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.

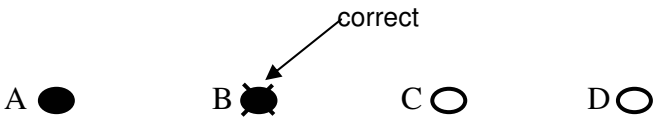
Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

**Sample:** 2 + 4 = (A) 2 (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.


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.



**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

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

(A) $2x+5$ (B) $2x+26$

(C) $6x+5$ (D) $6x+26$

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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

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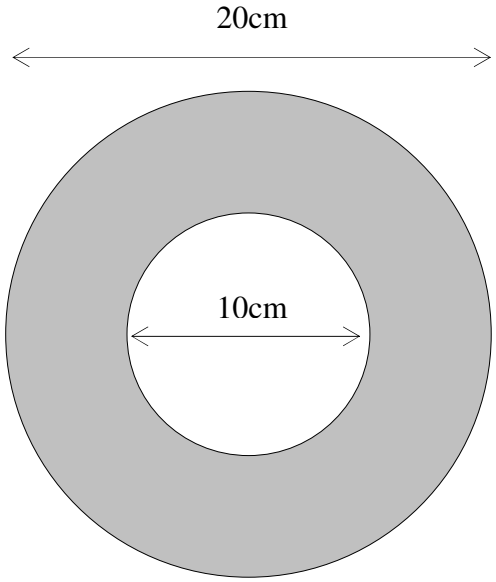
6.




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

(A) $\pi\left(20^2-10^2\right)$ (B) $100\pi$

(C) $75\pi$ (D) $75$

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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.

| Stem | Leaf |
|---|---|
| 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) $\frac{2}{3}$

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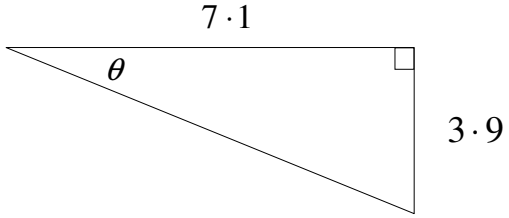
14.

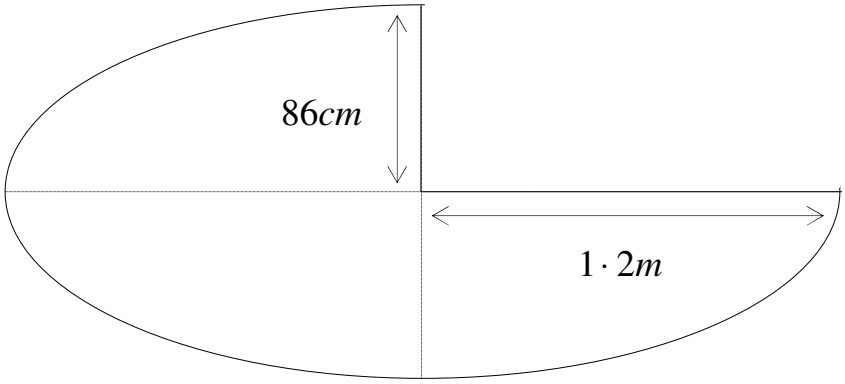



Correct to the nearest degree, $\theta$ = ?

(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) $2 \cdot 43m^2$ (D) $45m^2$

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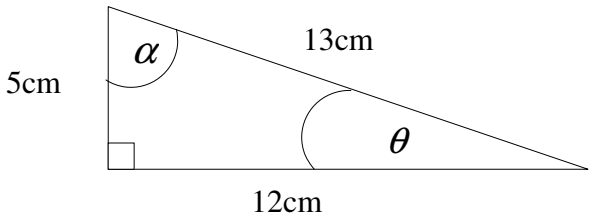
16. For the triangle drawn, which has the greatest value




(A) $\tan\alpha$ (B) $\cos\theta$

(C) $\tan\theta$ (D) $\sin\theta$

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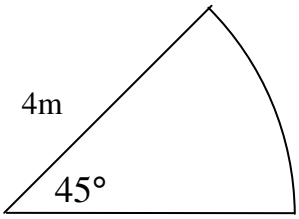
17. Mr. Wagner's Year 12 class consists of 14 students. There are seven males and seven females. Two students are to be selected for bentching. How many different combinations can be chosen if there must be one male and one female?

(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) $\pi$ (D) $2\pi$

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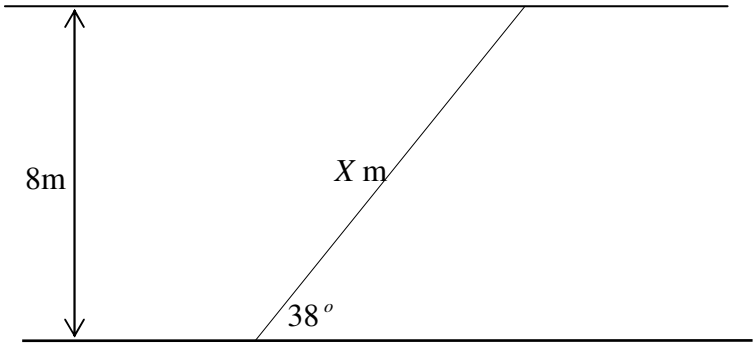
19. The value of *X,* ( correct to 3 decimal places) in the diagram below is




(A) $4\cdot925$ (B) $6\cdot304$

(C) $10\cdot152$ (D) $12\cdot994$

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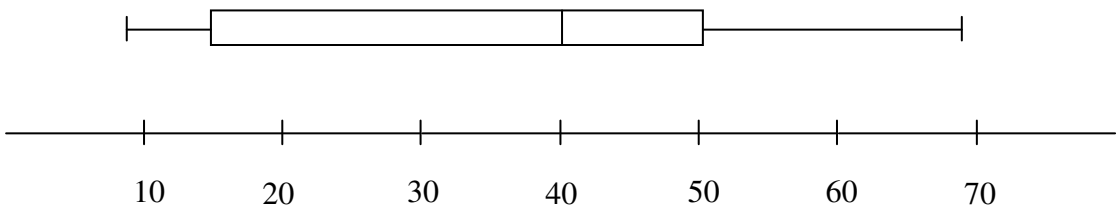
20. The results of a test are displayed in a box-and-whiskers plot.




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.

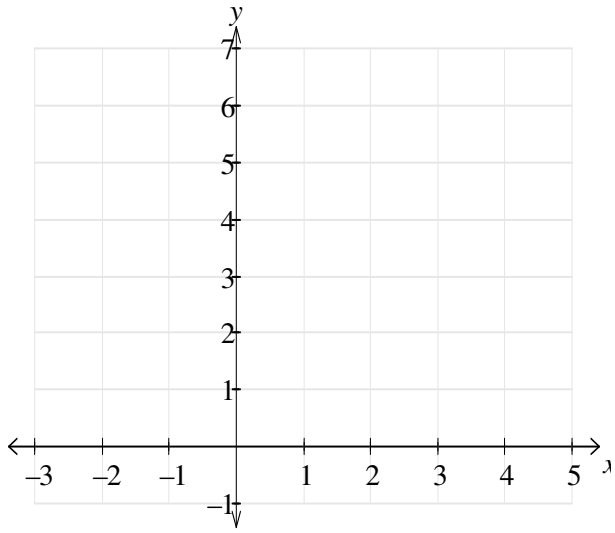
i) Express the distance from earth to Mars in scientific notation. (1)

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 through the point $(-98,102)$. Show working to justify your answer. (2)

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

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.

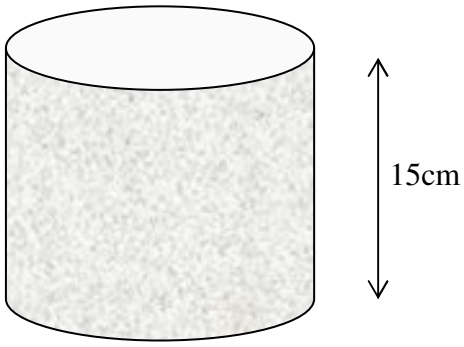
i) To calculate the probability of winning first prize Natalie wrote down her working as follows: (2)

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

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 $15cm$.



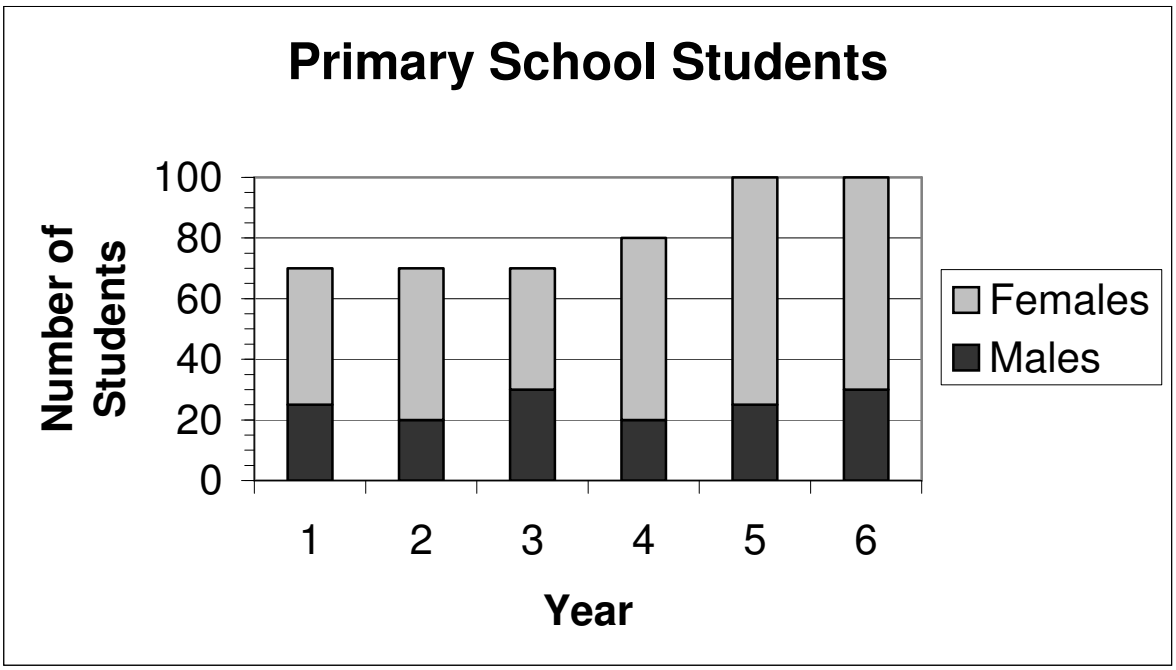

i) Explain why the area of the base of the cylinder is $40cm^2$ . (1)

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

| Time (end of) | Principal P | Interest I | P+I | Amount still owing 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)

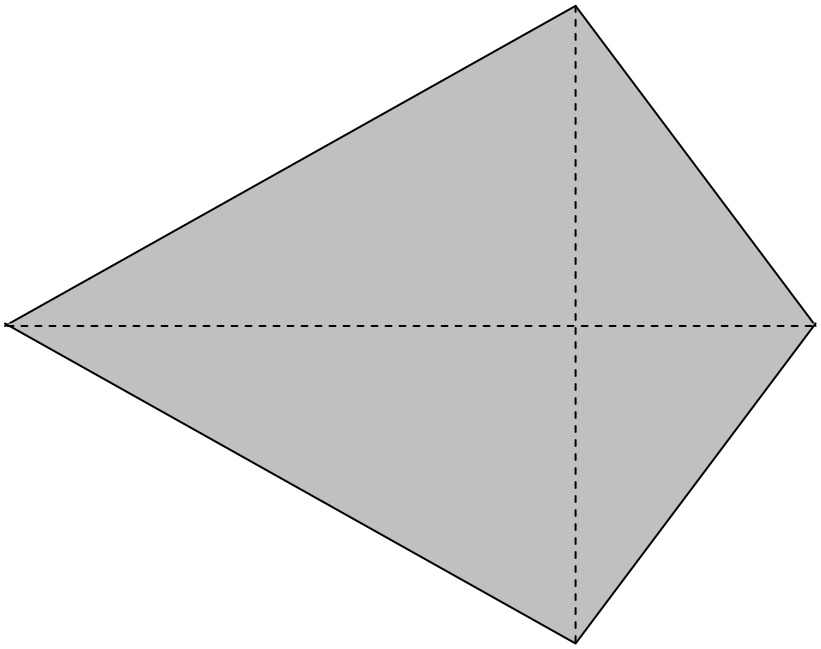
Did Adam receive a refund from the taxation office and if so, how much did he receive?

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. ○ |
| 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. ○ |

**Formulae Sheet**

**Area of an annulus**

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

$R$ = 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**

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

$h$ = 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:

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

**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**

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

**Gradient-intercept form of straight line**

$y = mx + b$

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

# General Mathematics

## Multiple-choice answer sheet

Student Number: _____

Teacher's Name: _____

| | | | | |
|---|---|---|---|---|
| 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) $v = u + at$
$= 8 + 10 \times 5$
$= 58$ $\Rightarrow$ (B)

2) $10(x-3) + 2(4x+2) = 10x - 30 + 8x + 4$
$= 18x - 26$ $\Rightarrow$ (D)

3) Vol B $= 3 \times$ Vol A
$(W \times 6 \times 4) = 3 \times (8 \times 3 \times 5)$
$24W = 360$
$W = 15$ $\Rightarrow$ (D)

4) Increased by the two open circles
$\therefore$ Area $= 2 \times \pi r^2$
$= 2 \times \pi (8)^2$
$\doteq 402 \text{ cm}^2$ $\Rightarrow$ (C)

5) $7 + 4 + 6 = 17$ scores $\Rightarrow$ (A)

6) Using graphics calc: $xO_{n-1} = 1.44$ (2dp) $\Rightarrow$ (D)

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

8) 2 hrs $= 120$ mins : \$4.20
1 min : $4.20 \div 120 = 0.035$
$\therefore$ 18 mins : $18 \times 0.035 = \$0.63$ $\Rightarrow$ (C)

(9) $A = \pi(R^2 - r^2) = \pi(20^2 - 10^2)$
$= \pi(400 - 100) = 300\pi$ $\Rightarrow$ (D)

cont.

(10) $\bar{x}_{new} = \dfrac{4 \times 60 + 90}{5}$

$= 66 \Rightarrow$ (D)

(11)

Total repaid $= 320 \times 4 \times 12$

$= \$15360$

$\therefore$ Interest $= 15360 - 10000$

$= \$5360 \Rightarrow$ (C)

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

(13) $Q_1 = 24$

$Q_3 = 45.5$

$\therefore IQ_R = Q_3 - Q_1$

$= 45.5 - 24$

$= 21.5 \Rightarrow$ (B)

(14) $\dfrac{7.2\%}{12} \Rightarrow$ (A)

(15) $\theta = \cos^{-1}\left(\dfrac{7.1}{10.4}\right) \div 47° \rightarrow$ (A)

(16) $A = \pi ab = \pi \times 0.86 \times 1.2$

$= 3.24\ m^2 \Rightarrow$ (B)

(17) Deposit $= \dfrac{20}{100} \times 10000 = \$2000$

Amount borrowed $= 10000 - 2000$

$= \$8000$

Total repaid $= 200 \times 4 \times 12 = \$9600$

$\therefore$ Interest $= 9600 - 8000 = \$1600$

Interest per yr $= 1600 \div 4 = \$400$

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

cont

(18) Perimeter $= 4 + 4 + \frac{45}{360} \times 2\pi \times 4$

$= 8 + \frac{1}{8} \times 8\pi$

$= 8 + \pi$ $\Rightarrow$ (B)

(19) One glass vol $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \pi \times (3)^2 \times 12$

$= 36\pi$

$= 113.097\ldots \text{ cm}^3$

$\therefore$ Vol six glasses $= 6 \times 113.097\ldots$

$= 678.58\ldots$

$\doteq 680 \text{ cm}^3$ (nearest $10 \text{ cm}^3$) $\Rightarrow$ (B)

(20) (C)

Section B

## Question 21

a) $A = \frac{10}{3}[16 + 4 \times 13 + 10]$ ✓ ✓

$= 260 m^2$ ✓ (2)

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

ii) $\underline{1} \times \underline{1} \times \underline{4} \times \underline{3} \times \underline{2} \times \underline{1} = 24$ ✓ ✓ ✓ (4)

iii) $\frac{24}{720} = \frac{1}{30}$ ✓ ✓

c) i) $78\,300\,000 km = 7.83 \times 10^7 km$ ✓

ii) $Speed = \frac{distance}{time} = \frac{7.83 \times 10^7}{200 \times 24}$ ✓ (4)

$= 16312.50 km/h$ ✓

$= 16313 km/h$ (nearest km/h)
✓

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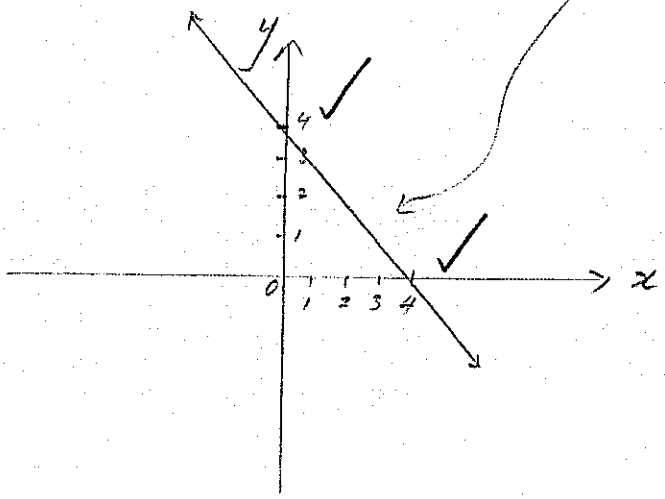
## Question 22

a i)

| $x$ | $-2$ | $0$ | $3$ | $4$ |
|---|---|---|---|---|
| $y$ | $6$ ✓ | $4$ ✓ | $1$ ✓ | $0$ ✓ |




✓ ✓ ✓ (5)

ii) $m = -1$ ✓ (1)

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

$y = 4 - (-98)$ ✓ (2)

$= 4 + 98$

$= 102$ ✓ Yes ∴ $(-98, 102)$ lies on the line.

b) % error $= \dfrac{(12.4 - 12)}{12} = \dfrac{0.4}{12} \times \dfrac{100\%}{1}$ ✓ ✓ (2)

$= 3.3\dot{}\,\%$ or $3.33\%$ (2 d.p.) ✓

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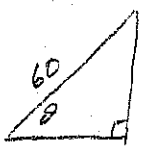
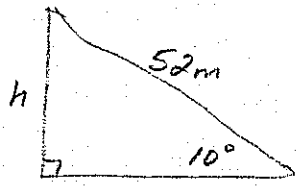
## Question 23

a i) 


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

$= 10°$ ✓ ($-\frac{1}{2}$ rounding)

ii) 


$\therefore \sin 10° = \frac{h}{52}$ ✓ (5)

$h = 52 \sin 10°$

$= \underline{9.1 \text{ m (1dp)}}$ ✓✓ (if used full carried through answer from part (i))

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

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

$\therefore 600 = \pi \times r^2 \times 15$ ✓

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

$r = \sqrt{\left(\frac{600}{15\pi}\right)}$

$= 3.5682\ldots$ cm ✓

$= 3.6$ cm (nearest mm) ✓ (5)

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

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

$r^3 = \frac{3 \times 600}{4\pi}$ ✓

$r = \sqrt[3]{\left(\frac{1800}{4\pi}\right)} = 5.2$ cm ✓ (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) $\bar{x}_{males} = \frac{(25 + 20 + 30 + 20 + 25 + 30)}{6}$
$= 25$ ✓

vi) $\sigma_{n\ males} = 4.08$ (2dp) (using graphics calc) ✓
$\sigma_{n-1} = 4.47$

vii)

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

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⇒ $\sigma_{n\ females} = 12.80$ (using calc) ✓
He was incorrect. The females have a ✓
much higher standard deviation meaning they are
less consistent in numbers.

## Question 25

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

(ii) $I = Prn$ (2)

$= 15000 \times \frac{1.5}{100} \times 1$

$= \$225$ ✓

iii) $A = 15000 + 225 - 400$ ✓

$= \$14825$ (4)

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

$C = 14467.0856 + 217.0063 = \$14684.0919$ ✓

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

iv) Paid off $= 15000 - 13106.2337$ ✓

$= \$1893.7663$ ✓

v) 90% owing amount $= \frac{90}{100} \times 15000 = \$13500$ ✓

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

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## Question 26

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

ii) Amount borrowed $= 30000 - 4500$
$= \$25500$ ✓

$I = Prn = 25500 \times \frac{9}{100} \times 5$
$= \$11475$ ✓ (6)

iii) Total repaid $= 25500 + 11475$
$= 36975$ ✓

∴ Monthly repayment $= \frac{36975}{5 \times 12}$ ✓
$= \$616.25$ ✓

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

ii) Tax payable $= 0 + \frac{17}{100} \times (20000 - 6000)$ (4)
$= \$2380$ ✓

Tax paid $= 120 \times 26$
$= \$3120$ ✓

∴ Refund recieved $= 3120 - 2380$
$= \$740$ ✓

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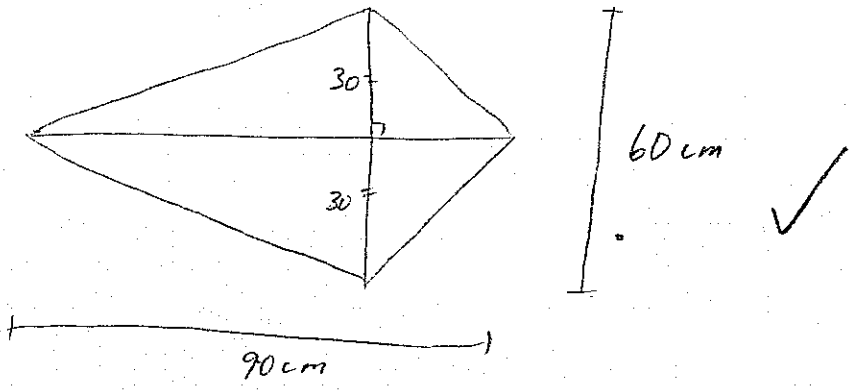
## Question 27

a i)



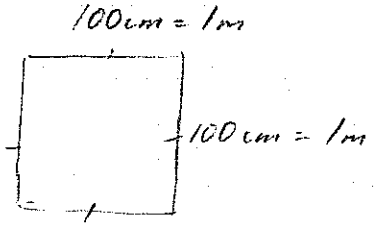

✓

$$\text{Area} = \left(\frac{1}{2} \times 90 \times 30\right) \times 2$$

$$= 2700 \text{ cm}^2 \quad ✓$$

(5)

ii)




$\therefore$ 10000 $cm^2$ = 1 $m^2$

$\therefore$ Area = 2700 ÷ 10000

= 0.27 $m^3$ ✓

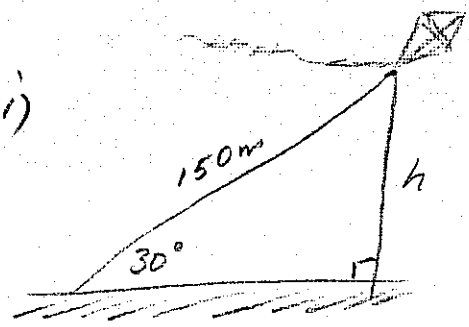
$\therefore$ Cost of covering one side = $120 × 0.27

= $32.40 ✓

(both sides = 2 × 32.40

= $64.80 ) ✓

b) i)



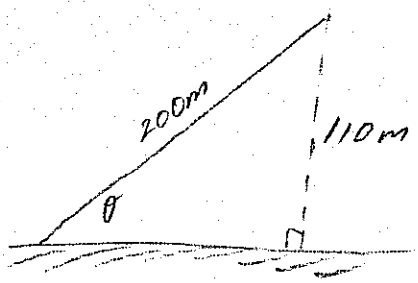

✓

ii) $\sin 30° = \frac{h}{150}$ ✓

$\therefore h = 150 \sin 30°$

= 75m ✓

iii)




(5)

$\sin\theta = \frac{110}{200}$ ✓

$\theta = 33°$ ✓ (nearest deg)

$\therefore$ Increase in elevation angle was 3°. ✓

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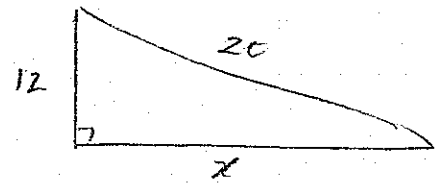
# Question 28

a i)




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

$= 400 - 144$ ✓

$= 256$ ✓

$\therefore x = 16$ cm ✓ (2)

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

Back triangle $= 96$ cm$^2$ ✓

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

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

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

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

$= 578.053\ldots$ cm$^2$ ✓

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

$= 1250.1$ cm$^2$ (1 dp) ✓

b i)

| $x$ | C.F | Frequency |
|---|---|---|
| 4 | 3 | 3 |
| 6 | 10 | 7 |
| 8 | 18 | 8 |
| 10 | 25 | 7 |
| 12 | 30 | 5 ✓ (Freq col) |
| | Total = 30 | |

⇒ Mode is score 8. ✓ (4)

ii) Median $= 8$ (using graphics calc) ✓

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

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