St Ignatius' College Riverview

TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

2010

General Mathematics

General Instructions

- Reading time – 5 minutes
- Working time – 2½ hours
- Attempt ALL Questions
- Board approved calculators may be used
- A formula sheet is provided at the back of this paper
- Use the Multiple Choice Answer Sheet provided
- Answer Question's 23 – 28 in the booklets provided.
- Write **your name** and your **teacher's name** clearly on each booklet
- No candidate number required

Total Marks - 100

Section 1 Pages 2 – 10

22 marks

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

Section 2 Pages 11 – 20

78 marks

- Attempt Questions 23 - 28
- Allow about 120 minutes for this section.

A Formula sheet is provided on Pages 21 and 22 of this question booklet.

Section I

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

Use the Multiple-Choice Answer sheet provided

1 The number 386.956 correct to two significant figures is:

(A) 39

(B) 386.95

(C) 386.96

(D) 390

2 Sylvie had a spherical candle mould whose volume was exactly one litre.

What was the radius of the mould in cm?

(A) 2356.2

(B) 238.7

(C) 13.3

(D) 6.2

3 $\dfrac{3.216\times10^{6}}{4.8\times10^{6}+2.1\times10^{3}}$ is nearest to:

(A) 2.1×10^{3}

(B) 1.54×10^{6}

(C) 6.6×10^{-1}

(D) 6.7×10^{-1}

4 Town X and town Y both li on the same line of longitude. Town X lies 56^{o} north of the Equator and Town Y lies 12^{o} south of the Equator.

What is the distance between the two towns?

(A) 2640 nautical miles

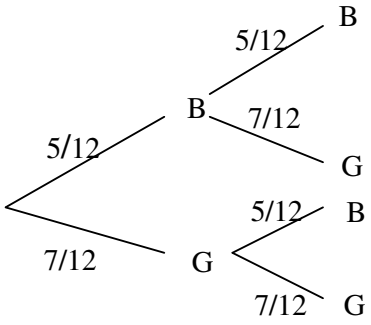
(B) 4080 nautical miles

(C) 4914 nautical miles

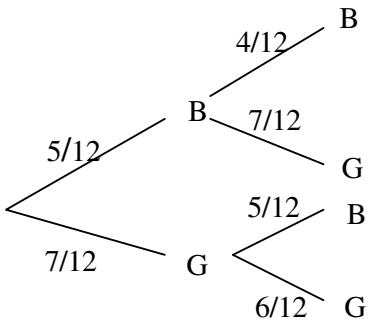
(D) 7595 nautical miles

5 There are 5 blue marbles and 7 green marbles in a bag. The marbles are identical in size and shape. Two marbles are selected without replacement. Which of the following probability trees show the correct probabilities?

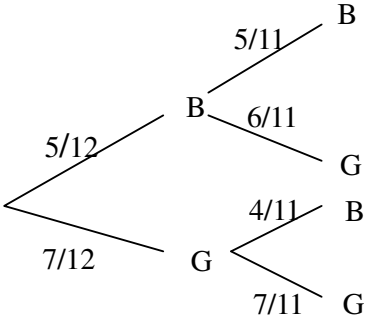
(A)



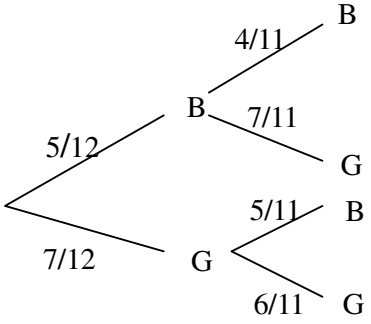
(B)



(C)



(D)



6 John scored 120, 140, 180, 160 and 140 out of 200 in his first five tests.
He needs to maintain a mean of 150 or above to remain in his university class.
What must he score in his sixth test to have a mean of 150?

(A) 76

(B) 150

(C) 160

(D) 192

7 Kenny scored the following results in four tests: 70, 32, 29 and 80.
The following week he repeated the four tests and recorded an improvement of 5 marks in each test.
Which of the following statements will be true?

(A) The mean increases and the standard deviation remains the same

(B) The mean increases and the standard deviation will increase by 5

(C) The mean increases and the standard deviation will decrease by 5

(D) The mean and standard deviation will remain unchanged

8 The following table shows the fuel capacity and distance per litre of four cars.

CAR	**TANK CAPACITY (Litres)**	**DISTANCE PER LITRE (Kilometres)**
Camry	65	11
Commodore	73	8
Falcon	80	7
Magna	64	12

Which car would go furthest on a full tank?

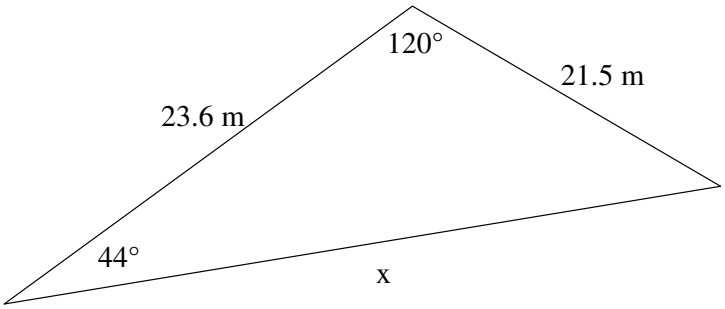
(A) Camry

(B) Commodore

(C) Falcon

(D) Magna

9



NOT TO SCALE

The correct value for x is:

(A) $x = 23.6^2 + 21.5^2 - 2 \times 23.6 \times 21.5 \cos 120$

(B) $x = \sqrt{23.6^2 + 21.5^2 - 2 \times 23.6 \times 21.5 \cos 120}$

(C) $x = \dfrac{23.6 \sin 120^o}{\sin 44^o}$

(D) $x = \dfrac{21.5 \sin 44^o}{\sin 120^o}$

10 The back to back stem and leaf plot below shows the number of downloads per day of songs from two bands "Ants" and "Psychos" from a certain website over a two week period.

Ants							Psychos						
			7	4	2	0	8						
9	8	7	5	3	1	1	2	5	5				
		6	6	4	0	2	2	4	5	6	7	8	9
					2	3	0	5	8				

Question cont'd on next page.

10. Cont'd

Which statement is true when comparing the data for the daily number of downloads?

(A) Ants had a higher mode than Psychos

(B) Psychos had a higher mode than Ants

(C) Ants had a higher range than Psychos

(D) Psychos had a higher range than Ants

11 Simplify $\dfrac{12a^4b^3 \times 5a^2b^3}{15a^2b^3}$

(A) $4a^4b^2$ (B) $4a^4b^3$

(C) $4a^3b^2$ (D) $4a^3b^3$

12 The following table shows the income tax payable by Australian residents for the 2006-2007 financial year.

Taxable Income ($)	Tax payable on taxable income.
1 - 6000	nil
6001 - 30 000	15c for each $1 over $6000
30 001 - 75 000	$3600 + 30c for each $1 over $30 000
75 001 - 150 000	$17 100 + 40c for each $1 over $75 000
150 001 and over	$47 000 + 45c for each $1 over $150 000

Carl earned $56 200 during the 2006 - 2007 financial year. His allowable tax deductions were $4 200

How much income tax did he have to pay?

(A) $3 600 (B) $10 200

(C) $11 460 (D) $18 200

13 A set of scores has a mean of 58 and a standard deviation of 4.8. What mark corresponds to a Z-score of 2.5?

(A) 70 (B) 75

(C) 80 (D) 85

14 What equation represents the relationship between x and y in the following table?

x	-4	-1	2	5
y	-1	0	1	2

(A) $y = 3x - 1$

(B) $y = 3x + 1$

(C) $y = \frac{x+1}{3}$

(D) $x = 3y + 1$

15 This concrete block is used in a backyard garden.

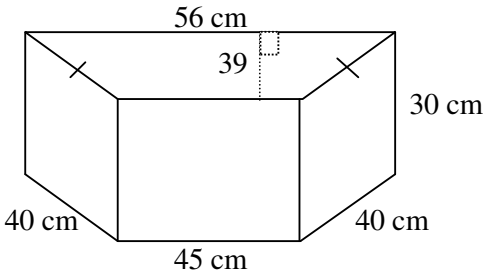
The volume of the block is:

(A) 1969.5 cm^3

(B) 34110 cm^3

(C) 59085 cm^3

(D) 65520 cm^3



16 Players in a sports competition are asked to write down their heights. Which of the following best describes these data?

(A) Discrete

(B) Stratified

(C) Categorical

(D) Continuous

17 The table shows the number of students in each year of a school.

Year	Number of students
7	202
8	240
9	210
10	232
11	174
12	142

100 students from the school are to be surveyed. On a proportional basis, how many Year 8 students should be surveyed?

.

(A) 16

(B) 18

(C) 20

(D) 40

18 Sally takes out a loan of $4500 to buy a computer. Interest is charged at a flat rate of 10% p.a. and Sally repays the loan over 3 years.
What is the total amount that Sally will repay?

(A) $450

(B) $1350

(C) $3800

(D) $5850

19 Burke Street is 650 m long. What would be its length on a map with a scale of 1 : 5000 ?

(A) 1.3 mm

(B) 13 mm

(C) 130 mm

(D) 1300 mm

20 Simplify $12 - 3(2x - 2)$

(A) $14 - 6x$

(B) $6 - 6x$

(C) $-6x + 6$

(D) $18 - 6x$

21 Kim borrowed \$300 000 to buy a house. She is paying it off monthly at an interest rate of 7.5% p.a. compounded monthly. The payments for the first 3 months are shown in the table below.

No. of months (N)	Principal (P)	Interest (I)	P + I	P + I – R R = repayment
1	300 000	1 875.00	301 875.00	299 775.00
2	299 775.00	1873.59	301 648.59	299 548.59
3	299 548.59	1872.18	301 420.77	299 320.77
4	299 320.77	X	Y	Z

The values for X, Y and Z are

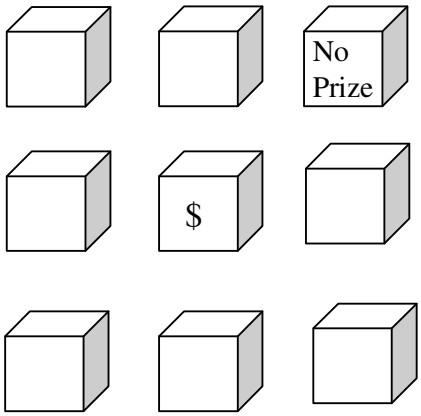
(A) X=\$224490.58, Y=\$523811.34, Z=\$521711.35

(B) X=\$2870.75, Y=\$302191.52, Z=\$309091.52

(C) X=\$4870.75, Y=\$601191.52, Z=\$320091.52

(D) X=\$1870.75, Y=\$301191.52, Z=\$299091.52

22



In a game show, there are nine boxes, four of which contain money. All the other boxes are empty. Two boxes have already been chosen as shown. ($=money)

What is the probability that the next box chosen holds a money prize?

(A) $\frac{1}{7}$

(B) $\frac{2}{7}$

(C) $\frac{3}{7}$

(D) $\frac{4}{7}$

Section II

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

Start each question on a SEPARATE page/ booklet.

All necessary working should be shown in every question

Question 23 (13 marks) Use a separate page/ booklet **Marks**

(a) This table shows the repayment per $1000 on a monthly reducible loan.

Term in years	*7%*	*7.25%*	*7.5%*	*7.75%*	*8%*	*8.25%*	*8.5%*
5	19.8012	19.9194	20.0379	20.1570	20.2765	20.3963	20.5164
10	11.6108	11.7401	11.8702	12.0011	12.1328	12.2653	12.3985
15	8.9883	9.1286	9.2701	9.4128	9.5566	9.7014	9.8474
20	7.7530	7.9036	8.0559	8.2095	8.3644	8.5207	8.6782
25	7.0678	7.2281	7.3899	7.5533	7.7182	7.8875	8.0522
30	6.6530	6.8218	6.9921	7.1641	7.3377	7.5127	7.6891

(i) Use the table above to find the monthly repayment per $1000 on a loan borrowed at 7% for 20 years. **1**

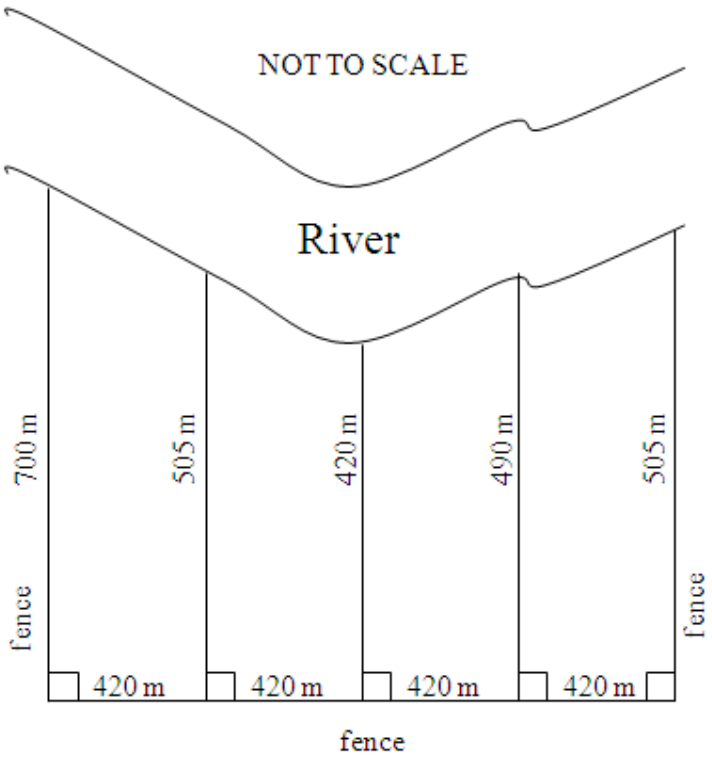
(ii) How many $1000 are there in $60 000? **1**

(iii) Use your answer in Parts (i) and (ii) to calculate the monthly repayment on a loan of $60 000 at 7% over 20 years. **1**

(iv) Calculate the total amount repaid over the term of the loan in Part (iii)? **1**

(v) Determine how much interest was paid after the loan in Part (iii) was fully paid? **2**

(b) The diagram below shows an area of land bounded by a river and fences. **Marks**



Use TWO applications of Simpson's rule to find the approximate area of this land bound by the river and the fences **4**

(c) Use the guess, check, refine method to solve the following equation correct to 1 decimal place:

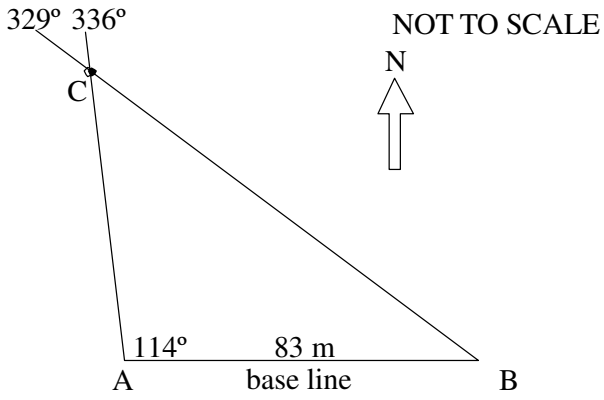
$4^{u} = 16384$ **2**

(d) Convert $5\,\text{cm}^2$ to mm^2 **1**

Question 24 (13 marks) Use a separate page/ booklet

Marks

(a) A student using the method of triangulation has written down the information he needs on the sketch below. The sketch shows a base line AB and the compass bearings of a post C from each of A and B. The baseline AB lies in the east-west direction. The distance AB is 83 metres.



(i) What is the value of $\angle ACB$? **1**

(ii) The student has noted that $\angle CAB = 114°$. Find $\angle CBA$. **1**

(iii) Find the distance from B to the post C, to the nearest metre. **2**

(iv) Find the area of the triangle ABC correct to the nearest square metre. **2**

(b) Roy travels in his jet from his home at A (15°N, 120°E) to his brother's place at B (45°S, 30°W).

(i) When it is 12 noon on Friday in Roy's home, what time should it be in his brother's place? (ignoring time zones)? **2**

(ii) The journey from Roy's home to his brother's place takes 18 hours. If Roy arrives at his brother's place on Friday at 10 pm, what time did he leave his home? **2**

(c) A bank has three different types of savings accounts, as described in the table.

	Type A	Type B	Type C
Account service fees per month: • if minimum monthly balance stays at or above \$450 • if balance drops below \$450	Nil \$4.00	\$5.00 \$5.00	Nil Nil
Number of fee-free transactions per month	20	Unlimited	8
Fee per transaction over the free limit	90 cents	Nil	90 cents

Jackie has a type A account. In March, her minimum balance was \$280, and she made twenty one transactions.

(i) Calculate the fee she was charged for March. **1**

(ii) In any month, Jackie normally has between \$200 and \$300 in the bank. She usually makes about 22 transactions each month. Explain why Jackie should choose a type B account at this bank in order to minimise fees. **2**

Question 25 (13 marks) Use a separate page/ booklet **Marks**

(a) The heights of students in a school are normally distributed with a mean of 150 cm and a standard deviation of 15cm.

(i) What percentage of students are more than 180 cm tall? **1**

(ii) Between what limits will the height of a student chosen at random 'almost certainly' lie? **1**

(iii) If there were 1450 students at the school, how many students are less than 135 cm tall? **1**

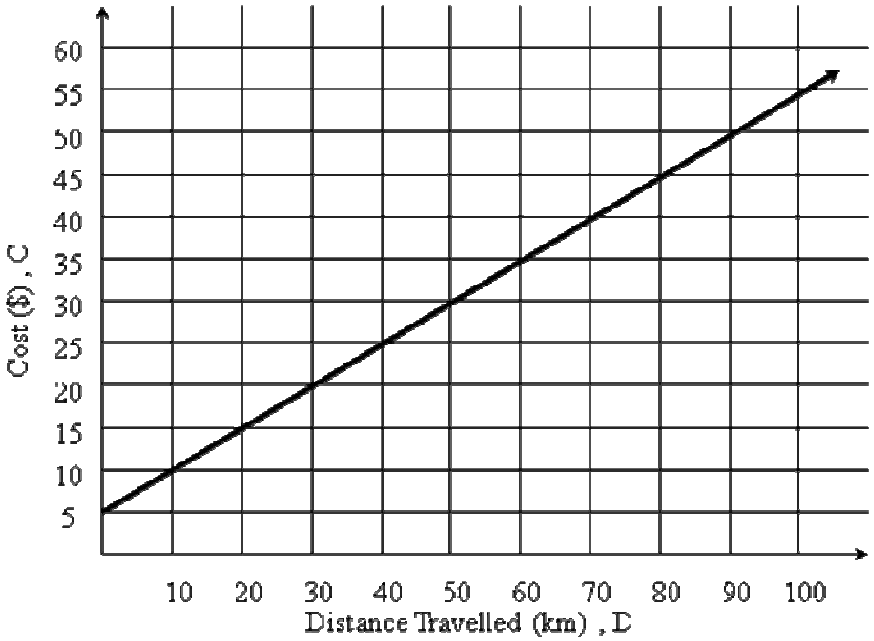
(b) The formula for the volume of a cone is $v = \frac{1}{3}\pi r^2 h$

where V = volume, h = height and r = radius

(i) Show that the radius of the cone is $r = \sqrt{\frac{3V}{\pi h}}$ **2**

(ii) Calculate the radius of the base of a cone that is 20cm high and has a volume of 200 cm^3. (Answer to 2 decimal places) **2**

(c) The cost of travelling by taxi is shown on the graph below



(c) Cont'd

(i) What is the cost per kilometre of travelling by taxi? **1**

(ii) Using C for cost and D for distance, write an equation that describes the line graph for the cost of hiring a taxi. **1**

(d) Alma's car rentals charges a cost (C) of $120 per day for the hire of a car plus an insurance fee of $80. Let n be the number of days.

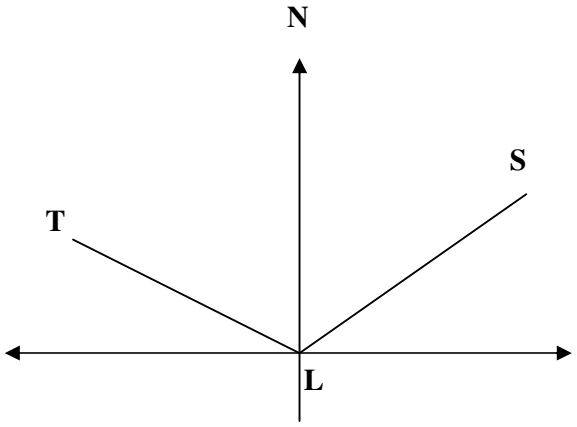
(i) Write the formula for the cost C of hiring a car for n days. **1**

(ii) Jenny hired a car and her total bill was $1520. How many days did Jenny hire the car for? **1**

(e) Solve for x $\dfrac{2(x-1)}{3} = \dfrac{3x+3}{4}$ **2**

Question 26 (13 marks) Use a separate page/ booklet **Marks**

(a) A ship S is $N25^0E$ and 12 nautical miles from a tower L. A tanker T, is $N38^0W$ and 7 nautical miles from the tower.

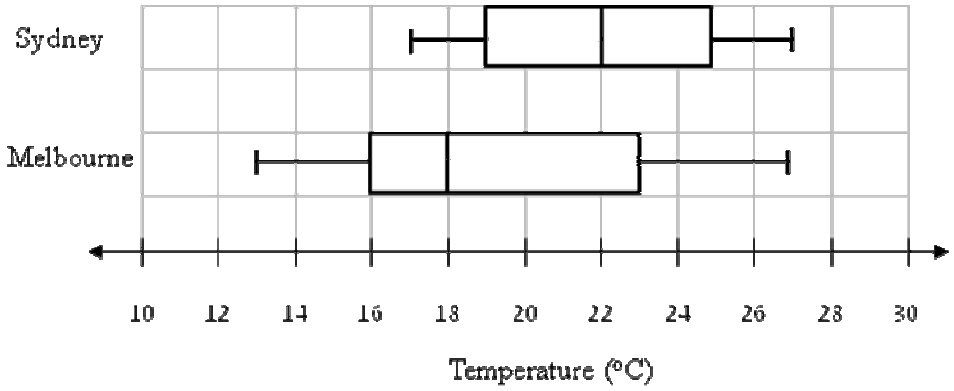


(i) Draw the above diagram into your writing book and label the information given. **1**

(ii) **Show** that the distance of the ship to the tanker is 10.8 Nm **2**

(iii) Find the bearing, to the nearest degree, of the ship from the tanker. **2**

(b) The average monthly maximum temperatures for Sydney and Melbourne are displayed on the box-and-whisker plot below.



(i) What is the interquartile range of temperatures for Sydney ? **1**

(ii) What percentage of months in Melbourne have an average maximum temperature greater than 16^o C? **1**

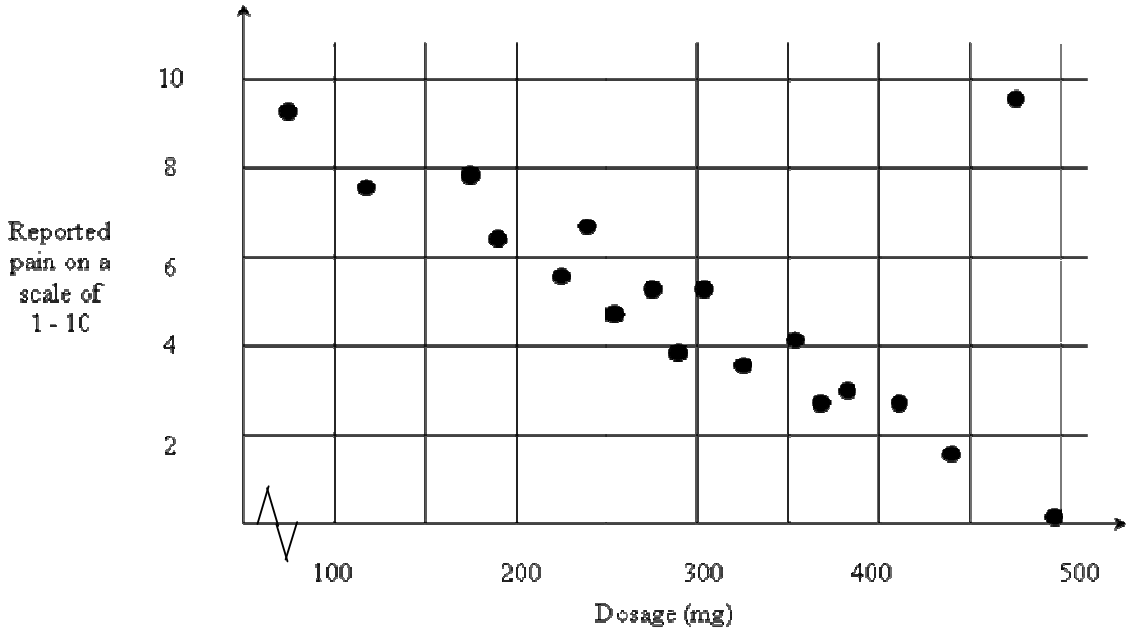
(iii) Briefly describe the shape of the distribution of the monthly maximum temperatures for Melbourne. **1**

(c) There are five players in a tennis team. Andy, Roger, Marcos, Leyton and Todd.

(i) At a practice session, each player is to play a game against each of the other players. How many games will be played to achieve this. **1**

(ii) A captain and a vice-captain need to be selected from the players to represent the team in an upcoming tournament. How many different combinations of captain and vice-captain are possible? **1**

(d) A scatter plot of pain (as reported by patients) compared to the dosage of a pain killing drug is shown below.



(i) Briefly describe (in words) the relationship between the reported pain of patients and the dosage of a pain killing drug **1**

(ii) What correlation co-efficient could be applied to this relationship? **1**

(iii) Briefly describe the possible circumstances of the 'outlier' patient. **1**

Question 27 (13 marks) Use a separate page/ booklet **Marks**

(a) At the school athletics carnival, the probability that any race will have a false start is $\frac{1}{15}$.

(i) What is the probability that a race will not have a false start? **1**

(ii) Lisa entered two races at the athletics carnival. What is the probability that

(α) both her races will have false starts. **2**

(β) at least one of her races will have a false start. **2**

(b) John purchases a car for \$53 200 and uses the declining balance method to depreciate at 10% p.a.

(i) From the table below calculate the values of X and Y **2**

Years	Amount of depreciation (\$)	Salvage value (\$)
0	0	53 200
1	5320	47 880
2	X	Y

(ii) When will the car be worth \$30 000, to the nearest tenth of a year? **1**

(c) Einstein High Mathematics department decided to set the pass mark on a recent exam paper to be 70% or higher. If you did not achieve 70% or higher on the first attempt, you attempted the paper again. The following two-way table records the student's results.

	Males	Females	Total
Passed on first attempt	102	98	200
Passed on second attempt	36	32	68
Total	138	130	

(i) How many students sat the exam. **1**

(ii) What percentage of females passed their test on the second attempt? **1**

(iii) What percentage of students passed their test on the first attempt? **1**

(iv) What is the probability that a student selected at random from the entire group is male and passed the test on the first attempt? **2**

Question 28 (13 marks) **Use the special booklet for Q 28** **Marks**

(a) Bill invested $800 at the end of every 6 months for 10 years, in an account which earned compound interest of 2% per half year.

(i) Show that the value of Bill's investment at the end of 10 years was $19437.90. **3**

(ii) What single amount of money would Bill have to invest for 10 years, earning 2% per half year compound interest, for it to have a value of $19437.90. **2**

(b) Harry is playing a game of chance in which he is to throw a die with 20 faces numbered from 1 to 20.

The table summarises the outcomes of the game

Score Obtained	Outcomes
1,2,3,4,5,6,7,8,9,10	Win $20
11,12,13,14	Lose $10
15,16,17,18,19,20	Win $30

(i) What should Harry's financial expectation be when he plays this game? **2**

(ii) If it costs Harry $20 to play each game, what will be his average outcome per game? **1**

THE FOLLOWING QUESTION MUST BE ANSWERED ON THE GRAPH PROVIDED ON THE BACK PAGE OF THE Q 28 BOOKLET

(c) Eleven students study Geography and English. The marks scored in a test are recorded in the table.

Student	Deb	Jo	Bill	Ted	Kay	Mac	Con	Val	Len	Si	Des
Geography	24	30	27	22	18	24	29	25	21	28	19
English	20	12	15	26	30	14	11	23	29	22	27

(i) Display this data on a scatter-plot. **2**
(Use axes on back page of Q28 answer booklet)

(ii) Construct a Median Regression Line to represent the data. **3**
(Clearly label the 3 median points)

Trial Examination Paper

GENERAL MATHEMATICS

FORMULAE SHEET

Area of an annulus

$A = \pi(R^2 - r^2)$
$R =$ radius of outer circle
$r =$ radius of inner circle

Area of an ellipse

$A = \pi ab$

$a =$ length of semi-major axis
$b =$ length of semi-minor axis

Area of a sector

$A = \frac{\theta}{360}\pi r^2$
$\theta =$ number of degrees in central angle

Arc length of a circle

$l = \frac{\theta}{360} 2\pi r$
$\theta =$ number of degrees in central angle

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

Surface area

Sphere $A = 4\pi r^2$
Closed cylinder $A = 2\pi rh + 2\pi r^2$
$r =$ radius
$h =$ perpendicular height

Volume

Cone $V = \frac{1}{3}\pi r^2 h$
Cylinder $V = \pi r^2 h$
Pyramid $V = \frac{1}{3}Ah$
Sphere $V = \frac{4}{3}\pi r^3$
$r =$ radius
$h =$ perpendicular height
$A =$ area of base

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

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

FORMULAE SHEET

Simple interest

$I = \Pr n$
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
r = percentage interest rate per compounding period, expressed as a decimal

Future value (A) of an annuity

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

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

Present value (N) of an annuity

$$N = M\left[\frac{(1+r)^n - 1}{r(1+r)^n}\right]$$

or

$$N = \frac{A}{(1+r)^n}$$

Straight-line formula for depreciation

$S = V_0 - Dn$
S = salvage value of asset after n periods
V_0 = purchase price of the asset
D = amount of depreciation apportioned per period
n = number of periods

Declining balance formula for depreciation

$S = V_0(1-r)^n$
S = salvage value of asset after n periods
r = percentage interest rate per period, expressed as a decimal

Mean of a sample

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

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

$\bar{x}$ = mean
x = individual score
n = number of scores
f = frequency

Formula for a z-score

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

s = standard deviation

Gradient of a straight line

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

Gradient-intercept form of a straight line

$y = mx + b$
m = gradient
b = y – intercept

Probability of an event

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

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

Name : _____

Teacher's Name : _____

YEAR 12 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

GENERAL MATHEMATICS-MULTIPLE CHOICE ANSWER SHEET

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

(A) ⬭ (B) ⬬ (C) ⬭ (D) ⬭

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

(A) ⬭ (B) ⬬ (C) ⬬ (D) ⬭

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

correct

(A) ⬭ (B) ⬬ (C) ⬬ (D) ⬭

ATTEMPT ALL QUESTIONS

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) ⬭	**21**	(A) ⬭	(B) ⬭	(C) ⬭	(D) ⬭
11	(A) ⬭	(B) ⬭	(C) ⬭	(D) ⬭	**22**	(A) ⬭	(B) ⬭	(C) ⬭	(D) ⬭