



Maitland Grossmann High School

2007
HSC COURSE
HALF-YEARLY EXAMINATION

GENERAL MATHEMATICS

General Instructions:

- Reading Time – 5 Minutes.
- Writing Time – 2 Hours.
- Write using blue or black pen.
- Calculators may be used.
- A formulae sheet is provided at the back of this paper.

Total Marks - 85

Section I: Total Marks (20)

- Attempt Questions 1 – 20.
- Allow about 30 minutes for this section.

Section II: Total Marks (65)

- Attempt Questions 21 – 25
- Allow about 1½ hours for this section.
- All necessary working must be shown.
- Start each new question on a new page
- Marks may be deducted for poorly or badly arranged work.

Section I - 20 marks Attempt Questions 1-20

Allow about 30 minutes for this section

1. Simplify $3(x - 2) - 2(x - 1)$.
(A) $x - 4$ (B) $x - 3$
(C) $x - 1$ (D) $x - 8$
2. Using the tax table, determine the tax payable on a taxable income of \$43 500.

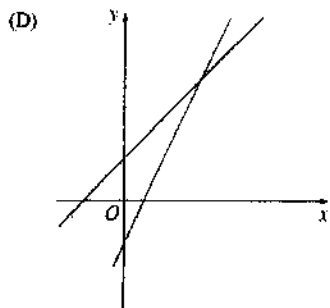
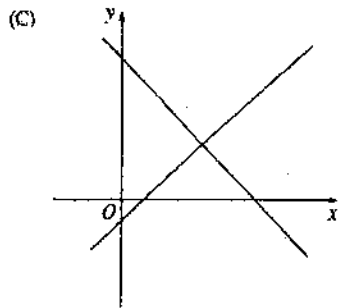
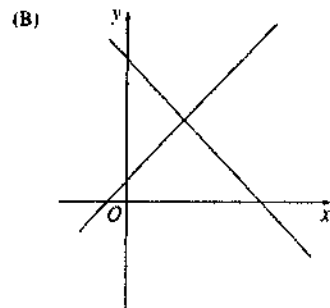
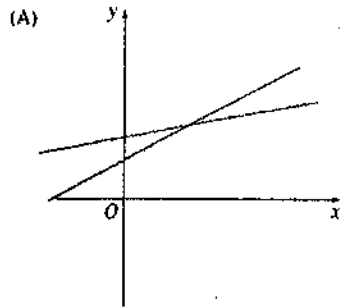
| Taxable income | Tax on this income |
|---------------------|---|
| \$0 – \$6 000 | NIL |
| \$6 001 – \$22 000 | 16 cents for each \$1 over \$6 000 |
| \$22 001 – \$45 000 | \$2 560 plus 25 cents for each \$1 over \$22 000 |
| \$45 001 – \$60 000 | \$8 310 plus 40 cents for each \$1 over \$45 000 |
| \$60 001 and over | \$14 310 plus 48 cents for each \$1 over \$60 000 |

- (A) \$2560 (B) \$7935
(C) \$8060 (D) \$8310
3. Which equation represents the relationship between x and y in this table?

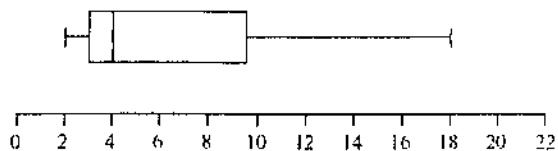
| | | | | | |
|-----|---|---|----|----|----|
| x | 1 | 2 | 3 | 4 | 5 |
| y | 3 | 7 | 11 | 15 | 19 |

- (A) $y = x + 2$ (B) $y = 3x$
(C) $y = 2x + 1$ (D) $y = 4x - 1$
4. If $y = 3x^3 - 2$, what is the value of y , when $x = -2$
(A) -20 (B) -22
(C) -24 (D) -26
 5. Ella invested \$3000 for two years at 12% p.a. interest compounded 6-monthly. The value of her investment after this time is closest to:
(A) \$3120 (B) \$3720
(C) \$3760 (D) \$3790

6. Amanda drew a correct diagram that gave the solution to the simultaneous equations $y = x + 3$ and $y = \frac{x}{4} + 5$. Which diagram did she draw?



7. This box-and-whisker plot represents a set of scores.



What is the interquartile range of this set of scores?

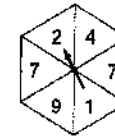
- (A) 4 (B) 6.5
(C) 9.5 (D) 16

8. A large spherical water tank has a radius of 3m.

What is the approximate volume of the tank?

- (A) 27 m^3 (B) 81 m^3
(C) 113 m^3 (D) 152 m^3

9. The diagram shows a spinner.

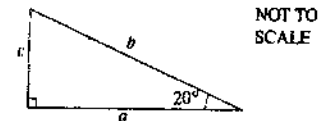


The arrow is spun and will stop in one of the six sections.

What is the probability that the arrow will stop in a section containing a number greater than 2?

- (A) $\frac{2}{3}$ (B) $\frac{3}{5}$
(C) $\frac{1}{2}$ (D) $\frac{5}{6}$

10. What is the correct expression for $\cos 20^\circ$ in this triangle?



NOT TO SCALE

- (A) $\frac{c}{b}$ (B) $\frac{b}{a}$
(C) $\frac{a}{c}$ (D) $\frac{a}{b}$

11. What is the median of this set of scores: 4, 4, 5, 5, 6, 6, 7, 7, 7, 8, 8

- (A) 5.5 (B) 6
(C) 6.5 (D) 7

12. Daniel has 3000 shares with a current market value of \$2.70 each. During the past 12 months, Neville received a total dividend of \$243.

What is the current dividend yield on these shares?

- (A) 0.03% (B) 0.3%
(C) 3% (D) 3.3%

13. What is the gradient of the line with y-intercept 6, and x-intercept 3?

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

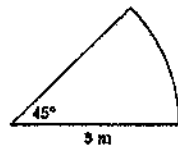
14. Warren used the 'capture-recapture' technique to estimate the number of rabbits living in a particular area.

- He caught, tagged and released 60 rabbits.
- Later, he caught 250 rabbits at random from the same area.
- He found that 10 of these 250 rabbits had been tagged.

What is the correct estimate for the total number of rabbits living in this area, using the 'capture-recapture' technique?

- (A) 850 (B) 1000
(C) 1250 (D) 1500

- 15.



The area of this sector is approximately

- (A) 2.4 m^2
(B) 3.5 m^2
(C) 18.8 m^2
(D) 28.3 m^2

16. The manager of a nursery measures the height of his seedlings at 9:00 am every morning. Which of the following best describes the type of data collected?

- (A) categorical (B) discrete
(C) continuous (D) meticulous

17. Calculate the simple interest earned if \$2100 is invested for 8 years at a rate of 6% p.a.

- (A) \$16 800 (B) \$3108
(C) \$1008 (D) \$826

18. The scale on a model plane is 1:150. If the actual length of the plane is 70m, what is the approximate length of the model plane?

- (A) 47 cm (B) 105 cm
(C) 21 cm (D) 64 cm

19. Ashlee purchased a camera for \$704 while on holidays in Australia. This price included 10% GST. When she left Australia she received a refund of the GST. What was Carmen's refund?

- (A) \$52 (B) \$64
(C) \$70.40 (D) \$78.22

20. A compass direction of South-East could also be described as a True bearing of:

- (A) 045° (B) 135°
(C) 225° (D) 315°

Section II

20 marks

Attempt Questions 21-25

Allow about 90 minutes for this section

Start each question on a NEW page.

All necessary working should be shown in every question

Question 21

Marks

- a. Calculate the total to be repaid on a \$6000 loan at 8% p.a. flat rate interest to be repaid over 4 years. 2
- b. Barry borrows \$11 500 to buy a new car. He repays the loan over 5 years at \$280 per month. Calculate the flat rate of interest charged on the loan (to 1 decimal place). 3
- c. Azhar borrowed \$140 000 to buy a home at 9% p.a. reducible interest over 25 years. The monthly repayment is \$1174.60. Copy and complete the table below. 2

| Month | Principal (\$) | Interest (\$) | Balance Owning (\$) |
|-------|----------------|---------------|---------------------|
| 1 | 140 000 | 1050 | 139 875.40 |
| 2 | 139 875.40 | | |

- d. An extract from a credit card statement is shown below.
Interest rate = 16% p.a. Interest is calculated daily on the outstanding balance.

| Date | Credit | Debit | Balance |
|---------------------------|--------|------------------|---------|
| 1 st November | | | \$400 |
| 9 th November | \$300 | | \$100 |
| 17 th November | | \$650 - purchase | \$750 |
| 24 th November | | \$175 - purchase | \$925 |
| 1 st December | | ? - interest | |

- i) Calculate the daily interest rate (use 1 year = 365.25 days)
Give your answer correct to 5 decimal places. 1
- ii) Calculate the interest that would be due for the month of November? 2

- e. Mr and Mrs Richards decide to borrow \$245 000 over a period of 20 years at a rate of 7.5% per annum. **Marks**

| MONTHLY REPAYMENT TABLE | | | | | | |
|--|----------------------|-------|------|------|------|------|
| Principal and interest per \$1000 borrowed | | | | | | |
| Interest rate (pa) | Term of loan - years | | | | | |
| | 5 | 10 | 15 | 20 | 25 | 30 |
| 6.5% | 19.57 | 11.35 | 8.71 | 7.46 | 6.75 | 6.32 |
| 7.0% | 19.80 | 11.61 | 8.99 | 7.75 | 7.07 | 6.65 |
| 7.5% | 20.04 | 11.87 | 9.27 | 8.06 | 7.39 | 6.99 |
| 8.0% | 20.28 | 12.13 | 9.56 | 8.36 | 7.72 | 7.34 |

- (i) Using the Monthly Repayment Table, calculate their monthly repayment. 1
- (ii) How much interest do they pay over the 20 years? 2

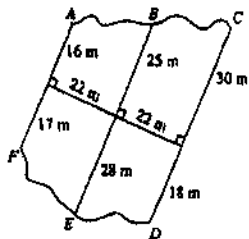
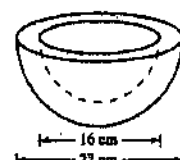

Question 22

Marks

- a. Consider the scores 3, 4, 5, 5, 8, 9, 12, 15, 18, 20
- i) Calculate the mean 1
 - ii) Find the median 1
- b. The results for two classes in a Geography test are listed below:
- Class A: 43, 50, 54, 63, 75, 48, 68, 72, 65, 63, 70, 69, 55, 64, 73, 66, 50, 59
 Class B: 35, 89, 42, 79, 45, 90, 64, 53, 66, 82, 71, 63, 32, 79, 44, 92, 46, 63
- i) Represent the data in a back-to-back stem-and-leaf plot with stems 3, 4, ... 3
 - ii) Find the range and interquartile range for each class. 3
- c. Cholesterol levels of males in the hospitality industry follow a normal distribution with a mean of 5.8 mmol/L (millimoles per litre) and a standard deviation of 0.3 mmol/L. If the recommended level is less than 5.5 mmol/L, what percentage of males have a healthy cholesterol level. 1
- d.
- i) Colin received a z-score of 1.5 in an assessment task. What does this mean? 1
 - ii) If the task mean was 68 and Colin's raw score was 82, what was the task standard deviation (as a fraction)? 1
 - iii) What was Kel's z-score (to 1 decimal place) if he scored 55 for the task? 1
 - iv) What was Mike's score (to the nearest whole number) if his z-score was 0.85? 1

Question 23

Marks

- a. The diagram (not to scale) shows an irregular area of land (ABCDEF). Use Simpson's rule twice to find the approximate area of the land. 3
- 
- b. Rosemary is having a party and decides to make an 'ice bowl' to hold punch. She freezes water in the space between two hemispherical bowls of diameter 16 cm and 22 cm.
- 
- i) What is the capacity of the 'ice bowl' (in litres)? 1
 - ii) What is the total surface area (inside and outside) of the 'ice bowl', correct to 1 decimal place? 4
- c. Calculate the area of this figure (rectangle and semi-circle), correct to 2 decimal places. 2
- 
- d. The side of a square courtyard is measured to be 5.8 m. (to 1 decimal place)
- i) What is the greatest possible error in this measurement? 1
 - ii) Between what two limits does its area lie? 2

Question 24

Marks

- a. The 'Safe As Houses' investment company will receive \$2000 at the end of each year for 5 years from a client. The money will earn 6% p.a. compounded annually. What is the present value of this annuity? 2
- b. Calculate the present value of an investment that is needed to have a future value of \$70 000 in 25 years time if it is invested at 15% p.a. with interest compounded annually. 2
- c. i) What is the future value of an annuity of \$6500 per year invested at the end of each year at an interest rate of 8% p.a. for 18 years? 2
 ii) What is the total interest earned? 1
- d. Harry opens a superannuation fund account earning 10% p.a. and plans to make a regular deposit every birthday, starting on his 52nd birthday and ending on his 60th birthday. If he wants to have \$500 000 when he retires at 60, what amount does he need to deposit each year? 2
- e. Mary borrows \$28 000 from a credit union at 6% per annum compounding monthly. She will repay the money over six years. Mary uses the formula:

$$28\,000 = M \left\{ \frac{(1+r)^n - 1}{r(1+r)^n} \right\}$$

to calculate her monthly repayment, M .

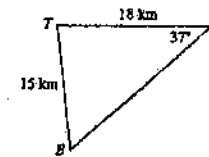
- (i) Rewrite the formula, showing the correct substitutions for r and n . 1
 (ii) Calculate Mary's monthly repayment. 2

- f. Use the formula $E = \frac{(1+r)^n - 1}{r}$ to calculate the effective interest rate on a loan of \$1700 at 10% p.a. over 6 years, correct to 1 decimal place. 1

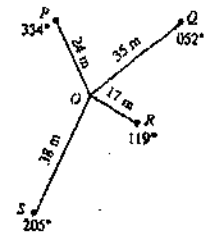
Question 25

Marks

- a. Calculate the size of $\angle TBA$, correct to the nearest minute. 2



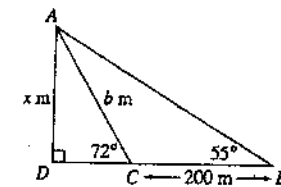
- b. This diagram shows the result of a compass radial survey.
 i) Find the size of $\angle POQ$ 1
 ii) Hence calculate the length of PQ to the nearest metre. 2
 iii) Calculate the area of $\triangle POQ$ to the nearest square metre. 1



- c. An isosceles triangle has two equal sides of length 11 cm and the other side is 17 cm. Calculate the size of one of the equal angles to the nearest degree. 2

- d. i) Use the information given in the diagram and the sine rule in $\triangle ABC$ to show that 3

$$b = \frac{200 \sin 55^\circ}{\sin 17^\circ}$$



- ii) Hence find the value of b correct to 1 decimal place. 1
 iii) Hence find the value of x correct to 1 decimal place. 1

Maitland Grossmann High School
 General Mathematics HSC Course
 2007 Half-Yearly Exam

Name SOLUTIONS Class _____

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

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

A B C D

If you think that 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 the correct answer by writing the word correct and drawing an arrow as follows

A B C D correct

Section I - (Use a blue or black pen)

- | | | |
|---|--|--|
| 1. <input checked="" type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 9. <input checked="" 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 checked="" type="radio"/> C <input type="radio"/> D |
| 2. <input type="radio"/> A <input checked="" 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 checked="" type="radio"/> D | 18. <input checked="" 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 checked="" type="radio"/> D | 11. <input type="radio"/> A <input checked="" type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 19. <input type="radio"/> A <input checked="" 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 checked="" type="radio"/> D | 12. <input type="radio"/> A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D | 20. <input type="radio"/> A <input checked="" 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 checked="" type="radio"/> D | 13. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input checked="" type="radio"/> D | |
| 6. <input checked="" 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 checked="" type="radio"/> D | |
| 7. <input type="radio"/> A <input checked="" type="radio"/> B <input type="radio"/> C <input type="radio"/> D | 15. <input type="radio"/> A <input checked="" type="radio"/> B <input type="radio"/> C <input type="radio"/> D | |
| 8. <input type="radio"/> A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D | 16. <input type="radio"/> A <input type="radio"/> B <input checked="" type="radio"/> C <input type="radio"/> D | |

2007 1/2 General Mathematics

(2) i) Interest = $\$(6000 \times 0.03 \times 4)$
 $= \$720$
 Total = $\$(720 + 6000)$
 $= \$6720$
 Total to be repaid is $\$7920$ (2)

ii) Int = $\$(400 \times 0.000044 \times 8) + (100 \times 0.000044 \times 8) + (150 \times 0.000644 \times 7) + (42.5 \times 0.000044 \times 6)$ (2)
 $= \$(1.408 + 0.352 + 2.31 + 2.144)$
 $= \$6.92$ (2dp) $\$6.51$ (2dp)

b) Total Paid = $\$(5 \times 12 \times 280)$
 $= \$16800$
 Total Interest = $\$(16800 - 11500)$
 $= \$5300$ (2)
 Annual interest = $\$(\frac{5300}{5})$
 $= \$1060$

Monthly repayment = $\$(245 \times 9.06)$
 $= \$2229.70$ (1)

Annual interest rate = $(\frac{1060}{11500} \times 100)\%$
 $= 9.2\%$ (1dp)

iii) Total repaid = $\$(197 \times 10 \times 12 \times 20)$
 $= \$473928$
 Interest = $\$(473928 - 245000)$
 $= \$228928$ (2)

24 cents (2)
 $I = Prn$
 $5300 = 11500 \times r \times 5$
 $r = 0.0925$
 $\frac{0.0925 \times 139875.4}{12}$
 $= 0.04380552$ (1)
 $= 0.00044$ (5dp)

They pay $\$228928$ interest over 10 years
 (22) i) Mean = $\frac{99}{10}$
 $= 9.9$
 ii) Median = $\frac{8+9}{2}$
 $= 8.5$

| Month | Principal | Interest | Balance |
|-------|-----------|----------|-----------|
| 1 | 140000 | 1050 | 139875.4 |
| 2 | 139875.4 | 1049.07 | 139749.87 |

| Class A | Class B |
|---------|---------|
| 3 | 25 |
| 83 | 2+56 |
| 45400 | 53 |
| 9865433 | 633+6 |
| 5320 | 7194 |
| | 824 |
| | 902 |

$$(15) \frac{\sin A}{a} = \frac{\sin B}{b}$$

$$\frac{\sin B}{17} = \frac{\sin 37^\circ}{15}$$

$$\sin B = \frac{17 \sin 37^\circ}{15}$$

$$B = 46^\circ 14' \text{ (nearest minute)}$$

$$b) \text{ i) } \angle POQ = 52^\circ + (360 - 334)^\circ = 78^\circ$$

$$\text{ii) } c^2 = a^2 + b^2 - 2ab \cos C$$

$$c^2 = 24^2 + 35^2 - 2 \times 24 \times 35 \times \cos 78^\circ$$

$$c = \sqrt{24^2 + 35^2 - 2 \times 24 \times 35 \times \cos 78^\circ}$$

$$= 38 \text{ (nearest whole no.)}$$

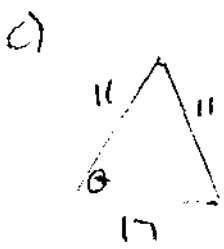
\therefore PQ is approx. 38m

$$\text{iii) } A = \frac{1}{2} ab \sin C$$

$$= \frac{1}{2} \times 24 \times 35 \times \sin 78^\circ$$

$$= 411 \text{ (nearest whole no.)}$$

\therefore area is approx 411 m²



$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos \theta = \frac{11^2 + 11^2 - 17^2}{2 \times 11 \times 11}$$

$$\theta = 39^\circ \text{ (nearest deg.)}$$

d) In ΔACB

$$\angle ACB = (180 - 70)^\circ = 110^\circ$$

$$\angle CAB = (180 - 109 - 55)^\circ = 17^\circ$$

$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

$$\frac{b}{\sin 55^\circ} = \frac{200}{\sin 17^\circ}$$

$$\therefore b = \frac{200 \sin 55^\circ}{\sin 17^\circ}$$

$$\text{ii) } b = \frac{200 \sin 55^\circ}{\sin 17^\circ} = 560.3 \text{ (1 dg)}$$

$$\text{iii) } \sin 72^\circ = \frac{x}{b}$$

$$x = \sin 72^\circ \times b$$

$$= \frac{\sin 72^\circ \times 200 \sin 55^\circ}{\sin 17^\circ}$$

$$= 532.9 \text{ (1 dg)}$$