



StudentNumber.....

Teacher's Name.....

MORIAH COLLEGE

Year 12

MATHEMATICS PRE-TRIAL

General Mathematics

Date: 16th MARCH, 2007

Time Allowed: 2 ½ hours plus 5 minutes reading time.

Examiners: Mr Wagner, Mr Vass

Candidates should remove the formula sheet and answer sheet from the end of the paper. Write your ID number and teacher on the answer booklet and this question paper immediately.

General Instructions

- Reading time – 5 minutes
- Working time – 2½ hours
- Write using black or blue pen
- Calculators may be used
- A formula sheet is provided at the back of this paper.

Total marks – 100

Section A

20 marks

- Attempt Questions 1–20
- Allow about 30 minutes for this section
- Answers are to be marked on the answer sheet provided.

Section B

80 marks

- Attempt Questions 21–28
- Allow about 2 hours for this section
- All solutions are to be written on this question paper

Section A

20 marks

Attempt Questions 1–20

Allow about 30 minutes for this section

Use the multiple-choice answer sheet.

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

Sample: $2 + 4 =$

(A) 2
A ☐

(B) 6
B ☒

(C) 8
C ☐

(D) 9
D ☐

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

A ☒

B ☒

C ☐

D ☐

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

A ☒

B ☒

C ☐

D ☐

correct



Section 1 Multiple Choice Questions (20 marks)

Mark the correct answer on the answer sheet provided. Fill in the response circle completely.

1. Use the formula $s = ut + \frac{1}{2}at^2$ to find the value of s if $u=8$, $a=10$ and $t=5$.

- | | |
|---------|---------|
| (A) 165 | (B) 665 |
| (C) 65 | (D) 540 |
-

2. Simplify $10(x+3) - 2(4x+2)$

- | | |
|------------|-------------|
| (A) $2x+5$ | (B) $2x+26$ |
| (C) $6x+5$ | (D) $6x+26$ |
-

3. The size of a television is determined by measuring the length of the diagonal of the screen, to the nearest centimetre. If the screen of a certain television is 45cm long wide and 24cm high, what size is the television?

- | | |
|----------|----------|
| (A) 38cm | (B) 47cm |
| (C) 60cm | (D) 51cm |
-

4. When fully simplified, $4x^2 \times 5x^3$ is the same as

- | | |
|-------------|-------------|
| (A) $20x^6$ | (B) $9x^5$ |
| (C) $9x^6$ | (D) $20x^3$ |

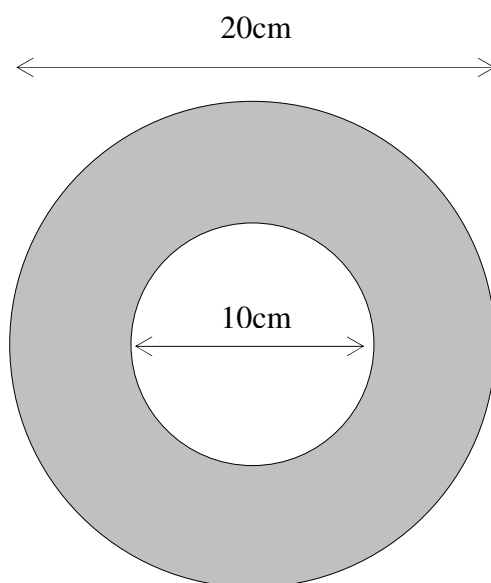
5.

Score	Frequency
13	10
14	9
15	7
16	4
17	3
Total	33

Determine the median for this set of scores

- (A) 13 (B) 14
(C) 15 (D) 16
-

6.



Which expression will give the area in square centimetres, of the annulus above?

- (A) $\pi(20^2 - 10^2)$ (B) 100π
(C) 75π (D) 75
-

7. A house plan shows a scale of 1:50. A room in this house has a length of 10 metres. How long will the room measure on the plan?

- (A) 5cm (B) 2cm
(C) 500cm (D) 20cm

8. A 12 minute phone call costs \$2.52. James spoke on the phone for one and a half hours. What was the cost of James' call?

(A) \$12.60 (B) \$25.20
(C) \$18.90 (D) \$31.50

9. A set of 4 test marks has a mean of 60. If a score of 80 is then added to the distribution the new mean of the marks will

(A) Rise by 20. (B) Rise by 80.
(C) Rise by 4. (D) Rise by 16.

Note: This information is used in the next two questions

10. Edward takes out a loan of \$10 000 to buy a car. He makes monthly payments of \$320 for 4 years. Jane took out the same loan and after paying a 20% deposit made monthly payments of \$200 for 4 years.

How much interest was Edward charged?

(A) \$2 800 (B) \$12 800
(C) \$5 360 (D) \$15 360

11. What rate of interest per annum was Jane charged?

(A) 4% (B) 5%
(C) 16% (D) 20%

12. Consider the following stem and leaf plot below.

<u>Stem</u>	<u>Leaf</u>
1	2
2	1 3 5 5
3	1 3 4
4	5 6
5	8 9

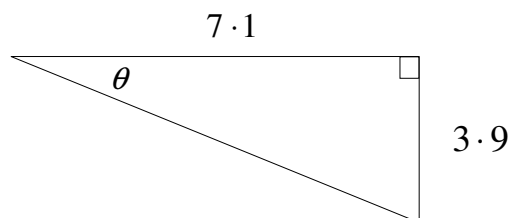
What is the interquartile range for this set of data?

- (A) 33 (B) 21.5
(C) 47 (D) 32
-

13. Moriah College has 3 different entrances through which students are allowed to enter. Karen arrives at school and passes through one of the entrances. Later on in the day Natali arrives and enters the school. What is the probability that Natali used the same entrance as Karen?

- (A) $\frac{1}{9}$ (B) $\frac{1}{3}$
(C) $\frac{1}{2}$ (D) $\frac{2}{3}$
-

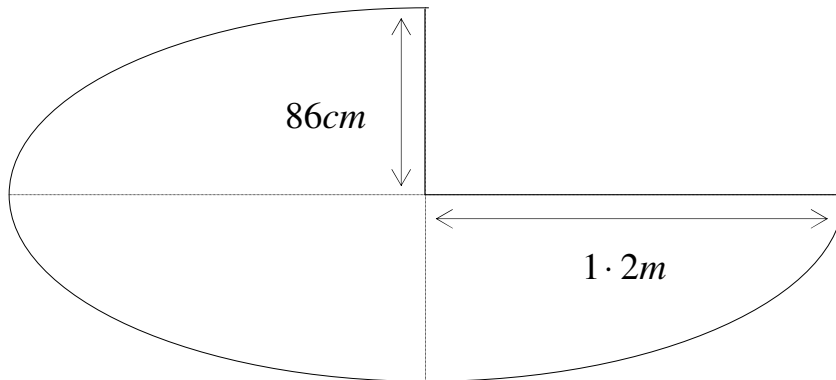
14.



Correct to the nearest degree, $\theta = ?$

- (A) 6 (B) 29
(C) 33 (D) 57

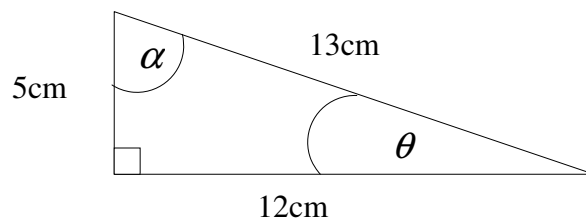
15.



The shape drawn above is formed by removing one quarter of the ellipse. The area of the shape is closest to

- (A) 24075cm^2 (B) 4500cm^2
 (C) 2.43m^2 (D) 45m^2
-

16. For the triangle drawn, which has the greatest value

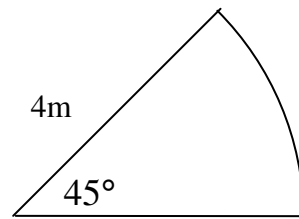


- (A) $\tan \alpha$ (B) $\cos \theta$
 (C) $\tan \theta$ (D) $\sin \theta$
-

17. Mr. Wagner's Year 12 class consists of 14 students. There are seven males and seven females. Two students are to be selected for benching. How many different combinations can be chosen if there must be one male and one female?

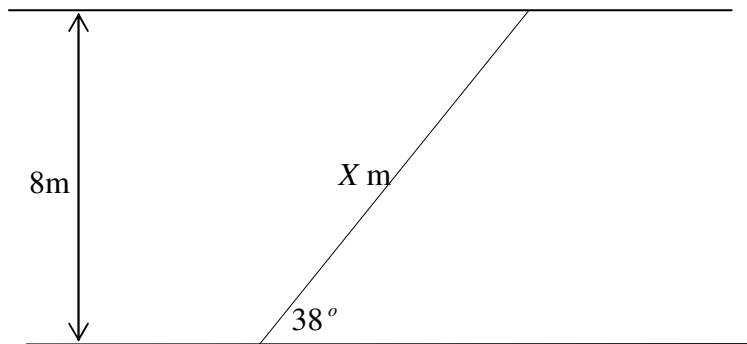
- (A) 14 (B) 42
 (C) 49 (D) 91

18. Which of the following calculations will give the perimeter of this sector of a circle?



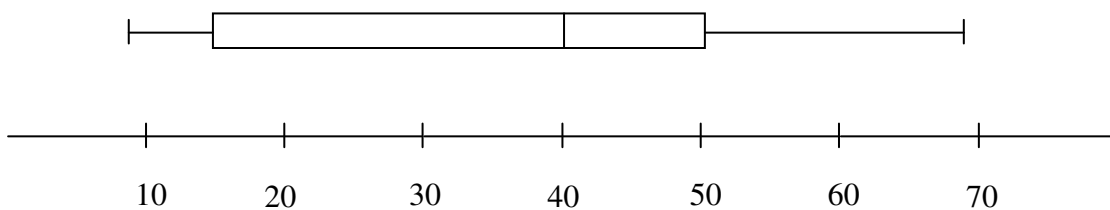
- (A) 16
- (B) $8 + \pi$
- (C) π
- (D) 2π

19. The value of X , (correct to 3 decimal places) in the diagram below is



- (A) 4.925 (B) 6.304
(C) 10.152 (D) 12.994

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



Which of the following statements is true?

- (A) The range is greater than 70. (B) The median test score is 50.
- (C) 25% of scores are greater than 50. (D) A score of 75 would be an outlier.

Section 11 Answer these questions in the spaces provided.

Question 21

a) Solve the equations

i) $15 - 2y = 10$ (2)

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

b) The distance between Earth and Mars is 78 300 000 km. An unmanned rocket is sent from Earth directly to Mars and takes 200 days to reach the planet.

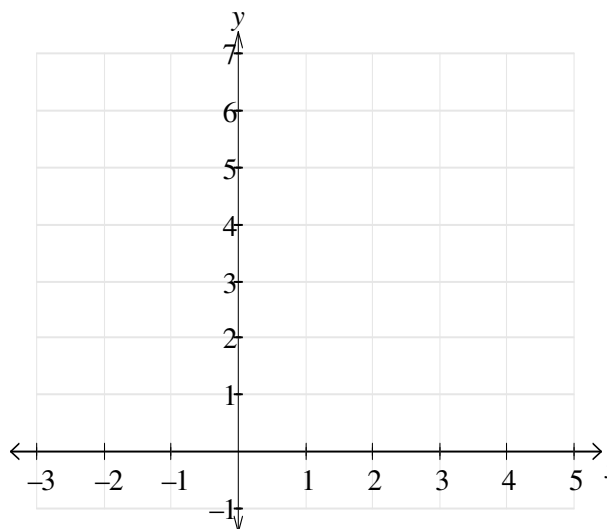
i) Express the distance from earth to Mars in scientific notation. (1)

ii) Find the average speed of the rocket. (Give answer correct to nearest km/h) (3)

Question 22

- a) i) By completing the table sketch the line which has the equation $y = 4 - x$ (5)
showing the points where the line cuts both of the axes.

x	-2	0		
y			1	0



- ii) What is the gradient of this line? (1)

- iii) If this line was extended would it eventually pass directly (2)
 through the point $(-98, 102)$. Show working to justify your answer.

- b) When Nicholas measured the height of a building he found it to be (2)
 $12 \cdot 4$ metres. The true height of the building was 12 metres.

Calculate the percentage error in Nicholas' measurement (correct to 2 d.p.).

Question 23

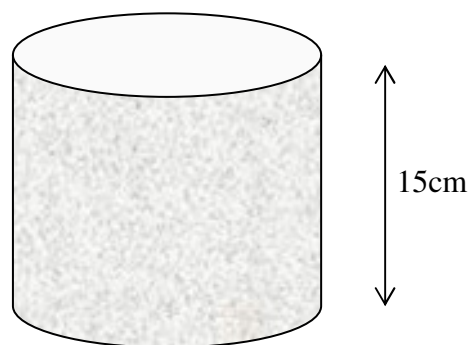
- a) A raffle has 200 tickets sold and there are two prizes to be won.
Natalie buys five tickets. Each ticket sold can only win one prize.
- i) To calculate the probability of winning first prize Natalie wrote down her working as follows: (2)

$$P(\text{win}) = \frac{X}{Y}$$

What were the values of X and Y ?

- ii) If Natalie won first prize, find the probability that she then won second prize. (2)

- b) The solid shown is a cylinder made of gold.
It has a volume of 600cm^3
and a height as shown of 15cm .



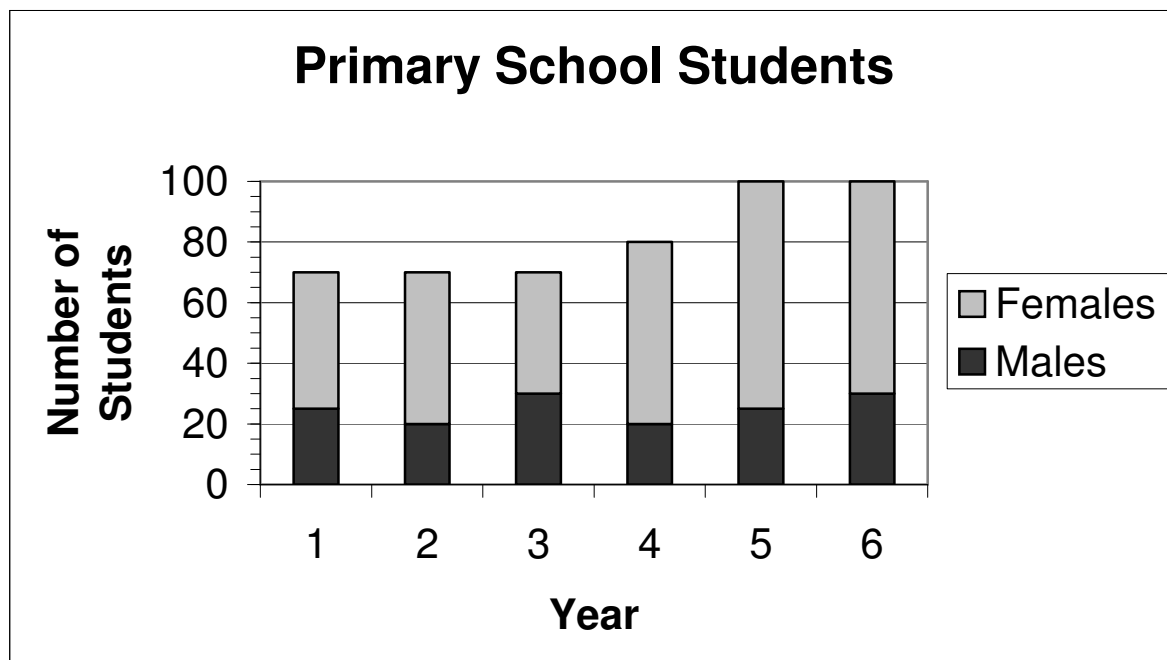
- i) Explain why the area of the base of the cylinder is 40cm^2 . (1)

ii) Find the radius of the base of the cylinder. (Give answer correct to 2 decimal places) (2)

iii) The cylinder is to be melted down and recast into a sphere. Find the radius of the sphere. (Give answer correct to 2 significant figures) (3)

Question 24

a) The diagram shows male and female students in a primary school from Year 1 to Year 6.



i) There are 100 students in Year 5. True or False. (1)

ii) How many more females are there in Year 4 than in Year 2? (2)

iii) What percentage of Year 3 is male? (give answer to nearest percent) (2)

iv) What is the ratio of male to female students in Year 1? (1)

v) What is the mean number of males in each year? (1)

vi) Find the standard deviation for the males in each year? (1)

vii) Jonathon said that the number of females in each year was more consistent than the number of males. Was he correct? Justify your answer with appropriate working. (2)

Question 25

a)

Adrian's Loan Repayments

Amount borrowed = \$15,000

Interest rate = 18% p.a. reducible
= 1.5% per month

Monthly repayment R = \$400

<u>Time</u> (end of)	<u>Principal</u> P	<u>Interest</u> I	P+I	<u>Amount still owing</u> P+I-R
1st month	\$15,000			A
2nd month	\$14,825.0000	B	\$15,047.3750	14647.3750
3rd month	14647.3750	219.7106	14867.0856	14467.0856
4th month	14467.0856	217.0063	C	14284.0919
5th month	14284.0919	214.2614	14498.3533	14098.3533
6th month	14098.3533	211.4753	14309.8286	13909.8286
7th month	13909.8286	208.6474	14118.4760	13718.4760
8th month	13718.4760	D		
9th month			13912.8556	13512.8556
10th month	13512.8556	202.6928	13715.5484	13315.5484
11th month	13315.5484	199.7332	13515.2816	13115.2816
12th month	13115.2816	196.7292	13312.0109	13106.2337

The table shows information regarding Adrian's loan. Several values are missing from the table. Answer the following questions related to the table.

- i) Explain the meaning of "reducible interest" (1)

ii) Why must the repayment be more than \$225? (1)

iii) Find the following missing values in the table which have been labelled: (5)

A

B

C

D

iv) How much of the loan has Adrian effectively paid back after 12 months? (1)
(Give answer to nearest dollar)

v) After how many months does Adrian owe less than 90% of his initial loan? (2)

Question 26

- a) Calli wanted to buy a Mazda Astina, which was advertised for \$30 000 cash or on terms. The terms were a 15% deposit and the balance to be repaid over 5 years with monthly repayments. Interest was charged at a flat rate of 9% p.a. She chose to pay on terms.

i) Find the deposit (1)

ii) Find the amount of interest to be paid (2)

iii) Find the monthly repayment (3)

b) Taxation Table for financial year 2001-2002.

Taxable Income (\$)	Tax Payable (\$)
0-6 000	Nil
6 001-20 000	Nil + 17% of excess over \$6 000
20 001-50 000	2 380 + 30% of excess over \$20 000
50 001-60 000	11 380 + 42% of excess over \$50 000
60 001 plus	15580 + 47% of excess over \$60 000

i) Leah had a taxable income in 2002 of \$68 000. Use the tax table above to calculate her tax payable. (2)

ii) Adam had a taxable income of \$20 000 in 2002. He had tax instalments of \$120 per fortnight taken from his wage throughout the financial year. (4)

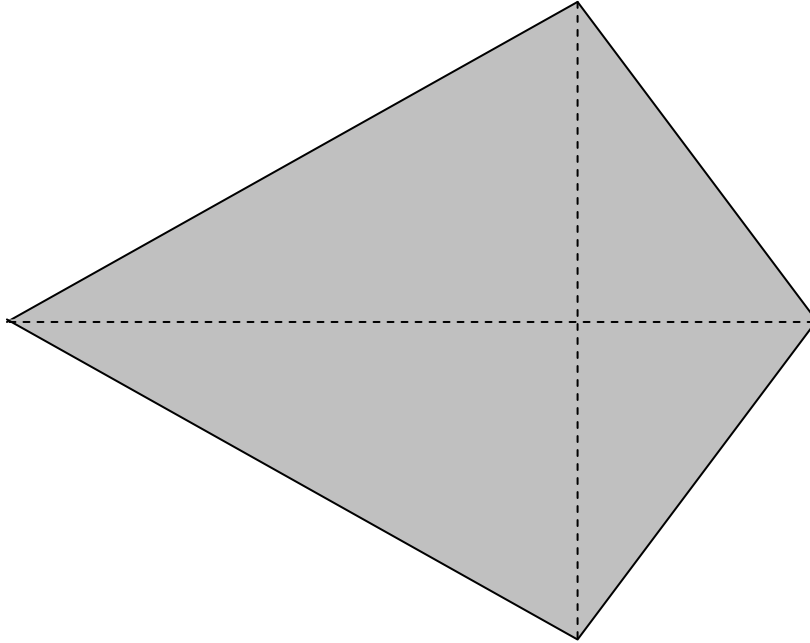
Did Adam receive a refund from the taxation office and if so, how much did he receive?

iii) Ben forgot his taxable income but recalled that his tax payable was exactly \$6 880. Using this information and the table above he was able to calculate his taxable income for 2002. (3)

What was his taxable income?

Question 27

- a) A kite is constructed as shown in the diagram below.
The two dotted lines represent the support arms of the kite. They are 60cm and 90cm respectively in length.



- i) Find the area of the kite. (3)

- ii) The grey plastic material used to cover the kite costs \$120 per square metre. (3)

Find the cost of covering the kite above.

- b) Alex decides to take the kite above and enjoy some flying. He allows the kite to fly so that the angle of elevation of the kite from the ground is 30° . The length of string joining the kite to the ground is 150m.

i) Draw a diagram showing the information presented clearly. (2)

ii) Find the height of the kite above the ground. (3)

iii) As a result of the the wind increasing in strength and Alex allowing an *extra* 50 metres of string to the kite it reached a new altitude of 110 metres. (4)

What was the increase in the angle of elevation? (Give answer to nearest degree).

General Mathematics

Multiple-choice answer sheet

Student Number : _____

Teacher's Name: _____

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

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

$$A = \frac{\theta}{360} \pi r^2$$

θ = number of degrees in central angle

Arc length of a circle

$$l = \frac{\theta}{360} 2\pi r$$

θ = number of degrees in central angle

Surface area of a sphere

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

Simpson's rule for area approximation

$$A \approx \frac{h}{3} (d_f + 4d_m + d_l)$$

h = distance between successive measurements

d_f = first measurement

d_m = middle measurement

d_l = 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:

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

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

$$A = M \left\{ \frac{(1 + r)^n}{r} \right\}$$

M = contribution per period, paid at the
end of the period

Present value (A) 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

General Mathematics

Multiple-choice answer sheet

Answer Number	
Index Number	

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

2007 Year 12 Pre Trial Worked Solutions

Section A - Multiple Choice

1) $v = u + at$

$$= 8 + 10 \times 5$$

$$= 58$$

$$\Rightarrow \textcircled{B}$$

2) $10(x-3) + 2(4x+2) = 10x - 30 + 8x + 4$

$$= 18x - 26$$

$$\Rightarrow \textcircled{D}$$

3) $\text{Vol B} = 3 \times \text{Vol A}$

$$(W \times 6 \times 4) = 3 \times (8 \times 3 \times 5)$$

$$24W = 360$$

$$W = 15$$

$$\Rightarrow \textcircled{D}$$

4) Increased by the two open circles

$$\therefore \text{Area} = 2 \times \pi r^2$$

$$= 2 \times \pi (8)^2$$

$$= 402 \text{ cm}^2$$

$$\Rightarrow \textcircled{C}$$

5) $7 + 4 + 6 = 17 \text{ scores} \Rightarrow \textcircled{A}$

6) Using graphics calc: $x_{0.95} = 1.44 \text{ (2 dp)} \Rightarrow \textcircled{D}$

7) $20 \div 50 = 0.4 \text{ m} = 40 \text{ cm} \Rightarrow \textcircled{D}$

8) $2 \text{ hrs} = 120 \text{ mins} : \4.20

$$1 \text{ min} : 4.20 \div 120 = 0.035$$

$$\therefore 18 \text{ mins} : 18 \times 0.035 = \$0.63 \Rightarrow \textcircled{C}$$

9) $A = \pi(R^2 - r^2) = \pi(20^2 - 10^2)$

$$= \pi(400 - 100) = 300\pi \Rightarrow \textcircled{D}$$

Cont.

(10)

$$\bar{x}_{\text{new}} = \frac{4 \times 60 + 90}{5}$$

$$= 66$$

$\Rightarrow$ (D)

(11)

$$\begin{aligned}\text{Total repaid} &= 320 \times 4 \times 12 \\ &= \$15360\end{aligned}$$

$$\begin{aligned}\therefore \text{Interest} &= 15360 - 10000 \\ &= \$5360\end{aligned}$$

$\Rightarrow$ (C)

(12)

$$\frac{5}{13} + \frac{1}{13} = \frac{6}{13} \Rightarrow (B)$$

(13)

$$Q_1 = 24$$

$$\therefore IQ_R = Q_3 - Q_1$$

$$Q_3 = 45.5$$

$$= 45.5 - 24$$

$$= 21.5$$

$\Rightarrow$ (B)

(14)

$$\frac{7.2\%}{12} \Rightarrow (A)$$

(15)

$$\theta = \cos^{-1}\left(\frac{7.1}{10.4}\right) \doteq 47^\circ \Rightarrow (A)$$

(16)

$$A = \pi ab = \pi \times 0.86 \times 1.2$$

$$= 3.24 \text{ m}^2$$

$\Rightarrow$ (B)

(17)

$$\text{Deposit} = \frac{20}{100} \times 10000 = \$2000$$

$$\begin{aligned}\text{Amount borrowed} &= 10000 - 2000 \\ &= \$8000\end{aligned}$$

$$\text{Total repaid} = 200 \times 4 \times 12 = \$9600$$

$$\therefore \text{Interest} = 9600 - 8000 = \$1600$$

$$\text{Interest per yr} = 1600 \div 4 = \$400$$

$$\therefore \text{Interest rate} = \frac{400}{8000} \times \frac{100}{1} \% = 5\% \Rightarrow (B)$$

cont

(18)

$$\begin{aligned}\text{Perimeter} &= 4 + 4 + \frac{45}{360} \times 2\pi \times 4 \\ &= 8 + \frac{1}{8} \times 8\pi \\ &= 8 + \pi \Rightarrow \textcircled{B}\end{aligned}$$

(19)

$$\begin{aligned}\text{One glass vol} &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \times \pi \times (3)^2 \times 12 \\ &= 36\pi \\ &= 113.097 \dots \text{ cm}^3\end{aligned}$$

$$\begin{aligned}\therefore \text{Vol six glasses} &= 6 \times 113.097 \dots \\ &= 678.58 \dots \\ &= 680 \text{ cm}^3 \text{ (nearest 10 cm}^3\text{)} \Rightarrow \textcircled{B}\end{aligned}$$

(20)

Ⓒ

Section B

Question 21

$$\begin{aligned} \text{a) } A &= \frac{10}{3} [16 + 4 \times 13 + 10] \\ &= 260 \text{ m}^2 \end{aligned} \quad (2)$$

$$\text{b) i) } \underline{6} \times \underline{5} \times \underline{4} \times \underline{3} \times \underline{2} \times \underline{1} = 720 \quad \checkmark$$

$$\text{ii) } \underline{1} \times \underline{1} \times \underline{4} \times \underline{3} \times \underline{2} \times \underline{1} = 24 \quad \checkmark \quad (4)$$

$$\text{iii) } \frac{24}{720} = \frac{1}{30} \quad \checkmark$$

$$\text{c) i) } 78\,300\,000 \text{ km} = 7.83 \times 10^7 \text{ km} \quad \checkmark$$

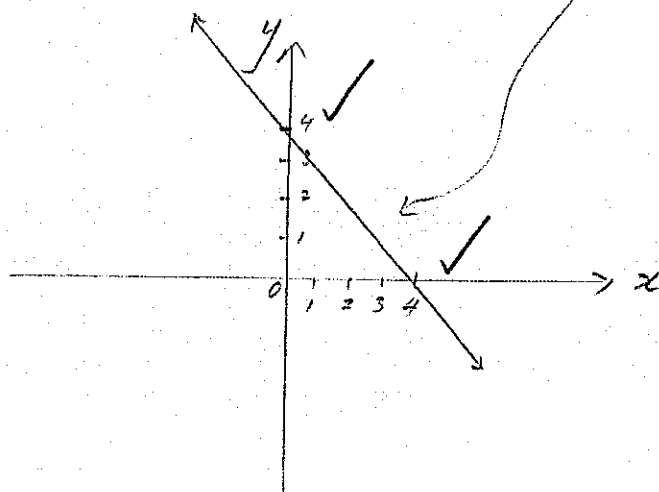
$$\begin{aligned} \text{ii) } \text{Speed} &= \frac{\text{distance}}{\text{time}} = \frac{7.83 \times 10^7}{200 \times 24} \quad \checkmark \\ &= 16312.50 \text{ km/h} \quad \checkmark \\ &= 16313 \text{ km/h (nearest km/h)} \quad \checkmark \end{aligned} \quad (4)$$

Question 22

ai)

x	-2	0	3	4
y	6	4	1	0

$$y = 4 - x$$



(5)

ii)

$$m = -1 \quad \checkmark$$

(1)

iii) Test when $x = -98$, does $y = 102$?

$$y = 4 - (-98) \quad \checkmark$$

$$= 4 + 98$$

$$= 102$$

$\checkmark$ Yes $\therefore (-98, 102)$ lies on the line.

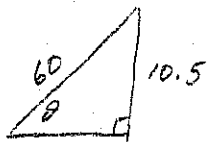
(2)

$$b) \quad \% \text{ error} = \frac{(12.4 - 12)}{12} = \frac{0.4}{12} \times \frac{100\%}{1} \quad \checkmark$$

$$= 3.3\% \quad \checkmark \text{ or } 3.33\% \text{ (2 d.p.)}$$

Question 23

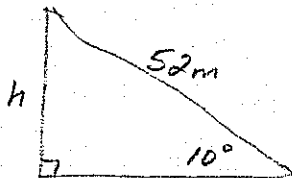
a i)



$$\Rightarrow \theta = \sin^{-1}\left(\frac{10.5}{60}\right) \checkmark$$
$$= 10^\circ \checkmark$$

($-\frac{1}{2}$ rounding)

ii)



$$\therefore \sin 10^\circ = \frac{h}{52} \checkmark$$

(5)

$$h = 52 \sin 10^\circ$$

$$= \underline{9.1 \text{ m (1dp)}} \checkmark \checkmark$$

(if used full carried through answer from part (i))

[Otherwise by retyping $\sin 10^\circ$, answer is 9.0 m to 1.d.p $-\frac{1}{2}$ mark]

b) i) $V = \pi r^2 h$

$$\therefore 600 = \pi \times r^2 \times 15 \checkmark$$
$$r^2 = \frac{600}{15\pi}$$

$$r = \sqrt{\frac{600}{15\pi}}$$

$$= 3.5682 \dots \text{ cm} \checkmark$$

$$= 3.6 \text{ cm (nearest mm)} \checkmark$$

(5)

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

$$600 = \frac{4}{3} \times \pi \times r^3 \checkmark$$

$$r^3 = \frac{3 \times 600}{4\pi} \checkmark$$

$$r = \sqrt[3]{\frac{1800}{4\pi}} = 5.2 \text{ cm} \checkmark \text{ (2 s.f.)}$$

Question 24

(from graph)

i) 25 ✓

ii) Yr 4 Fem = $80 - 20 = 60$ ✓

Yr 2 Fem = $70 - 20 = 50$ ✓

∴ 10 more in Yr 4. ✓

iii) Yr 3 male = 30 ✓

Total Yr 3 = 70 ✓

∴ % male = $\frac{30}{70} \times \frac{100\%}{1} \doteq 43\%$ (nearest %) ✓

iv) Male Yr 1 = 25

Female Yr 1 = $70 - 25 = 45$

∴ M : F

25 : 45 ✓

5 : 9 ✓

v) $\bar{x}_{\text{males}} = \frac{(25 + 20 + 30 + 20 + 25 + 30)}{6}$

= 25 ✓

vi) $\sigma_n \text{ males} = 4.08$ (2dp) (using graphics calc) ✓

$\sigma_{n-1} = 4.47$

vii)

# females	45	50	40	60	75	70
Year	1	2	3	4	5	6

⇒ $\sigma_n \text{ females} = 12.80$ (using calc) ✓

He was incorrect. The females have a much higher standard deviation meaning they are less consistent in numbers. ✓

110

Question 25

(i) Interest on a loan that reduces ✓
as the principal or balance owing reduces.

$$(ii) \quad I = P \cdot r \cdot n \quad (2)$$

$$= 15000 \times \frac{1.5}{100} \times 1$$
$$= \$225 \quad \checkmark$$

$$(iii) \quad A = 15000 + 225 - 400 \quad \checkmark$$
$$= \$14825 \quad (4)$$

$$B = 14825 \times \frac{1.5}{100} \times 1 = \$222.375 \quad \checkmark$$

$$C = 14667.0856 + 217.0063 = \$14684.0919 \quad \checkmark$$

$$D = 13718.476 \times \frac{1.5}{100} \times 1 = \$205.77714 \quad \checkmark$$

$$(iv) \quad \text{Paid off} = 15000 - 13106.2337 \quad \checkmark$$
$$= \$1893.7663 \quad \checkmark$$

$$(v) \quad 90\% \text{ owing amount} = \frac{90}{100} \times 15000 = \$13500 \quad \checkmark$$

Loan drops below \$13500 at end of 10th month. ✓ (4)

Question 26

i) $\text{Deposit} = \frac{15}{100} \times 30000 = \$4500 \checkmark$

ii) $\text{Amount borrowed} = 30000 - 4500$
 $= \$25500 \checkmark$

$$I = Prn = 25500 \times \frac{9}{100} \times 5$$
$$= \$11475 \checkmark$$

(6)

iii) $\text{Total repaid} = 25500 + 11475 \checkmark$
 $= 36975$

$$\therefore \text{Monthly repayment} = \frac{36975}{5 \times 12} \checkmark$$
$$= \$616.25 \checkmark$$

b) i) $\text{Tax payable} = 15580 + \frac{47}{100} \times (68000 - 60000)$
 $= \$19340 \checkmark$

ii) $\text{Tax payable} = 0 + \frac{17}{100} \times (20000 - 6000)$
 $= \$2380 \checkmark$

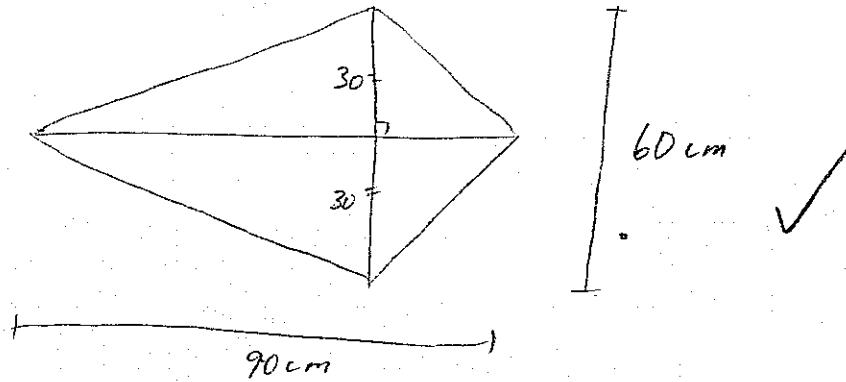
(4)

$$\text{Tax paid} = 120 \times 26$$
$$= \$3120 \checkmark$$

$$\therefore \text{Refund relieved} = 3120 - 2380$$
$$= \$740 \checkmark$$

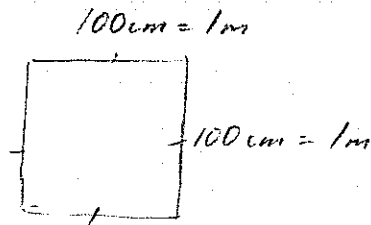
Question 27

a i)



$$\begin{aligned} \text{Area} &= \left(\frac{1}{2} \times 90 \times 30 \right) \times 2 \\ &= 2700 \text{ cm}^2 \quad \checkmark \end{aligned}$$

ii)



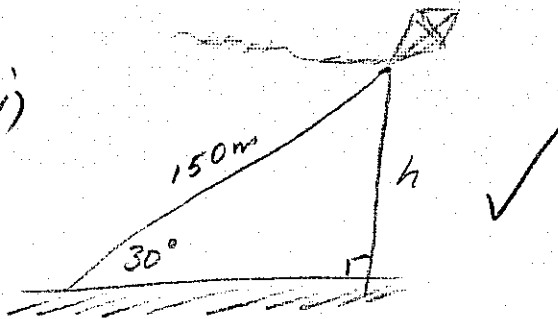
$$\therefore 10000 \text{ cm}^2 = 1 \text{ m}^2$$

$$\begin{aligned} \therefore \text{Area} &= 2700 \div 10000 \\ &= 0.27 \text{ m}^2 \quad \checkmark \end{aligned}$$

$$\begin{aligned} \therefore \text{Cost of covering one side} &= \$120 \times 0.27 \\ &= \$32.40 \quad \checkmark \end{aligned}$$

$$\begin{aligned} (\text{both sides} &= 2 \times 32.40) \\ &= \$64.80 \quad \checkmark \end{aligned}$$

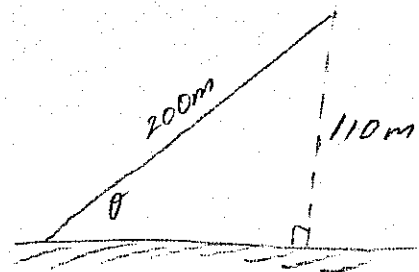
b) i)



$$\text{ii)} \quad \sin 30^\circ = \frac{h}{150} \quad \checkmark$$

$$\begin{aligned} \therefore h &= 150 \sin 30^\circ \\ &= 75 \text{ m} \quad \checkmark \end{aligned}$$

iii)



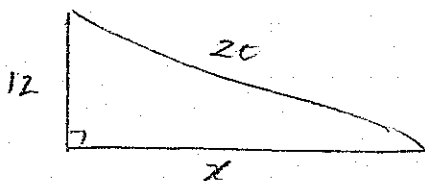
$$\sin \theta = \frac{110}{200} \quad \checkmark$$

$$\theta = 33^\circ \quad \checkmark (\text{nearest deg})$$

$$\therefore \text{Increase in elevation angle was } 3^\circ \quad \checkmark$$

Question 28

a i)



$$x^2 = 20^2 - 12^2$$

$$= 400 - 144$$

$$= 256$$

$$\therefore x = 16 \text{ cm}$$

(2)

ii) Front triangle = $\frac{1}{2} \times 12 \times 16 = 96 \text{ cm}^2$ ✓

Back triangle = 96 cm^2 ✓

Top slope = $15 \times 20 = 300 \text{ cm}^2$ ✓

Back rectangle = $12 \times 15 = 180 \text{ cm}^2$ ✓

Half a closed cylinder = $\frac{1}{2} \times (2\pi rh + 2\pi r^2)$

$$= \frac{1}{2} \times (2\pi \times 8 \times 15 + 2 \times \pi \times 8^2) \quad (4)$$

$$= 578.053 \dots \text{ cm}^2 \quad \checkmark$$

$$\therefore \text{Total S.A} = 96 + 96 + 300 + 180 + 578.1$$

$$= 1250.1 \text{ cm}^2 \text{ (1dp)} \quad \checkmark$$

bi)

x	C.F	Frequency
4	3	3
6	10	7
8	18	8
10	25	7
12	30	5

Total = 30

⇒ Mode is score 8. ✓

✓ (Freq col)

(4)

ii) Median = 8 (using graphics calc) ✓

iii) $\bar{x} = 8.3$ (1dp) (from calc) ✓

