Section I
22 marks
Attempt Questions 1-22
Allow about 30 minutes for this section.
Use the multiple choice answer sheet provided.

1) The solution to the equation $\sqrt{2x+3}=9$ is:

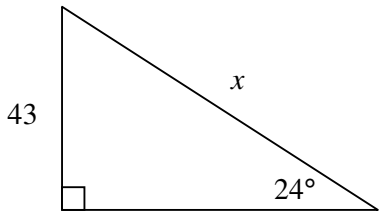
(A) 39

(B) 0

(C) 36

(D) -3

2) The value of x is given by:



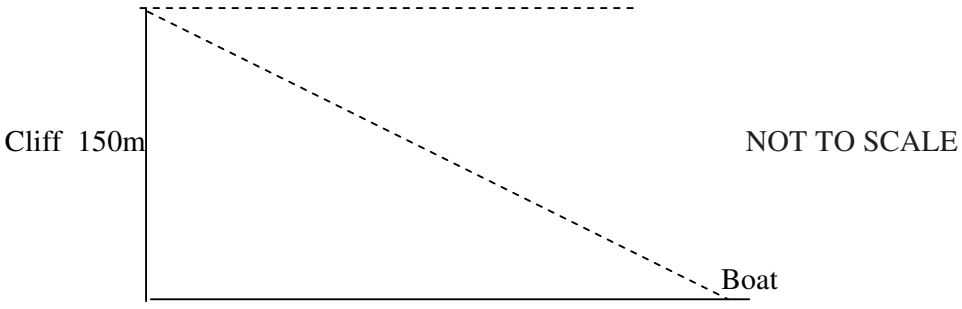
(A) $43\times\cos 24°$

(B) $43\times\sin 24°$

(C) $\dfrac{43}{\cos 24°}$

(D) $\dfrac{43}{\sin 24°}$

3) From the top of a vertical cliff 150m above sea level, the angle of depression of a boat out at sea is $33°$. How far is the boat from the base of the cliff?



(A) 275 m

(B) 179 m

(C) 231 m

(D) 255 m

4) A used car has a sale price of $6975. This represents a saving of 25% off the original price. The original price, to the nearest dollar is:

(A) $1744

(B) $5230

(C) $8719

(D) $9300

5) The stem-and-leaf plot represents the daily sales of car parking tickets from a vending machine. One of the measurements, 78, was left out of the data display. Which statistical measure is most affected by the addition of this score to the data?

5	4 5 7
6	2 4 6 6
7	7 9 9
8	1

(A) Mean

(B) Mode

(C) Median

(D) Range

6) If $100 is increased by 10% and the new amount is reduced by 10%, what is the final amount?

(A) $100

(B) $101

(C) $98

(D) $99

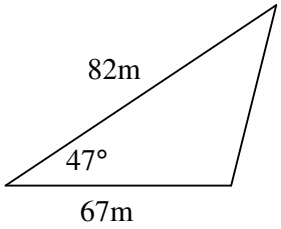
7) What is the area of the triangle to the nearest square metre?

(A) 106 m^2

(B) 1873 m^2

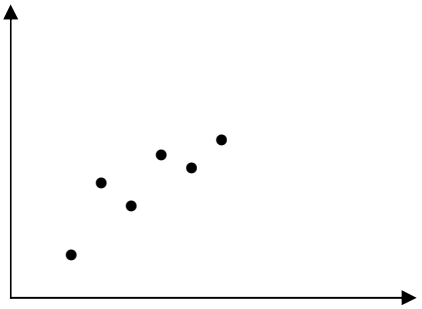
(C) 2009 m^2

(D) 4018 m^2



NOT TO SCALE

8) The correlation that best describes this scatterplot is



(A) low positive correlation

(B) perfect positive correlation

(C) high negative correlation

(D) perfect negative correlation

The following tax table is used for question 9) and question 10).

9) Using the tax table, what is the value of **A**?

Taxable income	Tax payable
\$0 - \$12000	Nil
\$12 001 - \$30 000	Nil plus 30 cents for each \$1 over \$12 000
\$30 001 - \$45 000	\$**A** plus 40 cents for each \$1 over \$30 000
\$45 001 - \$60 000	\$11 400 plus 50 cents for each \$1 over \$45 000
over \$60 000	\$18 900 plus 55 cents for each \$1 over \$60 000

(A) \$3 600

(B) \$5 400

(C) \$9 400

(D) none of the above

10) Gemma has a gross income of \$62 450 and total tax deductions of \$5 270. The tax payable on her taxable income is:

(A) \$6 421.50

(B) \$14 395.60

(C) \$17 490

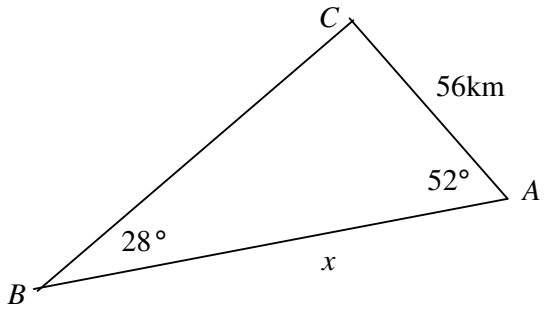
(D) \$26 874.60

11) In a probability experiment, a jar contains 5 red marbles and an unknown number of white marbles. Anthony selected a marble from the jar, recorded its colour, then replaced the marble in the jar. He repeated this procedure 200 times. His results showed a red marble being selected 17 times. The total number of marbles in the jar is approximately:

(A) 12
(B) 54
(C) 59
(D) 183

12) Three towns A, B and C are marked on the diagram. The distance A to C is 56km. $\angle ABC = 28°$ and $\angle BAC = 52°$.

NOT TO SCALE



The distance AB can be found by using:

(A) $\dfrac{x}{\sin 90^{o}} = \dfrac{56}{\sin 28^{o}}$

(B) $x = \dfrac{56\cos 52°}{\sin 28°}$

(C) $x = \dfrac{56\sin 28°}{\sin 52°}$

(D) $\dfrac{x}{\sin 100°} = \dfrac{56}{\sin 28°}$

13) If $x = -2,$ find the value of $\dfrac{1}{4}(x^3 - x^2 + 4)$

(A) –4

(B) –3

(C) –2

(D) 4

14) A jug contains 7 blue and 2 red balls. Two balls are selected at random and are placed on a bench. Which expression gives the probability that they will be different colours?

(A) $\left(\frac{7}{9}\times\frac{2}{9}\right)+\left(\frac{2}{9}\times\frac{7}{9}\right)$

(B) $\left(\frac{7}{9}\times\frac{2}{8}\right)+\left(\frac{2}{9}\times\frac{7}{8}\right)$

(C) $\left(\frac{7}{9}+\frac{2}{9}\right)\times\left(\frac{2}{9}+\frac{7}{9}\right)$

(D) $\left(\frac{7}{9}+\frac{2}{8}\right)\times\left(\frac{2}{9}+\frac{7}{8}\right)$

15) The solution to the equation $4(x-2)-3(x+4)=16$ is:

(A) $x=-4$

(B) $x=12$

(C) $x=14$

(D) $x=36$

16) The base length, l, of a square pyramid of volume V and perpendicular height h is given by the formula $l=\sqrt{\frac{3V}{h}}$. The value of l correct to one decimal place when $V=652$ and $h=7.8$ is

(A) 5.7

(B) 15.8

(C) 250.8

(D) 700.4

17) The mean of a set of scores is 60 and the standard deviation is 4. Between what values do 99.7% of the scores lie?

(A) 48 and 72

(B) 56 and 64

(C) 52 and 68

(D) None of these

18) The speed limit in the Sydney Harbour Tunnel is 80km/h. This is equivalent to:

(A) 2.2 m/s

(B) 22.2 m/s

(C) 133.3 m/s

(D) 1333.3 m/s

19) New car registration plates contain two letters followed by two numerals followed by two more letters eg AC 12 DC. Older registration plates contain three letters followed by three numerals eg ABC 123. Letters and numerals may be repeated in both systems. When comparing the number of plates available in both systems, which system has the greater quantity and by how much?

(A) Old system has 28 121 600 more

(B) Old system has 175 76 000 more

(C) New system has 28 121 600 more

(D) New system has 175 76 000 more

20) Amsterdam in the Netherlands is $15°$ north and $122°$ west of Seoul $(37°N, 127°E)$ in South Korea.The latitude and longitude of Amsterdam is:

(A) $(22°N, 5°W)$

(B) $(52°N, 5°E)$

(C) $(52°S, 5°W)$

(D) $(22°S, 5°E)$

21) Morgan invests \$4000 for 1 year and 8 months. The simple interest is calculated at a rate of 6% per annum. The total value of the investment at the end of this period is:

(A) \$432

(B) \$400

(C) \$4432

(D) \$4400

22) There are six swimmers in a race. In how many different ways can you pick the first two placegetters in the correct order?

(A) 15

(B) 30

(C) 45

(D) 60

End of Section I

Section II

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

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

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

a) Fully simplify the following:

(i) $5(x+3y)-2(x+y)$ **2**

(ii) $(8a^2b\times 6a^3b^8)\div 4ab^{12}$ **2**

(iii) $(3a^4k^2)^4$ **2**

b) Solve $\dfrac{10x-3}{8}=9$ **2**

c) Three students are selected to represent the school in a debating competition. These students are selected from a volunteer group of 3 boys and 4 girls.

(i) How many different selections are possible? **1**

(ii) How many different ways are there of selecting 2 boys and 1 girl? **1**

(iii) Hence, what is the probability of selecting 2 boys and 1 girl? **1**

d) The letters of PARRAMATTA are each written on separate cards. The cards are shuffled and one card is selected at random.

i) What is the probability of selecting an A? **1**

ii) Which letter(s) have the least probability of being selected? **1**

End of Question 23

Question 24 (13 marks) Use a SEPARATE writing booklet. **Marks**

a) At the local park in a country town, a reflection pool has been enclosed within a rectangular safety fence measuring 120m by 100m.

Use Simpson's Rule to find the approximate surface area of the reflection pool. **4**

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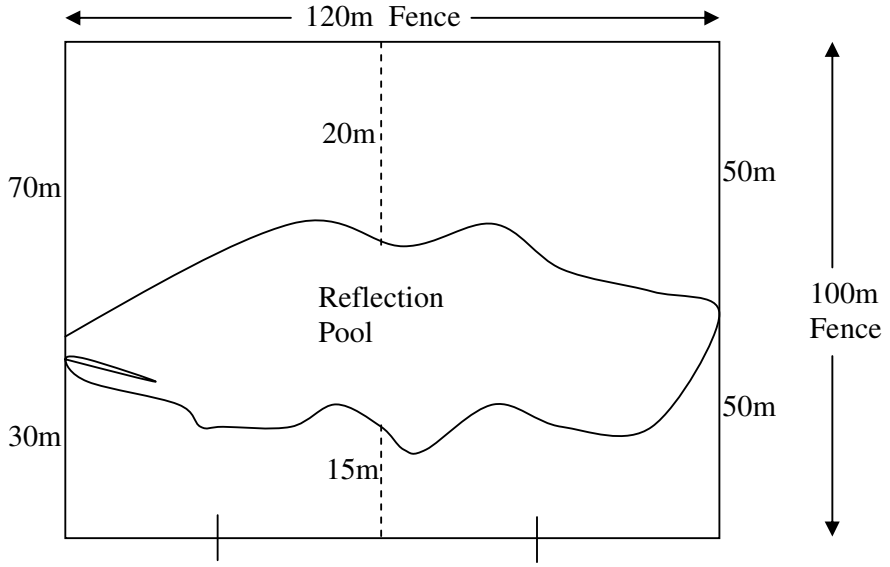
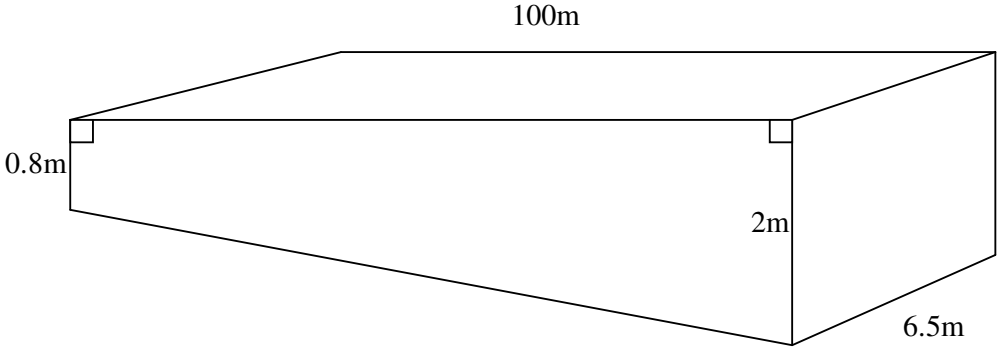


b) The Hacketts are building a swimming pool, in the shape of a trapezoidal prism, on their property. Measurements are indicated in the diagram.

DIAGRAM
NOT TO SCALE



i) Show that the area of the cross section is $140m^2$. **2**

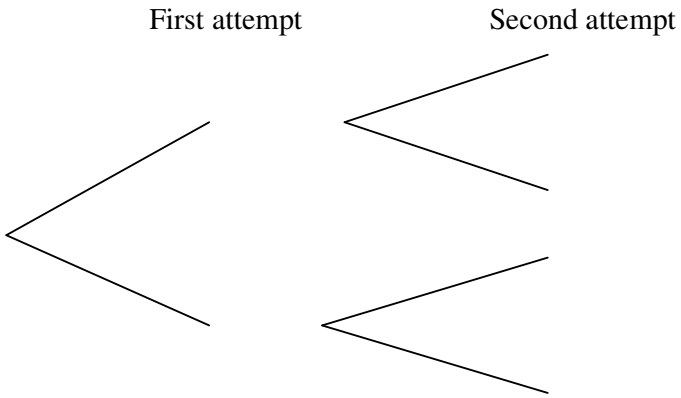
ii) Calculate the volume of water in the pool in cubic metres. **1**

iii) What is the capacity of the pool in kilolitres? **1**

Marks

c) Jesse is a basketball player who has a 38% chance of scoring a basket from the free throw line. He takes two attempts from this line.

(i) Copy and complete this probability tree to show his success. **3**

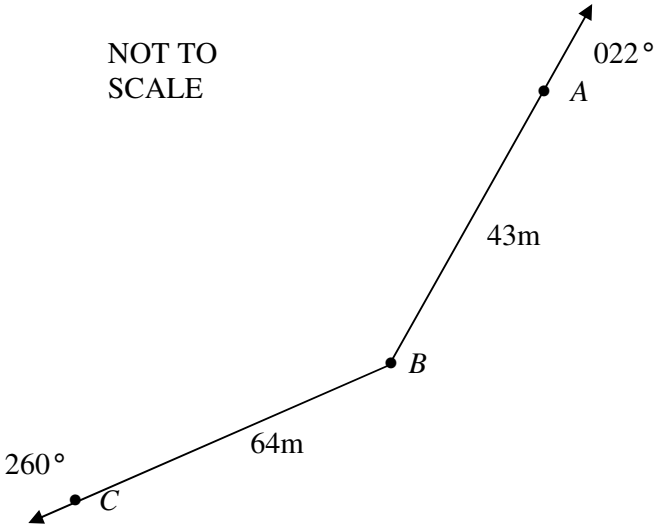


(ii) Calculate the probability that Jesse scores at least once. **2**

End of Question 24

Question 25 (13 marks) Use a SEPARATE writing booklet. **Marks**

a) Danni is a Rover Scout who is taking part in an orienteering session. The diagram below represents a triangular area of land . Danni is standing at B taking bearings and measurements to the corners A and C. The bearing of A from B is $022°$ and the bearing of C from B is $260°$. The distance AB is 43m and the distance BC is 64m.



(i) Show the obtuse angle $ABC = 122^{\circ}$. **1**

(ii) Calculate the distance AC, correct to 1 decimal place. **2**

b) A 72cm television set can be bought for $2300 cash or it can be purchased on terms. Douglas bought the television on terms of $142 deposit and $25 per week for 3 years.

(i) What was the total amount Douglas paid for the television? **2**

(ii) How much interest did he pay? **1**

(iii) Calculate the simple interest rate as a % p.a. of the money borrowed. **2**

Question 25 continued…

c) The table below shows the progress of a $230 000 loan with monthly repayments of $2 240.80. Interest is compounded monthly at 9.6% pa.

Month	Balance at start of month (P)	Interest charged at end of month (I)	Amount owing before repayment (P + I)	Amount owing at end of month (P + I - R)
1	$230 000	$1 840.00	$231 840.00	$229 599.20
2	$229 599 20	$1 836.79	$231 435.99	$229 195.19
3	$229 195.19	$1 833.56	$231 028.76	$228 787.96
4	$228 787.96	(i)	(ii)	(iii)

(i) Calculate how much interest is charged at the end of the fourth month. **1**

(ii) Calculate the loan plus interest for the 4^{th} month of the loan. **1**

(iii) Calculate the balance at the end of the 4^{th} month of the loan. **1**

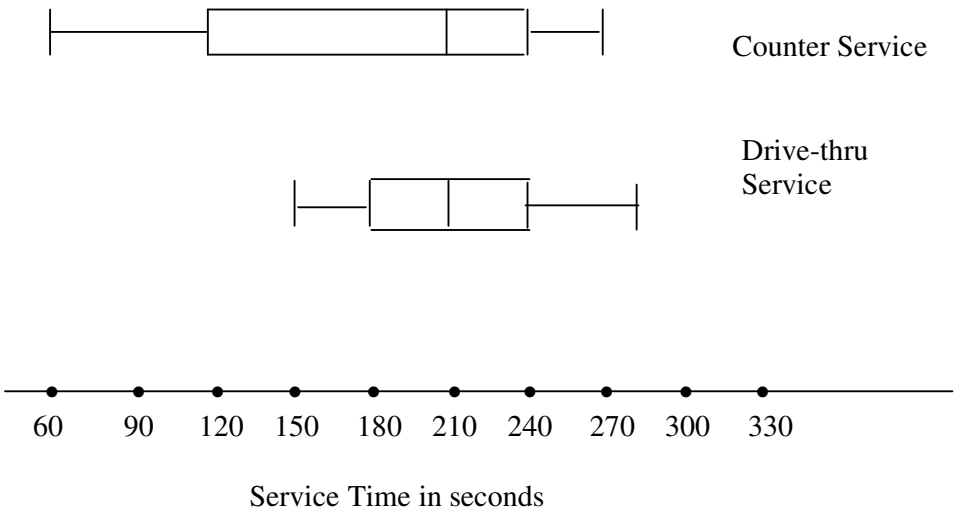
(iv) What is the total amount that has been paid off the home loan at the end of the first 4 months? **1**

(v) Suggest one way that this loan could be repaid faster. **1**

End of Question 25

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

a) Every Saturday after Netball, Sally and Karen go to Hungry Jill's for lunch. Each week they argue whether counter service or the drive-thru is quicker for service. They collect data each week: Sally uses counter service and Karen uses drive-thru. They time how long it takes to have their orders filled. The information they have collected is displayed in the following box-and -whisker plots.



(i) Compare and contrast the two distributions by discussing: **3**
Location,
Spread,
Shape and skewness

(ii) What recommendation(s) would you give Sally and Karen for the quickest purchasing at their favourite fast food outlet - counter service or drive-thru? Use the data display to support your answer. **2**

Question 26 continued…

b) Hannah received her results from two class tests she had recently completed. She was very happy that her score in the second test was higher than that of the first. The class results for both tests are normally distributed and the details are as follows:

	Test 1	Test 2
Number of students	25	25
Mean	60	65
Standard Deviation	7.5	15
Hannah's result	75	80

(i) Convert both of Hannah's test results to z - scores **1**

(ii) Was Hannah's second result really better than her first? Explain your answer using calculations. **2**

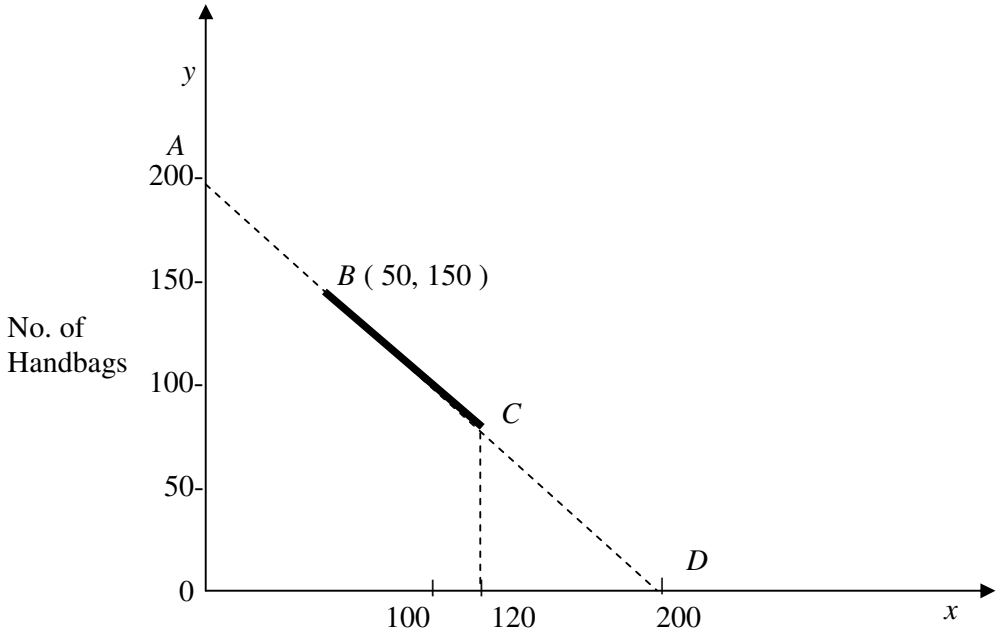
(iii) In the second test what percentage of students achieved a result higher than Hannah's? **1**

Question 26 continued… **Marks**

c) A leather goods factory specialises in making briefcases and handbags.
In any week

- the total number of briefcases and handbags made is 200
- the maximum number of briefcases made is 120
- the maximum number of handbags made is 150

The factory manager has drawn a graph to show the number of briefcases (x) and handbags (y) that can be made.



(i) Determine the equation of the line AD. **1**

(ii) Explain why the line AD is only relevant between B and C for this factory. **1**

(iii) The profit per week, \$$P$, can be found by using the equation

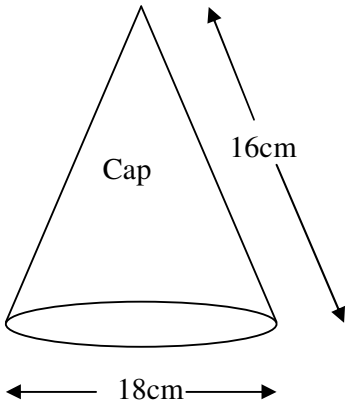
$$P = 24x + 15y$$

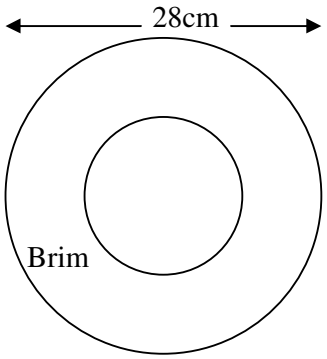
Compare the profits at B and C. **2**

End of Question 26

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

a) A company that makes fancy dress costumes has created a wizard's hat out of stiffened black felt. The design consists of a cap joined to a brim in the shape of an annulus. The design measurements for a small hat are illustrated below. NOT TO SCALE





(i) Calculate the external surface area of the **cap**. Answer to 1 decimal place**.** (S.A. = πrs) **1**

(ii) Calculate the area of the annulus to 1 decimal place. **2**

(iii) Hence, determine the **outside** surface area of the wizard's hat. Give your answer to the nearest cm^2. **2**

b) The time in Sydney is 10 hours ahead of time in London. A plane leaves Sydney at 7am on Wednesday and flies, non stop, directly to London. The flight takes 22 hours.

(i) Calculate the time and day in London when the plane lands. **2**

(ii) If the distance between Sydney and London is approximately 17 000 km, calculate the average speed of the plane in knots. Give your answer to the nearest whole number. (1 nautical mile =1.852km) **2**

(iii) The plane began its flight with 184 tonnes of fuel. When it landed, there was enough fuel in reserve to fly for another 45 minutes.
How much fuel was used for the flight? Give your answer correct to the nearest tonne. **2**

Marks

c) Chocolates are put into packets labelled as 50g. The machine that performs this task is set to measure a mean mass of 51g with a standard deviation of 1.5g.

(i) What percentage of packets will have a mass between 52.5g and 55.5g? **1**

(ii) If a packet is selected at random from a box containing these chocolate packets, between what masses will the packet most probably lie? **1**

End of Question 27

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

a) A test is available to predict the gender of an unborn baby. The table below shows the results of a number of trials of this test.

	Prediction		
	Accurate	Not accurate	Total
Male	115	17	132
Female	99	9	108
TOTAL			

(i) Complete the final line of the table on your answer booklet. **1**

(ii) How many trials of this test were conducted? **1**

(iii) What percentage of the test results were inaccurate?
(correct to 1 decimal place) **1**

(iv) What is the probability that a male baby was predicted accurately? **1**
(correct to 1 decimal place)

b) Two unbiased dice are thrown. Each die has six faces. The faces are numbered 1, 2, 3, 4, 5 and 6. The score is found by multiplying the numbers on each die.

2ND DIE \ 1ST DIE	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6	8	10	12
3	3	6	9	12	15	18
4	4	8	12	16	20	24
5	5	10	15	20	25	30
6	6	12	18	24	30	36

(i) What is the probability that the score is an even number? **1**

(ii) A game is created with these dice. There is a \$1 entry fee.
When the dice are thrown:
- \$10 is won if 36 is scored.
- \$5 is won if the score is 18 to 35.
- \$1 is lost if the score is less than 18.

What is the financial expectation from this game? Would you continue playing this game for an extended period? Explain your findings. **3**

(c) Laura is working on a problem involving the median regression line. She has calculated three median points: $M_1(1,2)$, $M_2(4,3)$ and $M_3(6,6)$.

(i) On a number plane (in the first quadrant only) sketch these three points and label them carefully. **1**

(ii) Find the gradient of the median regression line joining M_1 and M_3 . **1**

(iii) Laura proceeds to locate her median regression line. On your diagram, mark in where the median regression line should be. **2**

(iv) It was suggested that the correlation coefficient was -0.5 for the data collected to obtain this line. Suggest why this is incorrect. **1**

End of Question 28

End of Examination

FORMULAE SHEET

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

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

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–inte cept 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:

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

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

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

θ = number of degrees in central angle

Arc length of a circle

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

θ = number of degrees in central angle

Simpson's rule for area approximation

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

h = distance between successive measurements

d_f = first measurement

d_m = middle measurement

d_l = last measurement

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 $V = \dfrac{1}{3}\pi r^2 h$

Cylinder $V = \pi r^2 h$

Pyramid $V = \dfrac{1}{3}Ah$

Sphere $V = \dfrac{4}{3}\pi r^3$

r = radius

h = perpendicular height

A = area of base

Sine rule

$\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Area of a triangle

$A = \dfrac{1}{2}ab\sin C$

Cosine rule

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

or

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

ANSWER SHEET FOR MULTIPLE CHOICE SECTION

STUDENT 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 ⬭

21. A ⬭ B ⬭ C ⬭ D ⬭

22. A ⬭ B ⬭ C ⬭ D ⬭