-test, the scores from the second test had:

- (A) the same mean and a larger standard deviation
- (B) a larger mean and a larger standard deviation
- (C) a larger mean and a smaller standard deviation
- (D) a larger mean and the same standard deviation

- 9 There are 800 students at a local high school. In Year 12 there are 120 students. If 100 students are chosen for a survey using stratified sampling, how many Year 12 students will need to be surveyed?
- (A) 7
 (B) 13
 (C) 15
 (D) 17

- 10 The diagram below shows a surveyor's sketch of an offset survey of a field $ABCD$. All dimensions are in metres.



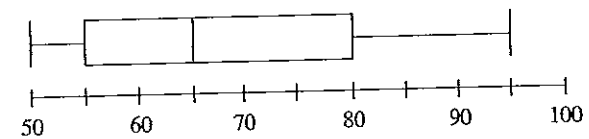
NOT
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SCALE

The area of the field, in square metres, is:

- (A) 154
 (B) 203
 (C) 1380
 (D) 2760

- 11 Bob buys a new filing cabinet for his office. The purchase price was \$279, but the value of the cabinet depreciates by 15% per year. The salvage value of the filing cabinet after 6 years is:
- (A) \$41.85
 (B) \$105.22
 (C) \$189.00
 (D) \$237.15

- 12



Julie and Bill make the following statements about the box-and-whisker plot above.

Julie: "The interquartile range is 15"
 Bill: "The median is 65"

Which of the students made a correct statement?

- (A) Bill only
 (B) Julie only
 (C) Bill and Julie
 (D) Both statements were incorrect

- 13 Lana celebrates her 18th birthday by going with FOUR of her friends to the theatre. They sit in FIVE adjoining seats. Lana sits in the middle seat. The FOUR friends then choose their seats at random.

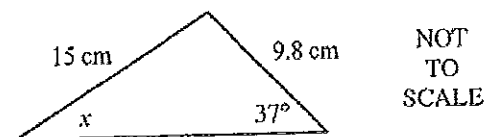


The probability that Clark sits next to Lana is:

- (A) $\frac{1}{5}$
 (B) $\frac{1}{4}$
 (C) $\frac{2}{5}$
 (D) $\frac{1}{2}$
- 14 The lengths of TWO pieces of timber are measured to be 1.6 m and 2.3 m respectively. What is the upper limit of their length when they are placed end to end?
- (A) 3.9 m
 (B) 3.95 m
 (C) 4.0 m
 (D) 4.1 m
- 15 \$2540 is invested for 3 years at 9% p.a. with interest compounded monthly. Which of the following expressions will give the value of the investment after 3 years?
- (A) $2540 \times 0.09 \times 3$
 (B) $2540(1 + 0.0075)^{36}$
 (C) $2540 \left[\frac{(1 + 0.0075)^{36} - 1}{0.0075} \right]$
 (D) $2540 \left[\frac{(1 + 0.0075)^{36} - 1}{0.0075(1 + 0.0075)^{36}} \right]$

- 16 An egg carton contains 5 brown eggs and 7 white eggs. TWO eggs are chosen at random and placed on a table. What is the probability that both eggs are brown?
- (A) $\frac{5}{36}$
 (B) $\frac{5}{33}$
 (C) $\frac{1}{6}$
 (D) $\frac{25}{144}$

17



In the diagram above, the value of x , correct to the nearest degree, is:

- (A) 23
 (B) 44
 (C) 59
 (D) 67
- 18 The mean mark in the Half-Yearly Examination in General Mathematics was 68 and the standard deviation was 9. A z -score of 2 for this test would represent a mark of:
- (A) 50
 (B) 66
 (C) 70
 (D) 86

- 19 At a particular school, the probability that a student travels to school by bus is 0.4, while the probability that a student wears the correct uniform is 0.8. If a student from the school is selected at random, then the probability that the student does not catch a bus but is in correct uniform is:
- (A) 12%
 (B) 32%
 (C) 48%
 (D) 80%

- 20 The following table shows the income tax rate for Australian residents for the 2005-06 financial year.

| Taxable Income | Tax Payable on Taxable Income |
|---------------------|--|
| \$0 – \$6000 | Nil |
| \$6001 – \$21 600 | 15¢ for each \$1 over \$6000 |
| \$21 601 – \$63 000 | \$2340 plus 30¢ for each \$1 over \$21 600 |
| \$63 001 – \$95 000 | \$14 760 plus 42¢ for each \$1 over \$63 000 |
| Over \$95 000 | \$28 200 plus 47¢ for each \$1 over \$95 000 |

At the end of the last financial year Susan was required to pay income tax of \$21 251.94. Her taxable income was:

- (A) \$6491
 (B) \$15 457
 (C) \$78 457
 (D) \$109 783
- 21 For a normal working week of 38 hours, Brian is paid \$24.30 per hour. Any time worked over 38 hours is paid at time-and-a-half. Brian was paid \$1032.75 for his work last week. Find the number of overtime hours that Brian worked last week.
- (A) 1.5
 (B) 3
 (C) 4.5
 (D) 42.5

- 22 The area of a sector is given by the formula $A = \frac{\theta}{360} \times \pi r^2$. Rearranging this formula to make r the subject gives:

- (A) $r = \sqrt{\frac{360A}{\pi\theta}}$
 (B) $r = \frac{\sqrt{360A}}{\pi\theta}$
 (C) $r = \sqrt{A - \frac{\pi\theta}{360}}$
 (D) $r = \sqrt{360A - \pi\theta}$

Section II

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

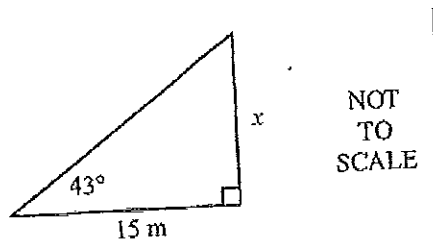
Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.
 All necessary working should be shown in every question.

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

Marks

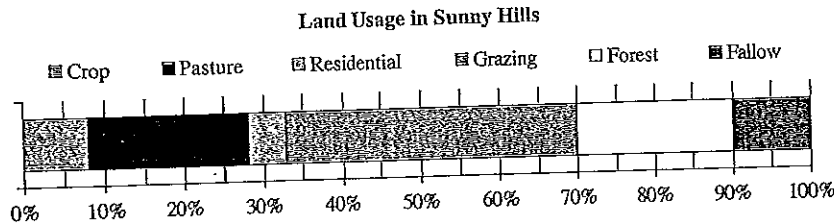
2

(a)



Find the value of x in the diagram above. Give your answer correct to 1 decimal place.

(b)



The divided bar graph above shows how land in the rural district of Sunny Hills is used for different purposes.

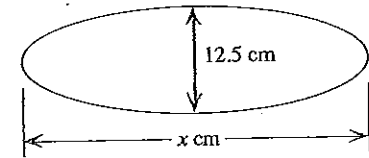
- (i) The district of Sunny Hills covers an area of 65 000 hectares. What area of land is dedicated to forests? 1
- (ii) Phillip is on the local council and wishes to represent this data in another form. Which type of graph could he use? Justify your answer. 2

Question 23 continues on Page 12

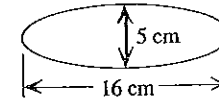
Question 23 (continued)

Marks

(c)



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The diagram above shows TWO similar ellipses.

- (i) Find the value of x . 1
 - (ii) Find the area of the smaller ellipse. Give your answer correct to 1 decimal place. 2
- (d) An investor decides to purchase 1000 shares in Telstra at a price of \$3.98 per share. There is a brokerage fee of 1% of the value of any purchase or sale of shares.
- (i) Find the total cost of purchasing these shares. 2
 - (ii) The company releases its dividend at 20% per share. How much will this investor receive in dividends? 1
 - (iii) Calculate the dividend yield. Express your answer as a percentage, correct to 2 decimal places. 2

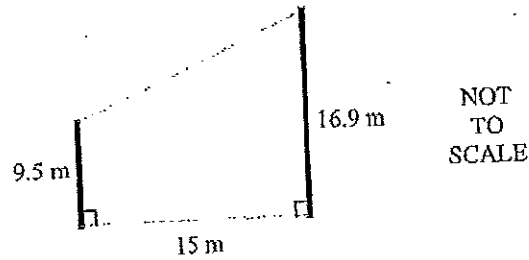
End of Question 23

Question 24 (13 marks) Use a SEPARATE writing booklet

Marks

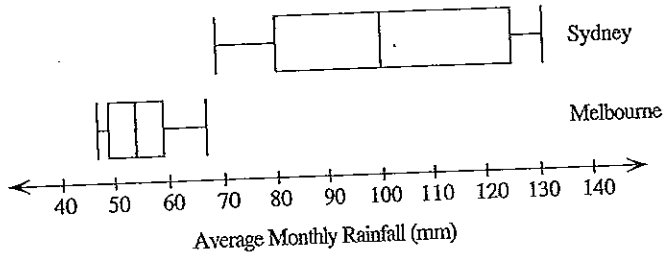
2

(a)



TWO posts are 15 m apart. The posts are 16.9 m and 9.5 m high. Find the shortest length of string which could be used to join the tops of the TWO posts. Give your answer correct to the nearest metre.

(b) A class studying statistics investigated the climatic data for Melbourne and Sydney. They found the average monthly rainfall in each of the two cities for every month of the year. Their results are summarised in the box-and-whisker plots below.



- (i) Which city received the least amount of rainfall? 1
- (ii) What is the median average monthly rainfall for Sydney? 1
- (iii) Compare and contrast the TWO data sets by examining the shape and skewness of the distribution and the measures of location and spread. 3

Question 24 continues on Page 14

Question 24 (continued)

Marks

2

(c) In the forest region of Sunny Hills a number of rare native mammals have been sighted recently. The local ranger decides to investigate this using the capture-recapture method. She captures 5 of these mammals one night, tags them and releases them. The following night she returns and captures another 10 and notices that 2 of these are tagged. Find a reasonable estimate for the total number of these mammals in the forest region of Sunny Hills.

(d) Kurt is intending to take out a reducible balance loan for \$45 000. He can afford to repay the loan with monthly repayments of \$512. Interest will be charged at a rate of 14.4% p.a.

- (i) Show that the interest charged at the end of the first month is \$540. 1
- (ii) How much will Kurt owe on the loan at the end of the first month, after the first repayment is made? 1
- (iii) Based on the information in the question and your calculations in (i) and (ii), would you advise Kurt to take out this loan? Justify your decision. 2

End of Question 24

Question 25 (13 marks) Use a SEPARATE writing booklet

Marks

- (a) At the Year 9 Activity Camp students must choose ONE activity from each of the THREE sessions. The possible activities are listed in the table below:

| SESSION 1 | SESSION 2 | SESSION 3 |
|-----------------|--------------|--------------|
| Archery | Horse riding | Cooking |
| Rock climbing | Fishing | Abseiling |
| Bush walking | Canoeing | Sailing |
| Gymnastics | | Swimming |
| Obstacle course | | Flying fox |
| | | Orienteering |

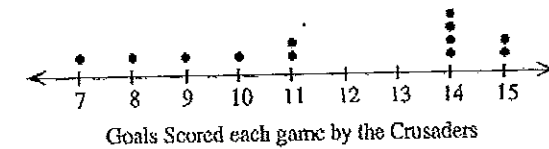
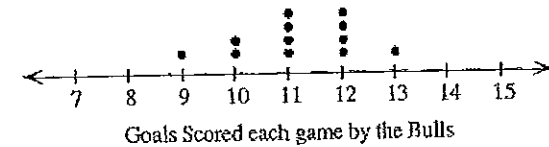
- (i) Over one day, how many possible activity combinations are possible? 1
- (ii) What is the probability that a person chooses archery, fishing and sailing? 1
- (iii) What is the probability that a person does not choose canoeing or abseiling? 2
- (b) The lengths of Atlantic Salmon at the Sunny Hills fish farm are found to be normally distributed with a mean length of 520 mm and a standard deviation of 30 mm.
- (i) Find the expected percentage of fish with lengths between 490 mm and 550 mm. 1
- The fish farm rejects fish with a length which is more than two standard deviations below the mean length.
- (ii) What is the minimum length of salmon which the fish farm will accept? 1
- (iii) What percentage of fish would you expect to be rejected by the fish farm? 1

Question 25 continues on Page 16

Question 25 (continued)

Marks

- (c) The Bulls and the Crusaders are TWO teams in a local district Australian Rules Football competition. At the end of the season they recorded the number of goals that they kicked in each game. The results are shown in the dot plots below:



- (i) The median number of goals kicked by the Bulls is 11, with a standard deviation of 1.1, correct to 1 decimal place. Determine the median number of goals and the standard deviation for the Crusaders. 2
- (ii) Which team scored the greater number of goals? Support your answer with mathematical reasoning. 2
- (iii) Which team is the more consistent scorer of goals? Use statistics to support your opinion. 2

End of Question 25

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

Marks

- (a) Young's rule can be used to calculate a child's medicine dose. Young's rule is:

$$C = \frac{nA}{n+12}$$

where C is the child's dose (in mL), n is the age of the child (in years) and A is the adult dose (in mL).

For a particular medicine, the adult dose is 24 mL

- (i) What is the dose for a 4 year old child? 1
- (ii) Find the age at which the dose is double that of the dose for a 4 year old. 3
- (b) Carol wants to invest \$150 at the end of every month for the next 5 years so that her son, who is currently in Year 8, will have some money to help finance his university education.
- (i) Carol can invest at 5.4% p.a., compounded monthly. Show that her investment will grow to \$10 305.71 after 5 years. 2
- (ii) If Carol could invest a single lump sum instead of making monthly contributions, what lump sum should she invest now to reach the same investment target over the same period of time? 2
- (c) Magadan, Russia and Sydney, Australia have position co-ordinates (59°N,151°E) and (34°S,151°E) respectively.
- (i) Show that the angular distance between these two cities is 93°. 1
- (ii) Find the distance, in nautical miles, between Magadan and Sydney. 1
- (iii) Raymond is on a plane which flies at 360 knots on a direct path from Magadan to Sydney. How long will it take to complete the journey? 1
- (iv) Raymond's aunt, Erin, is in Lusaka, Zambia, which is located at (15°S,28°E). Erin wants to call Raymond for his birthday. If Raymond can take the call at 5 pm Sydney time, at what time will Erin need to make the call? 2

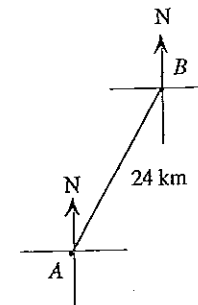
End of Question 26

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

Marks

(a) Solve: $\frac{4y-2}{2} + \frac{3y+4}{3} = 6$ 3

- (b) Joelle sets out from her base camp at A on a bearing of 027° for 24 km to point B where she makes her camp.



- (i) How far due east of base camp A is Joelle when she reaches point B ? Give your answer correct to 1 decimal place. 1
- The next day Joelle sets out from point B on a bearing of 100° for 15 km to point C .
- (ii) Copy the diagram above into your writing booklet. Complete the diagram, clearly showing all information about the journey from A to B and the journey from B to C . 1
- (iii) Explain why $\angle ABC = 107^\circ$. 1
- (iv) What is the length of the direct route from point C back to base camp at A ? Give your answer correct to the nearest kilometre. 3
- (c) Each time I dry my T-shirt in the clothes dryer it shrinks by 3%. How many times can the shirt be dried in the clothes dryer before it is less than 80% of its original size? 2
- (d) In a television game show, Carlos must choose one case out of the five cases on display. The cases contain the amounts \$15 000, \$10 000, \$1000, \$50 and \$1. It is not known which amount is in which case. 2



Calculate Carlos' financial expectation.

End of Question 27

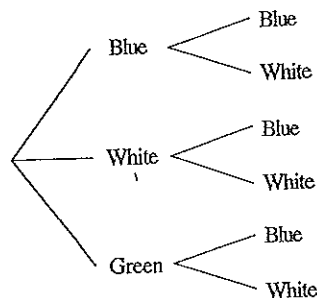
Question 28 (13 marks) Use a SEPARATE writing booklet.

Marks

- (a) TWO bags each contain FIVE coloured marbles. The first bag has 2 blue marbles, 2 green marbles and 1 white marble. The second bag has 3 blue marbles and 2 white marbles. ONE marble is chosen from each bag.

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

2



- (ii) Calculate the probability of drawing at least ONE white marble.

2

- (b) The following table gives the payment per period which is required for an ordinary annuity to reach a future value of \$1 at different interest rates and different periods of time.

Periodic Payment for an Ordinary Annuity with a Future Value of \$1

| Number of Periods | Interest Rate (% per period) | | | | | |
|-------------------|------------------------------|--------|--------|--------|--------|--------|
| | 2% | 4% | 6% | 8% | 10% | 12% |
| 1 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 2 | 0.4950 | 0.4902 | 0.4854 | 0.4808 | 0.4762 | 0.4717 |
| 3 | 0.3268 | 0.3203 | 0.3141 | 0.3080 | 0.3021 | 0.2963 |
| 4 | 0.2426 | 0.2355 | 0.2286 | 0.2219 | 0.2155 | 0.2092 |
| 5 | 0.1922 | 0.1846 | 0.1774 | 0.1705 | 0.1638 | 0.1574 |

- (i) Use this table to determine the payment required at the end of each year, so that the annuity is worth \$18 000 after 3 years when interest is paid at 8% p.a.
- (ii) Calculate the interest earned in this annuity.

1

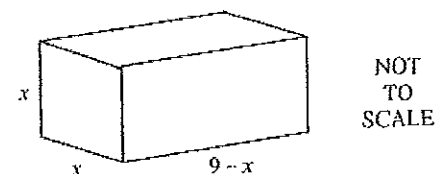
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Question 28 continues on Page 20

Question 28 (continued)

Marks

- (c) A packing carton is to be constructed as shown in the diagram below. All dimensions are in centimetres.



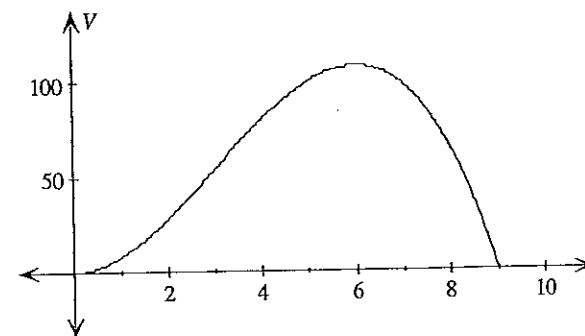
- (i) Show that the surface area (S) of the carton is $S = 36x - 2x^2$.

2

- (ii) Explain why the formula is only valid for values of x from $x = 0$ to $x = 9$.

1

The diagram below shows the graph of the volume (V) of the carton for values of x from $x = 0$ to $x = 9$. The dimensions of the carton are chosen so that its volume is a maximum.



- (iii) Find the value of x for which the carton has maximum volume.

1

- (iv) Find the surface area of the carton when it has maximum volume.

2

END OF PAPER

EXAMINERS

Bill Waddell (Convenor)
Patrick Curteis
Neila Darrough
Lynne Knapman
Julie MacDougal

St Patrick's Marist College, Dundas
Kambala, Rose Bay
La Salle College, Bankstown
PLC Sydney, Croydon
Rosebank College, Five Dock



CATHOLIC SECONDARY SCHOOLS ASSOCIATION
2006 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION
GENERAL MATHEMATICS – MARKING GUIDELINES/SOLUTIONS

| Question | Marks | Content | Syllabus Outcomes | Targeted Performance Bands |
|------------------|-------|---|------------------------|----------------------------|
| 1 | 1 | DA4: Summary statistics | P2, P7 | 2-3 |
| 2 | 1 | M7: Spherical geometry | H2, H7 | 2-3 |
| 3 | 1 | AM1: Basic algebraic skills | P2, P3 | 2-3 |
| 4 | 1 | AM3: Algebraic skills and techniques | H2 | 3-4 |
| 5 | 1 | M5: Further applications of area & volume | H2, H6 | 3-4 |
| 6 | 1 | FM4: Credit & borrowing | H2, H5, H8 | 3-4 |
| 7 | 1 | AM4: Modelling linear and non-linear relationships | H2, H3, H5 | 3-4 |
| 8 | 1 | DA5: Interpreting sets of data | H4, H5, H9 | 3-4 |
| 9 | 1 | DA2: Data collection & sampling | P9, P11 | 4-5 |
| 10 | 1 | M2: Applications of area and volume | P2, P6 | 3-4 |
| 11 | 1 | FM6: Depreciation | H2, H5 | 3-4 |
| 12 | 1 | DA5: Interpreting sets of data | H4, H5, H9 | 3-4 |
| 13 | 1 | PB2: Relative frequency & probability | P2, P10 | 3-4 |
| 14 | 1 | M1: Units of measurement | P2, P6 | 3-4 |
| 15 | 1 | FM2: Investing money | P2, P3 | 4-5 |
| 16 | 1 | PB3: Multi-stage events | H2, H4, H10 | 4-5 |
| 17 | 1 | M6: Applications of trigonometry | H2, H6 | 3-4 |
| 18 | 1 | DA6: The Normal Distribution | H4, H9 | 4-5 |
| 19 | 1 | PB2: Relative frequency & probability PB3: Multi-stage events | P2, P10 H2, H3, H10 | 4-5 |
| 20 | 1 | FM3: Taxation | P2, P8 | 4-5 |
| 21 | 1 | FM1: Earning money | P2, P7, P8 | 5-6 |
| 22 | 1 | AM2: Modelling and linear relationships | P4, P5 | 5-6 |
| SECTION 2 | | | | |
| 23(a) | 2 | M4: Right angled triangles | P2, P6 | 3-4 |
| 23(b)(i) | 1 | DA3: Displaying single data sets | P4, P7 | 3-4 |
| 23(b)(ii) | 2 | DA2: Data collection & sampling DA3: Displaying single data sets | P4, P9, P11 | 3-4 |
| 23(c)(i) | 1 | M3: Similarity of two-dimensional figures | P2, P6 | 3-4 |
| 23(c)(ii) | 2 | M3: Similarity of two-dimensional figures | P2, P6, P7 | 3-4 |
| 23(d)(i) | 2 | FM2: Investing money | P2, P8 | 3-4 |
| 23(d)(ii) | 1 | FM2: Investing money | P2, P8 | 2-3 |
| 23(d)(iii) | 2 | FM2: Investing money | P2, P8 | 3-4 |

DISCLAIMER

The information contained in this document is intended for the professional assistance of teaching staff. It does not constitute advice to students. Further it is not the intention of CSSA to provide specific marking outcomes for all possible Trial HSC answers. Rather the purpose is to provide teachers with information so that they can better explore, understand and apply HSC marking requirements, as established by the NSW Board of Studies.

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|------------|---|--|----------------------------|-----|
| 24(a) | 2 | M4: Right angled triangles | P2, P6 | 4-5 |
| 24(b)(i) | 1 | DA3: Displaying single data sets | P7 | 2-3 |
| 24(b)(ii) | 1 | DA4: Summary statistics | P2, P7 | 2-3 |
| 24(b)(iii) | 3 | DA5: Interpreting sets of data | H1, H2, H4, H5, H9, H11 | 5-6 |
| 24(c) | 2 | DA2: Data collection & sampling | P9 | 4-5 |
| 24(d)(i) | 1 | FM4: Credit & borrowing | H2, H5, H8 | 3-4 |
| 24(d)(ii) | 1 | FM4: Credit & borrowing | H2, H5, H8 | 4-5 |
| 24(d)(iii) | 2 | FM4: Credit & borrowing | H2, H5, H8, H11 | 5-6 |
| 25(a)(i) | 1 | PB1: The language of chance | P3, P10 | 3-4 |
| 25(a)(ii) | 1 | PB3: Multi-stage events | H3, H4, H10 | 3-4 |
| 25(a)(iii) | 2 | PB2: Relative frequency & probability PB3: Multi-stage events | P2, P10, H4, H10 | 5-6 |
| 25(b)(i) | 1 | DA6: The Normal Distribution | H2, H4, H5, H9, H11 | 3-4 |
| 25(b)(ii) | 1 | DA6: The Normal Distribution | H2, H4, H5, H9, H11 | 3-4 |
| 25(b)(iii) | 1 | DA6: The Normal Distribution | H2, H4, H5, H9, H11 | 3-4 |
| 25(c)(i) | 2 | DA4: Summary Statistics | P2, P7 | 3-4 |
| 25(c)(ii) | 2 | DA5: Interpreting sets of data | H1, H2, H4, H5, H9, H11 | 4-5 |
| 25(c)(iii) | 2 | DA5: Interpreting sets of data | H4, H10 | 5-6 |
| 26(a)(i) | 1 | AM1: Basic algebraic skills | P2, P3, P7 | 2-3 |
| 26(a)(ii) | 3 | AM1: Basic algebraic skills | P2, P3, P7 | 4-5 |
| 26(b)(i) | 2 | FM5: Annuities & loan repayments | H2, H5, H8 | 3-4 |
| 26(b)(ii) | 2 | FM5: Annuities & loan repayments | H2, H5, H8 | 4-5 |
| 26(c)(i) | 1 | M7: Spherical geometry | H2, H6 | 3-4 |
| 26(c)(ii) | 1 | M7: Spherical geometry | H2, H6 | 2-3 |
| 26(c)(iii) | 1 | M7: Spherical geometry | H2, H6, H7 | 3-4 |
| 26(c)(iv) | 2 | M7: Spherical geometry | H2, H6, H7 | 5-6 |
| 27(a) | 3 | AM1: Basic algebraic skills | P2, P3 | 4-5 |
| 27(b)(i) | 1 | M6: Applications of trigonometry | H1, H2, H6 | 3-4 |
| 27(b)(ii) | 1 | M6: Applications of trigonometry | H2, H6 | 3-4 |
| 27(b)(iii) | 1 | M6: Applications of trigonometry | H2, H6, H7 | 3-4 |
| 27(b)(iv) | 3 | M6: Applications of trigonometry | H1, H2, H6, H7 | 3-4 |
| 27(c) | 2 | AM3: Algebraic skills and techniques | H2, H3, H7, H11 | 5-6 |
| 27(d) | 2 | PB4: Applications of probability | H2, H4, H10 | 4-5 |
| 28(a)(i) | 2 | PB3: Multi-stage events | H2, H3, H10 | 4-5 |
| 28(a)(ii) | 2 | PB2: Relative frequency & probability | P2, P10 | 4-5 |
| 28(b)(i) | 1 | FM5: Annuities & loan repayments | H2, H5, H8 | 2-3 |
| 28(b)(ii) | 2 | FM5: Annuities & loan repayments | H2, H5, H8 | 3-4 |
| 28(c)(i) | 2 | AM4: Modelling linear and non-linear relationships | H2, H3 | 4-5 |
| 28(c)(ii) | 1 | AM4: Modelling linear and non-linear relationships | H2, H3, H5, H11 | 5-6 |
| 28(c)(iii) | 1 | AM4: Modelling linear and non-linear relationships | H2, H3, H5 | 4-5 |
| 28(c)(iv) | 2 | AM4: Modelling linear and non-linear relationships | H2, H3, H5, H11 | 4-5 |

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Section 1

| | | | | | |
|-------|-------|--------|--------|--------|--------|
| Q1. C | Q5. C | Q9. C | Q13. D | Q17. A | Q21. B |
| Q2. A | Q6. D | Q10. C | Q14. C | Q18. D | Q22. A |
| Q3. A | Q7. D | Q11. B | Q15. B | Q19. C | |
| Q4. B | Q8. D | Q12. A | Q16. B | Q20. C | |

Section 2

| Question | Solution | Criteria | Marks |
|-----------|--|---|-------|
| 23(a) | $\tan 43^\circ = \frac{x}{15}$ $x = 15 \times \tan 43^\circ$ $= 13.9877..$ $= 14.0m$ | 2 marks for using trig ratio and obtaining correct answer 1 mark for using trig ratio | 2 |
| 23(b)(i) | 20% of 65 000 = 13 000 hectares | 1 mark for correct answer | 1 |
| 23(b)(ii) | Sector, column or picture graph NOT histogram because it is categorical data | 2 marks for correct alternative graph and correct reason 1 mark for a correct part of the answer | 2 |
| 23(c)(i) | $\frac{x}{16} = \frac{12.5}{5}$ $x = 40cm$ | 1 mark for correct answer | 1 |
| 23(c)(ii) | $Area = \pi \times \frac{5}{2} \times \frac{16}{2}$ $= 20\pi cm$ $= 62.83185...cm^2$ | 2 marks for correct working and answer 1 mark for using correct formula. | 2 |
| 23(d)(i) | Cost of shares = 1000×3.98 $= \$3980$ Brokerage fee = 1% of \$3980 $= 0.01 \times 3980$ $= \$39.80$ Total cost = $3980 + 39.80$ $= \$4019.80$ | 2 marks for correct working and answer 1 mark for correct calculation of brokerage fee or for correct total cost from incorrect calculation of brokerage fee or cost of shares | 2 |
| 23(d)(ii) | Dividend = $1000 \times 20\%$ $= 1000 \times 0.20$ $= \$200$ | 1 mark for correct answer | 1 |

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| Question | Solution | Criteria | Marks |
|------------|--|---|-------|
| 23(d)(iii) | Dividend yield $= \frac{\text{dividend}}{\text{market value}} \times \frac{100}{1}$ $= \frac{0.20}{3.98} \times \frac{100}{1}$ $= 5.0251...$ $= 5.03\%$ OR Dividend yield $= \frac{\text{dividend}}{\text{market value}} \times \frac{100}{1}$ $= \frac{200}{3980} \times \frac{100}{1}$ $= 5.03\%$ | 2 marks for correct working and answer 1 mark for use of dividend yield formula but incorrect calculation or substitution | 2 |
| 24(a) | $l = \sqrt{15^2 + 7.4^2}$ $= 16.724...$ $= 17m$ | 2 marks for using Pythagoras and obtaining correct answer 1 mark for use of Pythagoras | 2 |
| 24(b)(i) | Melbourne | 1 mark for correct answer | 1 |
| 24(b)(ii) | 100mm | 1 mark for correct answer | 1 |
| 24(b)(iii) | Similar shapes, Sydney- symmetrical Melbourne- slight positive skew More consistent rain in Melbourne because spread is less. Range S(63) c.f. M(20), IQR-S(45) c.f. M(10) Quite different locations with Melbourne's maximum less than Sydney's minimum. Any other statement that compare and contrast. | 3 marks for correct comments on each aspect 2 marks for significant correct comments. 1 mark for some relevant and correct comment. | 3 |
| 24(c) | $\frac{p}{5} = \frac{10}{2}$ $p = 25$ | 2 marks for correct ratio and correct answer 1 mark for progress towards answer | 2 |

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| Question | Solution | Criteria | Marks |
|------------|--|--|-------|
| 24(d)(i) | Interest = Prn $= 45000 \times 0.012 \times 1$ $= \$540$ OR Interest = $A(1+r)^n$ $= 45000(1+0.012)^1$ $= \$540$ | 1 mark for correct answer | 1 |
| 24(d)(ii) | Amount owing $= \text{Balance} + \text{interest} - \text{payment}$ $= 45000 + 540 - 512$ $= \$45028$ or Amount owing $= \text{Balance} + \text{interest} - \text{payment}$ $= 45000 + 540 - 512$ $= \$45028$ | 1 mark for correct answer | 1 |
| 24(d)(iii) | Kurt should not take out the loan because the repayments (\$512) do not cover the interest (\$540). Therefore the loan could never be repaid. | 2 marks for correct conclusion and correct justification 1 mark for correct conclusion without a reasonable justification | 2 |
| 25(a)(i) | $5 \times 3 \times 6 = 90$ | 1 mark for correct calculation | 1 |
| 25(a)(ii) | $\frac{1}{5 \times 3 \times 6} = \frac{1}{90}$ | 1 mark for correct answer | 1 |
| 25(a)(iii) | $1 \times \frac{2}{3} \times \frac{5}{6} = \frac{10}{18}$ $= \frac{5}{9}$ | 2 marks for correct answer 1 mark for any correct part of answer | 2 |
| 25(b)(i) | 68% | 1 mark for correct answer | 1 |
| 25(b)(ii) | 460mm | 1 mark for correct answer | 1 |
| 25(b)(iii) | $2\frac{1}{2}\%$ | 1 mark for correct answer | 1 |
| 25(c)(i) | $\text{median} = \frac{11+14}{2} = 12.5$ Standard deviation = 2.7 | 2 marks for both correct answers 1 mark for one correct answer. | 2 |

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| Question | Solution | Criteria | Marks |
|------------|--|--|-------|
| 25(c)(ii) | Crusaders (142 goals) c.f. Bulls (134 goals) Answer: Crusaders by 8 goals. | 2 marks for correct calculations of total goals and conclusion 1 mark for progress towards answer. | 2 |
| 25(c)(iii) | The Bulls are more consistent because they had a lower standard deviation (1.1) compared to the Crusaders (2.7) | 2 marks for comparing standard deviations and correct conclusion. 1 mark for comparing standard deviations and incorrect conclusion. | 2 |
| 26(a)(i) | $C = \frac{4 \times 24}{4 + 12} = 6ml$ | 1 mark for correct answer. | 1 |
| 26(a)(ii) | $12 = \frac{24n}{n+12}$ $24n = 12n + 144$ $n = 12 \text{ years}$ | 3 marks for correct substitution into formula and correct answer. 2 marks for significant accurate working towards answer. 1 mark correct substitution into formula. | 3 |
| 26(b)(i) | $A = M \left[\frac{(1+r)^n - 1}{r} \right]$ $= 150 \left[\frac{(1+0.0045)^{60} - 1}{0.0045} \right]$ $= 150 \left[\frac{1.0045^{60} - 1}{0.0045} \right]$ $= \$10305.71$ OR Using graphic calculator: $n = 5 \times 12$ $I = 5.4\%$ $PV = 0$ $PMT = 150$ $FV = 0$ $P/Y = 12$ $C/Y = 12$ $\therefore FV = \$10305.71$ | 2 marks for use of FV formula and correct substitution 1 mark for use of FV formula | 2 |

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| Question | Solution | Criteria | Marks |
|-----------|--|---|-------|
| 26(b)(ii) | $N = \frac{A}{(1+r)^n}$ $= \frac{10305.71}{(1+0.0045)^{60}}$ $= \frac{10305.71}{1.0045^{60}}$ $= \$7871.93$ <p>OR</p> <p>Using graphic calculator:</p> $n = 5 \times 12$ $I = 5.4\%$ $PV = 0$ $PMT = 0$ $FV = 10305.71$ $P/Y = 12$ $C/Y = 12$ $\therefore PV = \$7871.93$ <p>OR</p> $N = M \left[\frac{(1+r)^n - 1}{r(1+r)^n} \right]$ $= 150 \left[\frac{(1+0.0045)^{60} - 1}{0.0045(1+0.0045)^{60}} \right]$ $= 150 \left[\frac{1.0045^{60} - 1}{0.0045(1.0045)^{60}} \right]$ $= \$7871.93$ <p>OR</p> <p>Using graphic calculator:</p> $n = 5 \times 12$ $I = 5.4\%$ $PV = 0$ $PMT = 150$ $FV = 0$ $P/Y = 12$ $C/Y = 12$ $\therefore PV = \$7871.93$ | <p>2 marks for use of either PV formula and correct substitution</p> <p>1 mark for use of either PV formula</p> | 2 |
| 26(c)(i) | $59^\circ + 34^\circ = 93^\circ$ | 1 mark for correct answer | 1 |

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| Question | Solution | Criteria | Marks |
|------------|--|---|-------|
| 26(c)(ii) | $93 \times 60 = 5580$ nautical miles $l = \frac{\theta}{360} 2\pi r$ $= \frac{93}{360} \times 2 \times \pi \times 6400$ $= 10388.1997\dots$ $= 5609$ nautical miles | 1 mark for correct answer | 1 |
| 26(c)(iii) | $t = \frac{5580}{360}$ $= 15.5$ hours $= 15\text{hrs } 30 \text{ min.}$ | 1 mark for correct answer | 1 |
| 26(c)(iv) | $\text{Time difference} = (151-28)^\circ \times \frac{4}{60} = 8.2\text{hrs}$ $5\text{pm} - 8.2\text{hrs} = 8:48\text{am}$ | <p>2 marks calculating time difference and correct time</p> <p>1 mark for calculations working towards answer.</p> | 2 |
| 27(a) | $3(4y-2) + 2(3y+4) = 36$ $12y-6+6y+8 = 36$ $18y = 34$ $y = \frac{34}{18}$ $= \frac{17}{9}$ $= 1\frac{8}{9}$ | <p>3 marks for correct expansion and simplification to obtain correct answer.</p> <p>2 marks for significant accurate working towards answer.</p> <p>1 mark for some correct expansion and/or simplification.</p> | 3 |
| 27(b)(i) | $d = 24 \cos 63^\circ$ $= 10.89577199$ $= 10.9\text{km}$ | 1 mark for correct working and answer | 1 |

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| Question | Solution | Criteria | Marks |
|------------|--|--|-------|
| 27(b)(ii) | | 1 mark for correct diagram containing all information. | 1 |
| 27(b)(iii) | $\angle ABC = 27^\circ + 80^\circ = 107^\circ$ | 1 mark for correct answer. | 1 |
| 27(b)(iv) | <p>Cosine rule</p> $AC^2 = \sqrt{15^2 + 24^2 - 2 \times 15 \times 24 \times \cos 107^\circ}$ $= 31.8042077$ <p>Ans = 32km</p> | <p>3 marks for using cosine rule correctly and correctly rounding off to 32km.</p> <p>2 marks for using cosine rule correctly.</p> <p>1 mark for use of cosine rule.</p> | 3 |
| 27(c) | <p>$(0.97)^n = 0.8$</p> <p>Guess & check</p> <p>$(0.97)^7 = 0.807\dots$</p> <p>$(0.97)^8 = 0.783\dots$</p> <p>Answer = 8 times</p> <p>OR by logs</p> $x = \frac{\log 0.8}{\log 0.97} = 7.32\dots$ <p>Answer = 8 times</p> | <p>2 marks for evidence of guess & check (or logs) and correctly determining the answer.</p> <p>1 mark for some logical working towards answer.</p> | 2 |

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| Question | Solution | Criteria | Marks |
|-----------|---|--|-------|
| 27(d) | $\text{Financial Exp} = (15\,000 \times \frac{1}{5}) + (10\,000 \times \frac{1}{5})$ $+ (1\,000 \times \frac{1}{5}) + (50 \times \frac{1}{5}) + (1 \times \frac{1}{5})$ $= \$5\,210.20$ | <p>2 marks for correct working and answer</p> <p>1 mark for correct formula and some substitution</p> | 2 |
| 28(a)(i) | | <p>2 marks for correct diagram and probabilities.</p> <p>1 mark for significant amount of correct information.</p> | 2 |
| 28(a)(ii) | <p>From tree diagram:</p> $\text{Blue/White}(\frac{4}{25}) + \text{Green/White}(\frac{4}{25})$ $+ \text{White/Blue}(\frac{3}{25}) + \text{White/White}(\frac{2}{25}) = \frac{13}{25}$ <p>OR</p> $P(\text{at least one white}) = 1 - P(\text{neither white})$ $= 1 - (\frac{4}{5} \times \frac{3}{5})$ $= 1 - \frac{12}{25}$ $= \frac{13}{25}$ | <p>2 marks for correct calculation and answer.</p> <p>1 mark for progress towards answer.</p> | 2 |

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| Question | Solution | Criteria | Marks |
|------------|---|---|-------|
| 28(b)(i) | Payment = 18000×0.3080 = \$5544 | 1 mark for correct answer | 1 |
| 28(b)(ii) | Total payments = 5544×3 = \$16632 Interest = $18000 - 16632$ = \$1368 | 2 marks for correct answer 1 mark for correct calculation of total payments or correct interest calculation from incorrect calculation of total payments | 2 |
| 28(c)(i) | Total surface area = (top + base) + 4 sides = $2x^2 + 4[x(9-x)]$ = $2x^2 + 4x(9-x)$ = $36x - 2x^2$ | 2 marks for correct surfaces and algebraic substitution to obtain answer. 1 mark for some logical working towards answer. | 2 |
| 28(c)(ii) | Surface area cannot be negative. Equation is negative for $x < 0$ and $x > 9$. | 1 mark for correct explanation. | 1 |
| 28(c)(iii) | Maximum volume when $x=6$ | 1 mark for correct answer | 1 |
| 28(c)(iv) | $S = 2x^2 + 4x(9-x) = 2x^2 + 36x - 4x^2 = 36x - 2x^2$ $S = 36(6) - 2(6)^2 = 216 - 72 = 144 \text{ cm}^2$ | 2 marks for correct substitution and correct answer. 1 mark for some progress towards answer. | 2 |

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