

Student Number:

2006**HIGHER SCHOOL CERTIFICATE**

Sample Examination Paper

GENERAL MATHEMATICS

General Instructions

- Reading Time – 5 minutes
- Working Time – 2.5 hours
- Write using blue or black pen
- Write your student number at the top of this page
- Calculators may be used
- A formulae sheet is provided at the back of this paper

Total marks – 100**Section I****22 marks**

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

Section II**78 marks**

- Attempt Questions 23–28
- Allow about 2 hours for this section

Directions to school or college

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Section I
22 marks

Allow about 30 minutes for this section

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

1	X			
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If you think you have made a mistake, blank out the incorrect answer and fill in the new answer.

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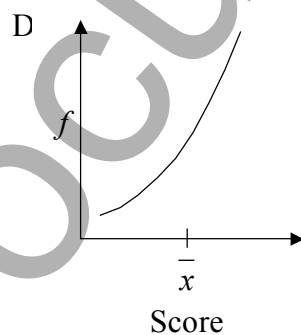
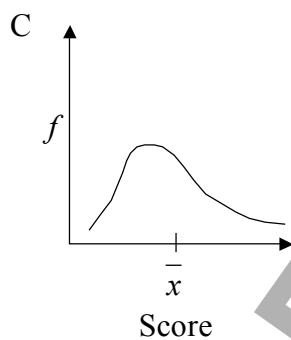
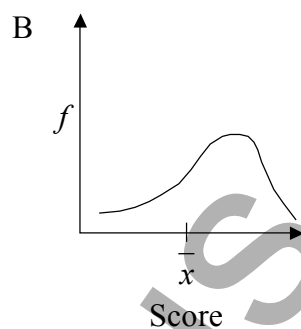
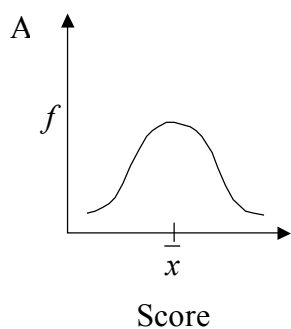
If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word *correct* and drawing an arrow.

1	X			X
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Correct →

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

- 1 Which of the diagrams below displays a set of scores which has its mode less than its mean?



- 2 Use the formula $x = \sqrt{h^2 + a^2}$ to find a if $x = 30$ and $h = 18$.

- A 12
B 24
C 35
D 576

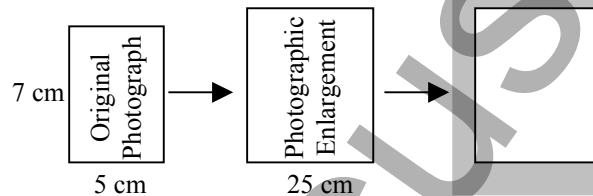
- 3 Researchers were testing a new lie detector. The results are shown below.

	Test Results		Total
	Accurate	Not accurate	
People telling the truth	60	8	68
People not telling the truth	140	22	162
Total	200	30	

What percentage of people who did the test were not telling the truth?

- A 13%
 B 64%
 C 70%
 D 87%
- 4 A photograph is enlarged and then mounted on cardboard so that there is a 5 cm border around the enlargement.

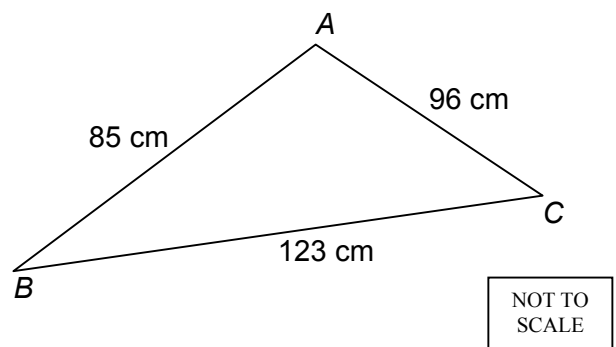
NOT TO
SCALE



The dimensions of the cardboard are:

- A $30 \text{ cm} \times 40 \text{ cm}$
 B $30 \text{ cm} \times 54 \text{ cm}$
 C $35 \text{ cm} \times 45 \text{ cm}$
 D $35 \text{ cm} \times 59 \text{ cm}$

5



Find $\angle A$, to the nearest degree.

- A 51°
 B 85°
 C 159°
 D It is impossible to find this angle.

6

Taxable income \$	TAX payable
\$1 – \$5 099	Nil
\$5 100 – \$12 599	0 plus 24 c for each \$1 over \$5 100
\$12 600 – \$19 499	\$1 800 plus 29 c for each \$1 over \$12 600
\$19 500 – \$34 999	\$3 801 plus 40 c for each \$1 over \$19 500

Mymen earns \$20 500 in a year. Her allowable deductions total \$1 500.

Using the table above, which of the following expressions represents her total tax payable?

- A $\$1\,800 + 6\,400 \times 29\text{ c}$
- B $\$1\,800 + 6\,400 \times 40\text{ c}$
- C $\$3\,802 + 1\,000 \times 29\text{ c}$
- D $\$3\,801 + 1\,000 \times 40\text{ c}$

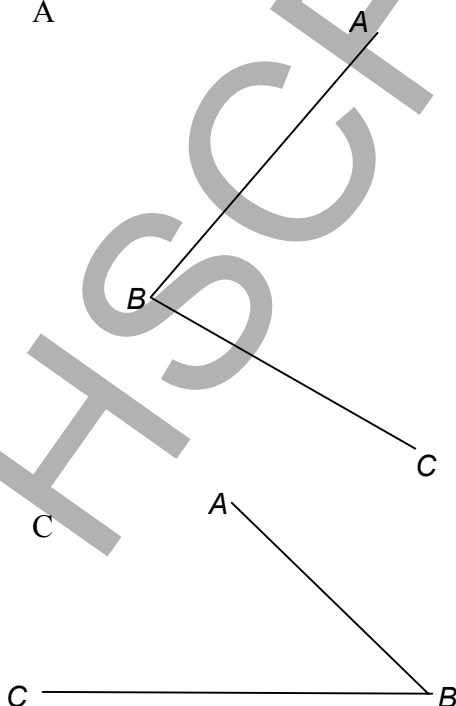
7 Simplify $8 - 2(3t - 4)$.

- A $-6t$
- B $4 - 6t$
- C $18t - 24$
- D $16 - 6t$

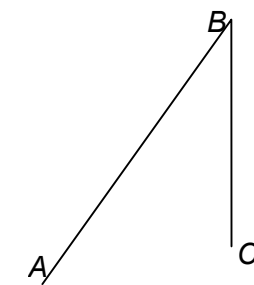
8 A bushwalker walks from A on a bearing of 124° to B and then changes direction and walks on a bearing of 223° to C.

Which of the following best represents this information?

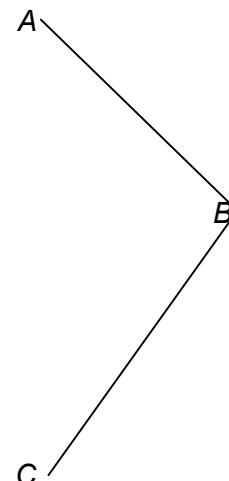
A



B



D



- 9 The scores 95, 38, 54, 72, 77, 56, 28, 48, 60 and 62 have a mean of 59 and a standard deviation of 18.3.

How many of these scores are more than one standard deviation away from the mean?

- A 1
B 2
C 3
D 5

10

MONTHLY REPAYMENTS					
Term of loan	Amount of Loan				
	\$2 000	\$4 000	\$6 000	\$8 000	\$10 000
6 months	\$353	\$699			
12 months	\$186	\$366	\$570	\$722	\$899
18 months	\$141	\$232	\$380	\$499	\$599
24 months	\$102	\$201	\$289	\$361	\$452
30 months	\$91	\$165	\$251	\$312	\$372
36 months	\$74	\$143	\$282	\$293	\$344

Calculate the amount of interest that Jamil will pay for a loan of \$8 000 over a term of 18 months.

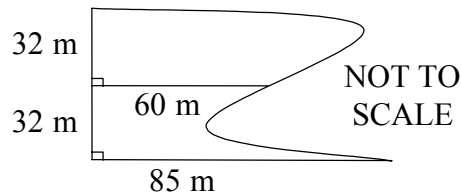
- A \$499
B \$664
C \$982
D \$8 982

- 11 My golf bag contains 10 golf balls of which 3 are red and the rest are white. I select one ball at random and hit it into a sand trap. I select another ball and hit it onto the green.

The probability that both balls were white is

- A $\frac{1}{15}$
B $\frac{7}{15}$
C $\frac{7}{10}$
D $\frac{3}{10}$

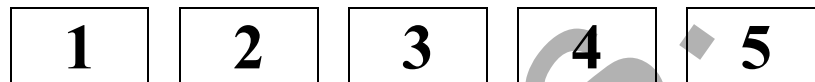
12



Use Simpson's Rule to find the area of this field, correct to the nearest square metre.

- A $1\,547\text{ m}^2$
- B $3\,467\text{ m}^2$
- C $4\,267\text{ m}^2$
- D $6\,933\text{ m}^2$

13 The digits 1, 2, 3, 4 and 5 are written on five separate cards.



Three cards are drawn at random from the deck, one at a time and placed face up on the table to form a 3-digit number.

How many different 3-digit numbers can be formed?

- A 10
- B 60
- C 120
- D 125

14 Rebecca was required to solve an equation for homework. This was her solution:

$$\begin{array}{ll}
 8 - 4(3x - 7) = 16 & \\
 8 - 12x + 28 = 16 & \text{..... Line 1} \\
 -12x - 20 = 16 & \text{..... Line 2} \\
 -12x = 36 & \text{..... Line 3} \\
 x = 3 & \text{..... Line 4}
 \end{array}$$

Which lines DO NOT follow correctly from the previous line?

- A Line 1 and Line 2
- B Line 1 and Line 4
- C Line 2 and Line 3
- D Line 2 and Line 4

- 15 The depreciation on my new DVD recorder worth \$4 000 can be found using the declining balance method.

The table below shows the value of the DVD recorder after a number of years.

Years	Salvage value (\$)
0	4000
1	3200
2	2560
3	2048
4	1638.40
5	1310.72
6	1048.58
7	838.86
8	671.09
9	536.87
10	429.50

During what year will the DVD player be first worth half of its original value?

- A 2nd
B 3rd
C 4th
D 5th
- 16 Mario borrows \$2 000 for a trip to Thailand. He repays the loan over 2 years at an interest rate of 6% p.a. compounding monthly.

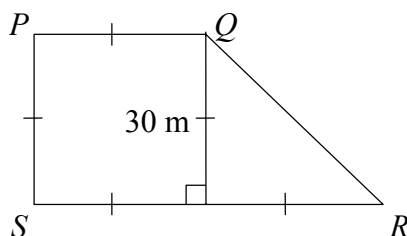
Mario's monthly instalments are

- A \$88.64
B \$93.33
C \$93.63
D \$93.93
- 17 The number of people in a town is given by $N = 2000e^{0.12t}$ where N is the number of people and t is the time in years. [Given $e \approx 2.718$]

The population after 3 years is approximately

- A 3
B 2 870
C 4 820
D 6 765

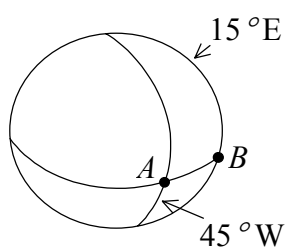
18



The area of the shape $PQRS$ is

- A 150 m^2
- B 800 m^2
- C 900 m^2
- D $1\,350 \text{ m}^2$

19

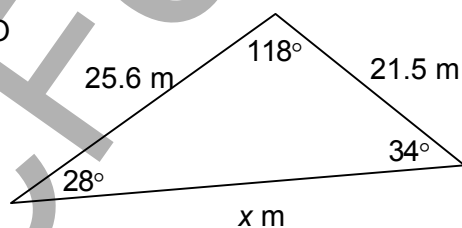


At B it is 10 am. The time at A is

- A 6 am
- B 8 am
- C Midday
- D 2 pm

20

NOT TO
SCALE



The correct value for x is given by

- A $x = \frac{25.6 \sin 34^\circ}{\sin 28^\circ}$
- B $x = \frac{25.6 \sin 118^\circ}{\sin 34^\circ}$
- C $x = \frac{25.6 \sin 118^\circ}{\sin 28^\circ}$
- D $x = \frac{21.5 \sin 118^\circ}{\sin 34^\circ}$

- 21** A family of four spends the following amounts on the given food items in one week.

Meat and fish	\$45
Fruit and vegetables	\$35
Groceries	\$65
Milk and dairy	\$18
Other	\$17

Nigel would like to display the information as a sector graph.

What size angle is needed to represent milk and dairy?

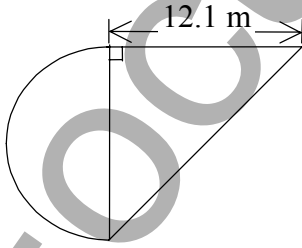
- A 9°
B 10°
C 18°
D 36°
- 22** A jar is filled with identical white buttons. Mary tips the buttons into a bowl and adds thirty more buttons, identical except that they are red, and mixes them together. Mary then randomly selects a handful of buttons and finds that she has eighteen buttons, four of which are red.

How many buttons should Mary estimate were originally in the jar?

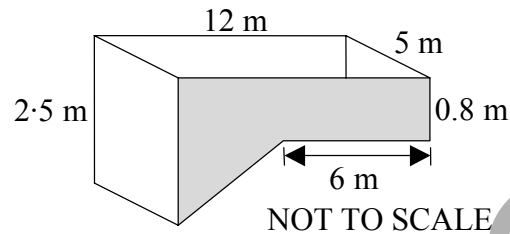
- A 105
B 135
C 165
D 545

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 answer booklet, clearly labelled with your student number.****All necessary working should be shown in every question.**

		Marks
Question 23 (13 marks)	Use a SEPARATE answer booklet.	
(a)	A die is thrown twice. What is the probability	
	(i) of obtaining a 2 on the first throw?	1
	(ii) of throwing a 4 and a 5 in any order?	1
	(iii) that the sum of the two numbers on the uppermost face is greater than 5?	1
(b)	 A garden bed in the school grounds is in the shape of a semicircle and a right-angled isosceles triangle.	
	(i) Calculate the area of the semicircle.	1
	(ii) Find the total area of the garden bed.	1
	(iii) Lawn fertilizer is to be spread at the rate of 3 kg per 100 m ² . How much is needed to cover the bed, correct to the nearest kg?	2
(c)	The length L of the diagonal of a cube of side S is given by the formula $L^2 = 3S^2$. Find, correct to the nearest millimetre, the length of the diagonal of a cube of side 15 millimetres.	1

- (d) Mr and Mrs Thrifty have just built a new in-ground swimming pool. The diagram below shows the in-ground swimming pool is 12 m long and 5 m wide. The depth at the shallow end is 0.8 m and at the deep end is 2.5 m. The depth begins to increase halfway along the pool.



- (i) Find the area of the shaded wall. 1
- (ii) Find the volume of water that the pool can hold when full to the top. 1
- (iii) The inside walls of the pool (NOT the floor) were painted with a special sealing paint. This type of paint costs \$35/m². Find the total cost to paint the inside of the pool. 3

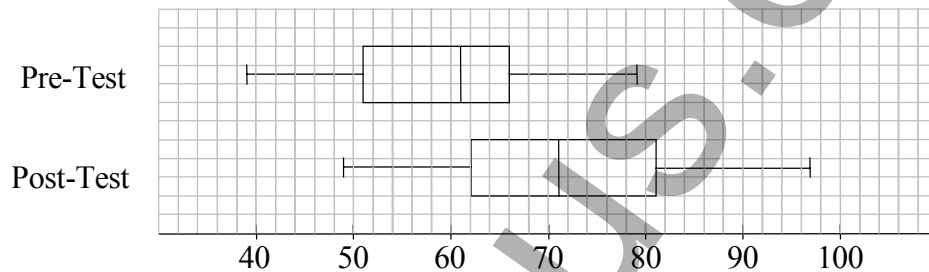
End of Question 23

Marks

Question 24 (13 marks) Use a SEPARATE answer booklet.

- (a) The performance of 18 students was recorded on a Pre-Test. A new Science program was introduced and then a Post-Test was given. The results are shown below:

		Pre-Test				Post-Test				
6	5	#	8	6	9	3				
			3	2	5	4				
			1	1	0	5	1	5	7	9
			3	3	0	6	2	3	6	8
			9	3	2	1	7	0	2	4
						8	1	4	7	
						9	4	7		



- What is the range for the Pre-Test? 1
- One entry in the Pre-Test is missing (represented by #). If the mean of these results is 59, what is the value of this score? 1
- Calculate the mean and sample standard deviation of marks for the Post-Test. 1
- A score is selected at random from the Post-Test results. What is the probability that this test lies within one sample standard deviation of the mean? 1
- Determine the interquartile range for the results of the Post-Test. 1
- Compare and contrast the displays for the Pre-Test and Post-Test by examining:
 - the shape and skewness of the distribution;
 - and
 - measure of location and spread. 1
- Use your answer in Part (vi) to support or reject the claim that: 1

“This Science program has allowed the students to make large gains in Science”.

		Marks
(b)	(i) Using the equation $P = QR^2$ find the value of P if $Q = 6$ and $R = 8$.	1
	(ii) Rearrange the equation $P = QR^2$ to make R the subject.	2
	(iii) Find the value of R if $P = 27$ and $Q = 3$.	1
(c)	In a lottery 100 000 tickets are sold. There are 50 major prizes and 108 minor prizes.	
	If a person buys 6 tickets in this lottery, what is their chance of winning	
	(i) a major prize?	1
	(ii) any prize?	1

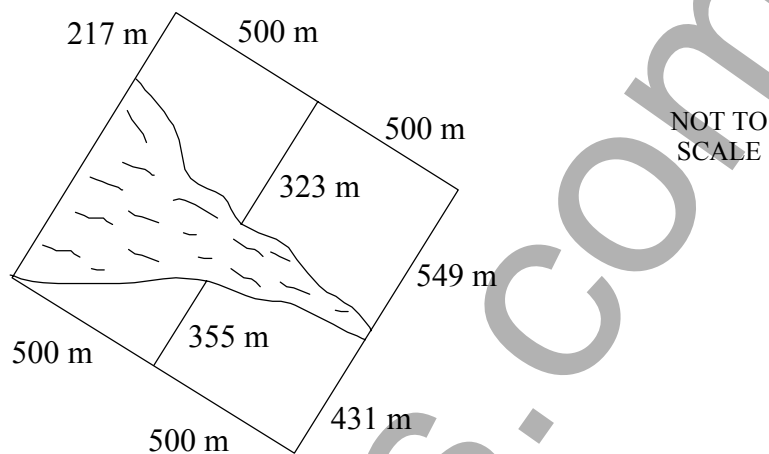
End of Question 24

Marks

Question 25 (13 marks) Use a SEPARATE answer booklet.

- (a) A paddock has a river running through it, as shown in the diagram below.

Use Simpson's Rule to find the area of the land in hectares. (1 ha = 10 000 m²) **2**



- (b) The surface area of a cube varies directly with the square of the cube's edge.

- (i) A cube of edge length 6.5 cm has a surface area of 253.5 cm².
Find the constant of variation. **2**

- (ii) Find the surface area of a cube with edge length of 10.25 cm **1**

- (c) Below is Belinda's timesheet for one week's work at Cheap Al's one dollar shop.

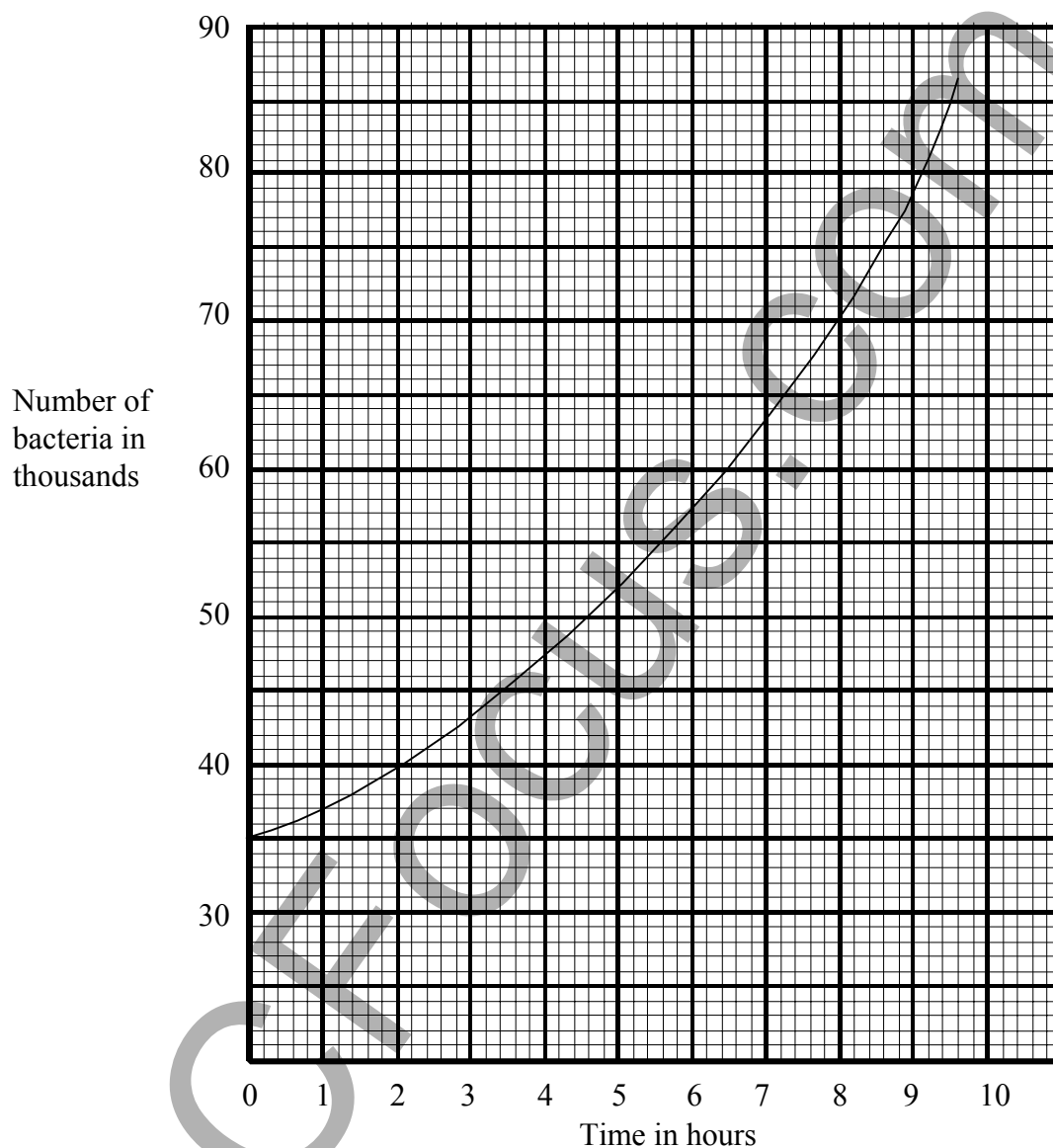
Day	Start	Finish	Meal Break
Monday	8:30 am	5:30 pm	1 hour
Tuesday	8:30 am	2:00 pm	30 minutes
Wednesday	8:30 am	5:30 pm	1 hour
Thursday	8:30 am	9:00 pm	2 hours
Friday	1:00 pm	5:00 pm	----
Saturday	8:00 am	4:00 pm	1 hour
Sunday	10:00 am	4:00 pm	1 hour

Conditions of employment at Cheap Al's	
Normal pay rate: \$9.80 per hour	
Staff are NOT paid for meal breaks	
Monday to Friday	Normal pay rate for the first eight hours worked: time-and-a-half thereafter
Saturday	Time-and-a-half
Sunday	Double time

- (i) For how many hours did Belinda work at the normal pay rate during this week? 1
- (ii) How much did Belinda earn at the normal rate of pay during this week? 1
- (iii) How much did Belinda earn from working at penalty rates during this week? 1
- (iv) What percentage of her pay for this week did Belinda earn by working at penalty rates? 2

Marks

- (d) At the start of an experiment there were 35 000 bacteria in a certain culture. The graph below shows the increase of bacteria (in thousands) with time, t (in hours).



From the graph, estimate

- | | | |
|-------|---|----------|
| (i) | the number of bacteria present after 3 hours. | 1 |
| (ii) | the time when the number of bacteria reaches 63 000. | 1 |
| (iii) | the time when the number of bacteria reaches double its initial size. | 1 |

End of Question 25

Question 26 (13 marks) Use a SEPARATE answer booklet.

- (a) A company spent \$500 000 on equipment 8 years ago.
Its current value is \$350 000.

Using the declining balance method, find the percentage depreciation rate over this period.

2

- (b) On the day of Jordan's birth, her grandparents, Mr and Mrs Wise decided to start saving for her university education. They invested \$200 per month in an account which paid 6% p.a. compounded monthly.

- (i) Show that by Jordan's 5th birthday, Mr and Mrs Wise had accumulated approximately \$13 954.

1

At this stage, Mr and Mrs Wise decided to stop the regular payments into this savings account but they left the \$13 954 to earn interest and grow for the next 12 years until Jordan's 17th birthday.

- (ii) Calculate the value of this investment after a further 12 years.

1

- (iii) University costs are approximately \$7 000 per year. Assuming Jordan attends university for 4 years, show by calculation whether or not Mr and Mrs Wise had saved enough money to cover Jordan's university education.

2

- (c) Bilal has just completed his Trial HSC exams. He scored 62 in Biology, 64 in English and 68 in Mathematics. The mean and standard deviation of the results in each subject are shown below.

Subject	Mean	Standard deviation
Biology	60	4
English	54	5
Mathematics	70	2

Rank Bilal's results from best to worst.

3

Marks

- (d) Mrs Trendy obtained a personal loan of \$2 000 to purchase a new flat screen television.
The loan is to be repaid over 2 years by equal monthly instalments.
The interest is charged at a flat rate of 9.5% p.a. and she pays a loan protection fee of 25 cents per \$100 borrowed.
- (i) Find the total charges that she will pay. **1**
- (ii) Calculate Mrs Trendy's monthly instalment. **2**
- (iii) Evaluate the effective annual interest rate using the formula

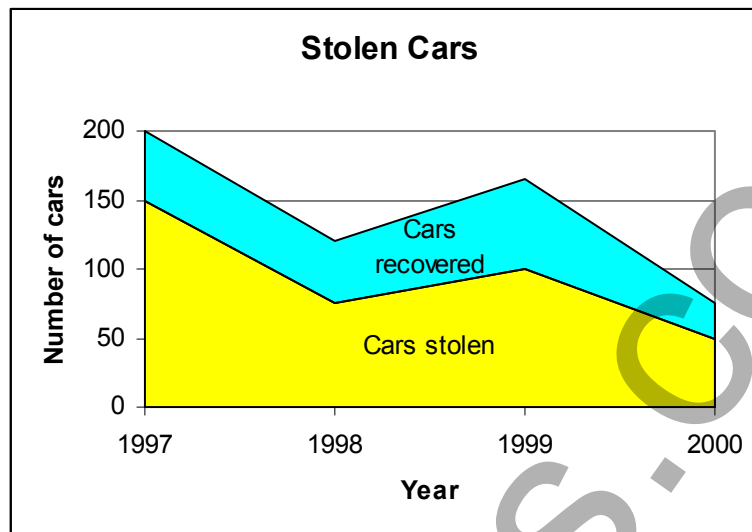
$$a = \frac{2Rn}{n+1}$$

where R is the flat rate of interest and n is the number of instalments. **1**

End of Question 26

Question 27 (13 marks) Use a SEPARATE answer booklet.

- (a) Morristown police included this chart as part of its neighbourhood watch report.



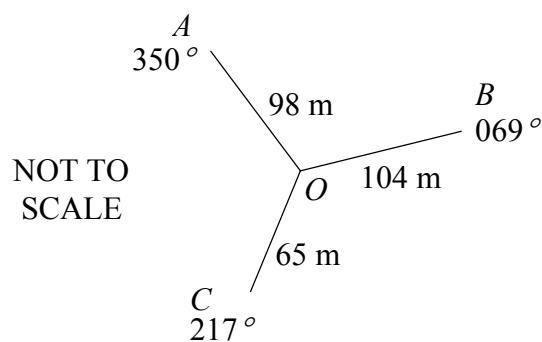
- (i) How many cars were stolen in 1998? 1
- (ii) How many cars were recovered during 1999? 1
- (iii) Copy and complete this summary table on your answer booklet. 2

	1997	1998	1999	2000
Number of cars stolen				
Number of cars recovered				

- (iv) What percentage of the cars stolen in 1997 were recovered in 1997? 1
- (v) During which year were half of the stolen cars recovered? 1
- (b) An aeroplane is flying from Cairo (30° N, 31° E) to Durban (30° S, 31° E) at a constant speed of 500 knots.
- (i) How many nautical miles will the plane travel in 5 hours? 1
- (ii) What are the plane's new coordinates as a result of this 5-hour flight? 1
- (iii) Given that the radius of the Earth is 6 400 km, calculate, to the nearest kilometre, the greatest circle distance from Cairo to Durban. 1

Marks

- (c) The results of a compass radial survey are shown below.



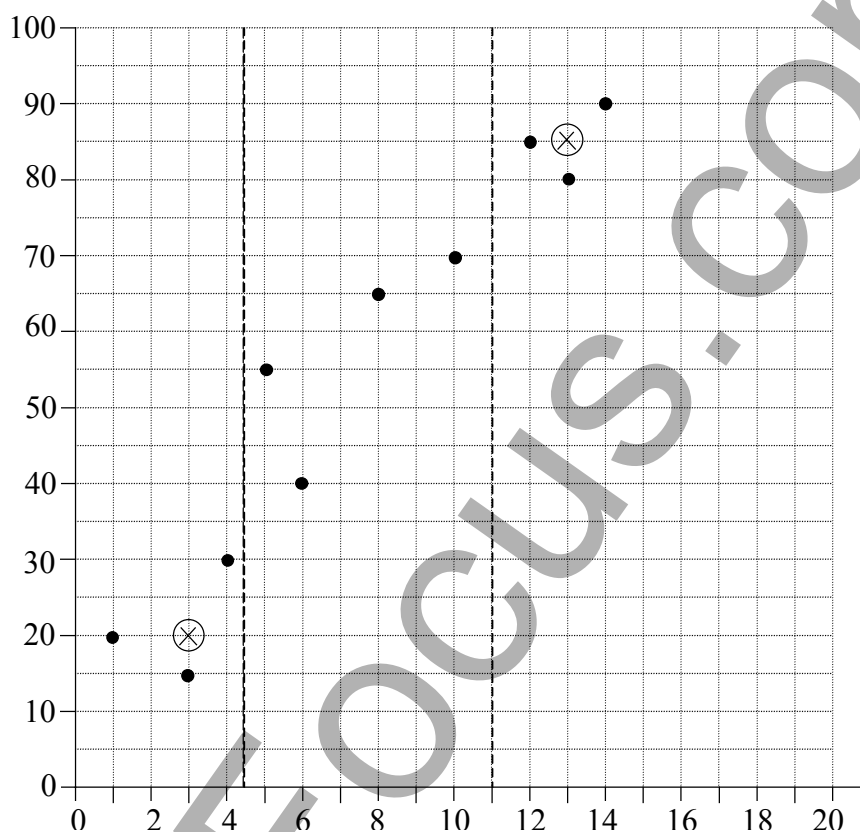
- | | | |
|-------|---|---|
| (i) | Find $\angle AOB$. | 1 |
| (ii) | Use the cosine rule to find the length of the boundary AB . | 2 |
| (iii) | Find the area of triangle AOB . | 1 |

End of Question 27

Question 28 (13 marks) Use a SEPARATE answer booklet.

(a) A scatterplot is made up for the following points.

x	1	3	4	5	6	8	10	12	13	14
y	20	15	30	55	40	65	70	85	80	90



- (i) Using the points plotted, determine the coordinates of the middle median point and mark it on the graph.
Use the graph provided on page 29.
- (ii) Using a pencil and ruler, draw the median regression line on the scatterplot.
- (iii) Determine the equation of the median regression line.

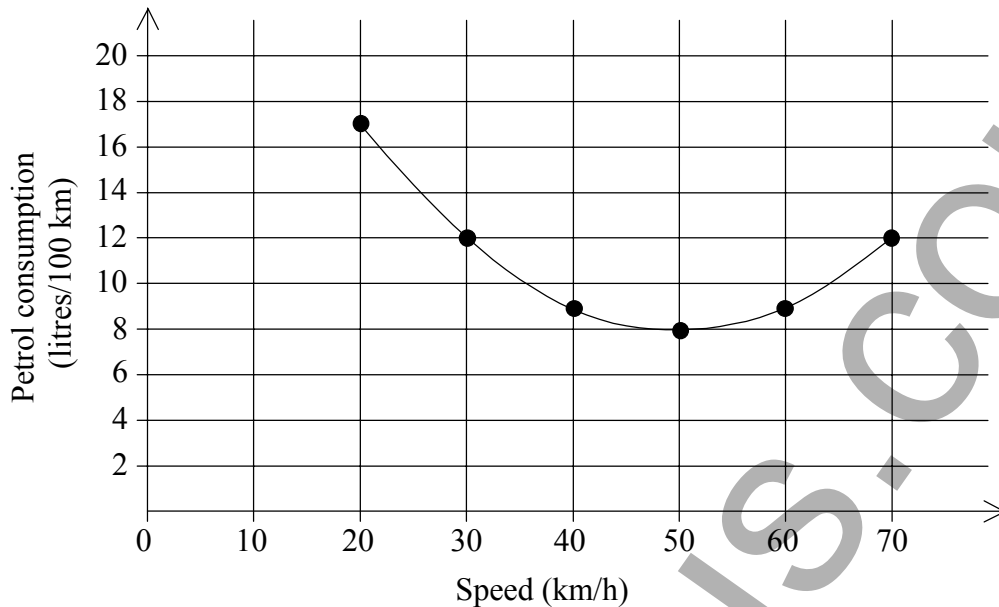
2

1

3

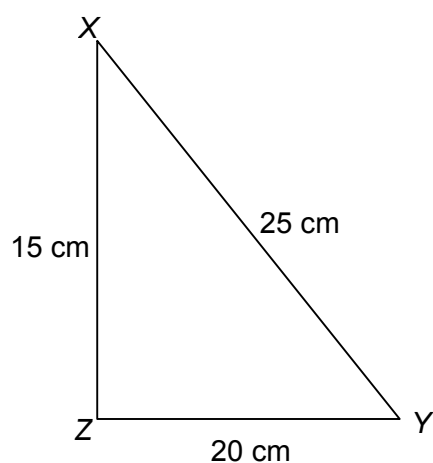
Marks

- (b) A car was test driven at different speeds and the petrol consumption was recorded.
The results are shown in the graph below.



- (i) What was the petrol consumption recorded at 60 km/hr? 1
- (ii) During the test the car was driven at 30 km/hr for 20 km.
How many litres of petrol did it use? 1
- The graph is modelled by the formula $C = 0.01S^2 - S + 33$ for speeds from 20 km/hr to 80 km/hr, where C is the petrol consumption in litres per 100 km and S is the speed in km/hr.
- (iii) Use this formula to calculate the petrol consumption at a speed of 80 km/hr. 1
- (iv) The formula $C = 0.01S^2 - S + 33$ is a good model for speeds between 20 km/hr and 80 km/hr.
Why would this formula NOT be useful for $S = 0$? 1

(c)



- | | | |
|------|---|---|
| (i) | Use Pythagoras' Theorem to show that triangle XYZ is a right-angled triangle. | 1 |
| (ii) | Calculate the size of angle XYZ to the nearest degree. | 2 |

End of 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

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

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

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

A = area of base

h = perpendicular height

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

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

General Mathematics – Formulae Sheet

Simple interest

$$I = P r n$$

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

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-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:

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

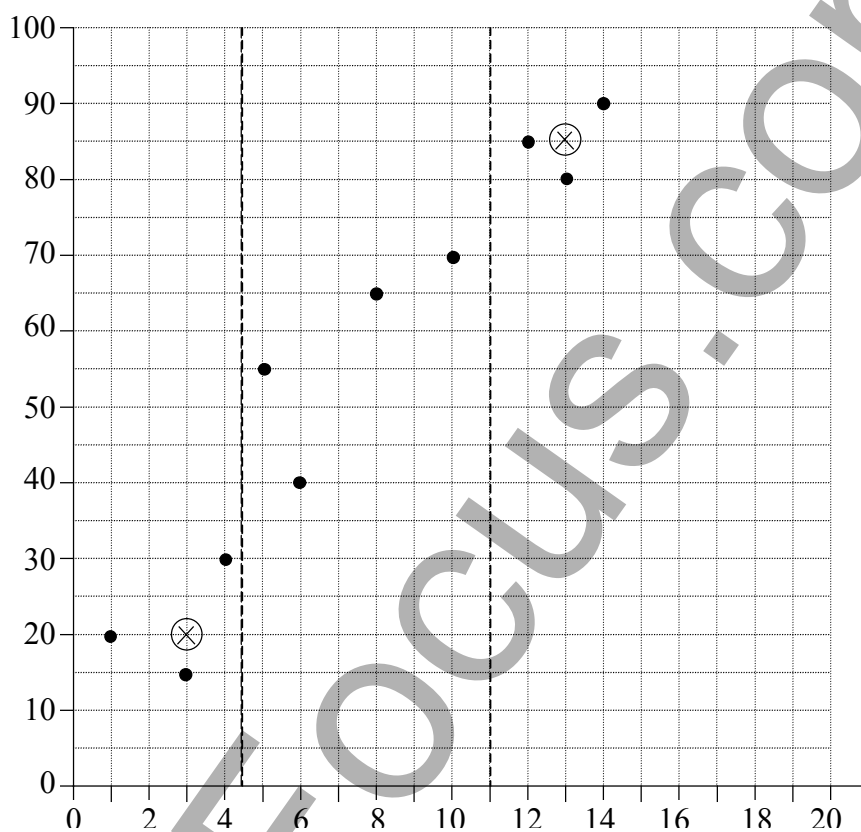
Section I – Multiple Choice**Answer sheet**

	A	B	C	D
1				
2				
3				
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Use this graph to answer Question 28(a) part (i)

x	1	3	4	5	6	8	10	12	13	14
y	20	15	30	55	40	65	70	85	80	90



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Mapping grid

Question	Mark	Content	Strand	Outcome(s)
1	1	Statistical measure	DA3/4	P1, P2, P4, P7, P11
2	1	Substitution into a formula	AM3	H3, H7
3	1	Two-way table	PB4	H2, H4, H11
4	1	Scale	M3	P2, P6, P7
5	1	Non-right-angled triangle trigonometry	M6	H6, H7
6	1	Tax payable	FM3	P2, P5, P7, P8, P11
7	1	Algebraic skills	AM1	P2, P3, P7
8	1	Bearings	M6	H1, H2, H6, H7, H11
9	1	Comparing data values	DA5	H1, H2, H4, H5, H9, H11
10	1	Reading a loan repayment table	FM2	P2, P3, P7, P8, P11
11	1	Probability	PB3	H2, H10, H11
12	1	Simpson's rule	M5	H1, H2, H6, H7, H11
13	1	Counting outcomes	PB3	H2, H10, H11
14	1	Equation solution	AM1	P2, P3, P7
15	1	Depreciation	FM6	H1, H2, H5, H8, H11
16	1	Loan repayment	FM5	H1, H2, H5, H8, H11
17	1	Algebra substitution	AM3	H2, H3, H7, H11
18	1	Area	M2	P2, P6, P7
19	1	Time difference	M7	H1, H2, H6, H7, H11
20	1	Non-right-angled triangle trigonometry	M6	H6, H7
21	1	Drawing a graph	DA3	P1, P4, P7, P9, P11
22	1	Capture/Recapture method	DA2	H1, H9, H11

Question	Mark	Content	Strand	Outcome(s)
23(a)	3	Probability outcome	PB3	H2, H10, H11
23(b)	4	Area applicable	M5	H6, H7
23(c)	1	Algebra skills	AM3	H2, H3, H7, H11
23(d)	5	Area and volume application	M5	H6, H7
24(a)	7	Interpreting sets of data	DA5	H1, H2, H4, H5, H9, H11
24(b)	4	Algebraic manipulation	AM3	H2, H3, H7, H11
24(c)	2	Probability	PB3	H2, H10, H11
25(a)	2	Simpson's Rule	M5	H1, H2, H6, H7, H11
25(b)	3	Direct variation	AM4	H1, H2, H3, H11
25(c)	5	Earning an income	FM1	P1, P2, P7, P8, P11
25(d)	3	Modelling a non-linear function	AM4	H1, H2, H3, H5, H11
26(a)	2	Declining balance depreciation	FM6	H1, H2, H5, H8, H11
26(b)	4	Future value of an investment	FM5	H1, H2, H5, H8, H11
26(c)	3	z-score	DA6	H2, H4, H5, H9, H11
26(d)	4	Loan repayments	FM5	H1, H2, H5, H8, H11
27(a)	6	Area graph	DA5	H1, H2, H4, H5, H9, H11
27(b)	3	Spherical geometry	M7	H1, H2, H6, H7, H11
27(c)	4	Radial survey	M6	H1, H2, H6, H7, H11
28(a)	6	Median regression line	DA7	H1, H2, H4, H5, H9, H11
28(b)	4	Modelling a non-linear function	AM4	H1, H2, H3, H5, H11
28(c)	2	Pythagoras' theorem/Right-angled triangle trig	M4	P2, P3, P6, P7, P11

Marking guidelines

Section I

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

Question 23(a)

Marking guidelines

Criteria	Marks
i. $P(2) = \frac{1}{6}$	1
ii. $P(4/5 \text{ or } 5/4) = \frac{1}{6} \times \frac{1}{6} + \frac{1}{6} \times \frac{1}{6} = \frac{1}{18}$	1
iii. $P(\text{sum} > 5) = (1,5 \text{ and } 1,6) + (2,4 \text{ and } 2,5 \text{ and } 2,6) +$ $(3,3 \text{ and } 3,4 \text{ and } 3,5 \text{ and } 3,6) + (4,2 \text{ and } 4,3 \text{ and } 4,4 \text{ and } 4,5 \text{ and } 4,6)$ $+ (5,1 \text{ and } 5,2 \text{ and } 5,3 \text{ and } 5,4 \text{ and } 5,5 \text{ and } 5,6)$ $+ (6,1 \text{ and } 6,2 \text{ and } 6,3 \text{ and } 6,4 \text{ and } 6,5 \text{ and } 6,6)$ $= 2 \times \frac{1}{36} + 3 \times \frac{1}{36} + 4 \times \frac{1}{36} + 5 \times \frac{1}{36} + 6 \times \frac{1}{36} + 6 \times \frac{1}{36}$ $= \frac{13}{18}$	1

Question 23(b)**Marking guidelines**

Criteria	Marks
i. $A = \frac{\pi r^2}{2} = \frac{\pi \times 6.05^2}{2} = 57.5 \text{ m}^2$ (correct to 1 decimal place)	1
ii. Total area $= \frac{1}{2} \times 12.1^2 + 57.5 = 130.7 \text{ m}^2$ (correct to 1 decimal place)	1
iii. Fertilizer needed $= 130.7 \div 100 \times 3$ $= 4 \text{ kg}$ (nearest kg)	1 1

Question 23(c)**Marking guidelines**

Criteria	Marks
$L^2 = 3S^2$ $L^2 = 3 \times 15^2$ $L = 26 \text{ mm}$	1

Question 23(d)**Marking guidelines**

Criteria	Marks
i. Wall area $= 12 \times 0.8 + 0.5 \times 6 \times 1.7$ $= 14.7 \text{ m}^2$	1
ii. Volume of pool $= 14.7 \times 5 = 73.5 \text{ m}^3$	1
iii. Surface area $= 2 \times 14.7 + 5 \times 2.5 + 5 \times 0.8$ $= 45.9 \text{ m}^2$	1 1
$\therefore \text{cost} = 45.9 \times \$35 = \$1\ 606.50$	1

Question 24(a)

Marking guidelines

Criteria	Marks
i. Range = $79 - 39 = 40$	1
ii. mean = $\frac{\text{sum of scores}}{\text{number of scores}}$ $\therefore 59 = \frac{1005 + x}{18}$ $x = 57$	1 (just 7 not acceptable)
iii. $\bar{x} = 71.9$ $\sigma_{n-1} = 13.2$	1 (for both)
iv. P(within 1 SD) = $\frac{12}{18} = \frac{2}{3}$	1
v. IQR = $Q_U - Q_L = 81 - 62 = 19$	1
vi. Pre-test is slightly negatively skewed. In the Post-test the mean and median are significantly higher. In the Post-test the range and interquartile range are slightly higher.	1
vii. The overall results of the Post-test have improved significantly for the whole group. There is a significant difference in the mean and median of the Post-test. Therefore the claim can be supported.	1

Question 24(b)**Marking guidelines**

Criteria	Marks
i. $P = QR^2$ $P = 6 \times 8^2 = 384$	1
ii. $P = QR^2$ $R^2 = \frac{P}{Q}$ $R = \pm \sqrt{\frac{P}{Q}}$	1 1
iii. $R = \pm \sqrt{\frac{27}{3}}$ $R = \pm 3$ 1 (OK if there is only a positive answer from the above equation)	1

Question 24(c)**Marking guidelines**

Criteria	Marks
i. $P(\text{winning a major prize}) = \frac{6 \times 50}{100\,000} = \frac{3}{1000}$	1
ii. $P(\text{winning any prize}) = \frac{6 \times 158}{100\,000} = \frac{237}{25\,000}$	1

Question 25(a)**Marking guidelines**

Criteria	Marks
Land area = $\frac{500}{3}(0 + 4 \times 355 + 431) + \frac{500}{3}(217 + 4 \times 323 + 549)$ = 308 500 + 343 000 = 651 500 m ²	1
In hectares = 651 500 ÷ 10 000 = 65.15 ha	1

Question 25(b)**Marking guidelines**

Criteria	Marks
i. $a \propto e^2$ $a = ke^2$ Now when $a = 253.5$, $e = 6.5$ $\therefore 253.5 = k \times 6.5^2$ $k = 6$	1 1
ii. Now $a = 6e^2$ When $e = 10.25$, $a = 6 \times 10.25^2$ $= 630.375 \text{ cm}^2$	1

Question 25(c)**Marking guidelines**

Criteria	Marks
i. Normal hours for the week = M8 + T5 + W8 + T8 + F4 = 33 hours	1
ii. Normal wage = $33 \times \$9.80$ = \$323.40	1
iii. Penalty rates wage = Th $2.5 \times 1.5 \times \$9.80$ + Sat $7 \times 1.5 \times \$9.80$ + Sun $5 \times 2 \times \$9.80$ = \$237.65	1
iv. % at penalty = $\frac{237.65}{561.05} \times 100\%$ = 42%	1 1

Question 25(d)**Marking guidelines**

Criteria	Marks
i. After 3 hours, approximately 43 000	1
ii. Time, approx. 7 hours	1
iii. Time when double, approx. 8 hours	1

Question 26(a)**Marking guidelines**

Criteria	Marks
$S = V_0(1 - r)^n$ $350\,000 = 500\,000(1 - r)^8$ $(1 - r)^8 = 0.7$ $1 - r = \sqrt[8]{0.7}$ $r = 1 - \sqrt[8]{0.7}$ $r = 4.4\%$ (correct to 1 decimal place)	1
	1

Question 26(b)**Marking guidelines**

Criteria	Marks
i. $A = M \left(\frac{(1 + r)^5 - 1}{r} \right)$ here $r = 6 \div 12 \div 100 = 0.005$, $n = 5 \times 12 = 60$ $A = 200 \left(\frac{(1 + 0.005)^{60} - 1}{0.005} \right)$ $A = \$13\,954$	1
ii. $A = P(1 + r)^n$ here $P = \$13\,954$, $r = 6 \div 12 \div 100 = 0.005$, $n = 12 \times 12 = 144$ $A = \$13\,954(1 + 0.005)^{144}$ $A = \$28\,616$	1
iii. Cost for 4 years = $4 \times \$7\,000 = \$28\,000$ $\therefore$ Mr and Mrs Wise have saved enough, by \$616	1
	1

Question 26(c)**Marking guidelines**

Criteria		Marks
$z = \frac{x - \bar{x}}{s}$		
Biology	$z = \frac{62 - 60}{4} = 0.5$	1
English	$z = \frac{64 - 54}{5} = 2$	
Maths	$z = \frac{68 - 70}{2} = -1$	1
$\therefore$ from best to worst, English, Biology and Maths		1

Question 26(d)**Marking guidelines**

Criteria		Marks
i.	Total charges = interest + fees $= 2\,000 \times 0.095 \times 2 + 0.25 \times 2\,000 \div 100$ $= \$385$	1
ii.	Instalment $= (\$2\,000 + \$385) \div 24$ $= \$99.38$	1 1
iii.	$a = \frac{2 \times 9.5 \times 24}{25}$ $= 18.24\%$	1

Question 27(a)**Marking guidelines**

Criteria					Marks
i.	Cars stolen in 1998 = 75 cars				1
ii.	Cars recovered in 1999 = 65 cars				1
iii.					
		1997	1998	1999	2000
	Number of cars stolen	150	75	100	50
	Number of cars recovered	50	45	65	25
iv.	% stolen but recovered in 1997 = $\frac{50}{150} \times 100\% = 33\frac{1}{3}\%$				1
v.	In the year 2000				1

Question 27(b)**Marking guidelines**

Criteria		Marks
i.	1 knot = 1 M/hr Hence plane will travel $500 \times 5 = 2\,500$ M	1
ii.	$1' = 1$ M $2\,500' = 41^\circ 40'$ Hence, 30°N plus $41^\circ 40'$, gives new coordinates of ($11^\circ 40'\text{S}$, 31°E)	1
iii.	Diff. in latitude = 60° Dist. = $\frac{60}{360} \times 2 \times \pi \times 6\,400$ = 6.702 km	1

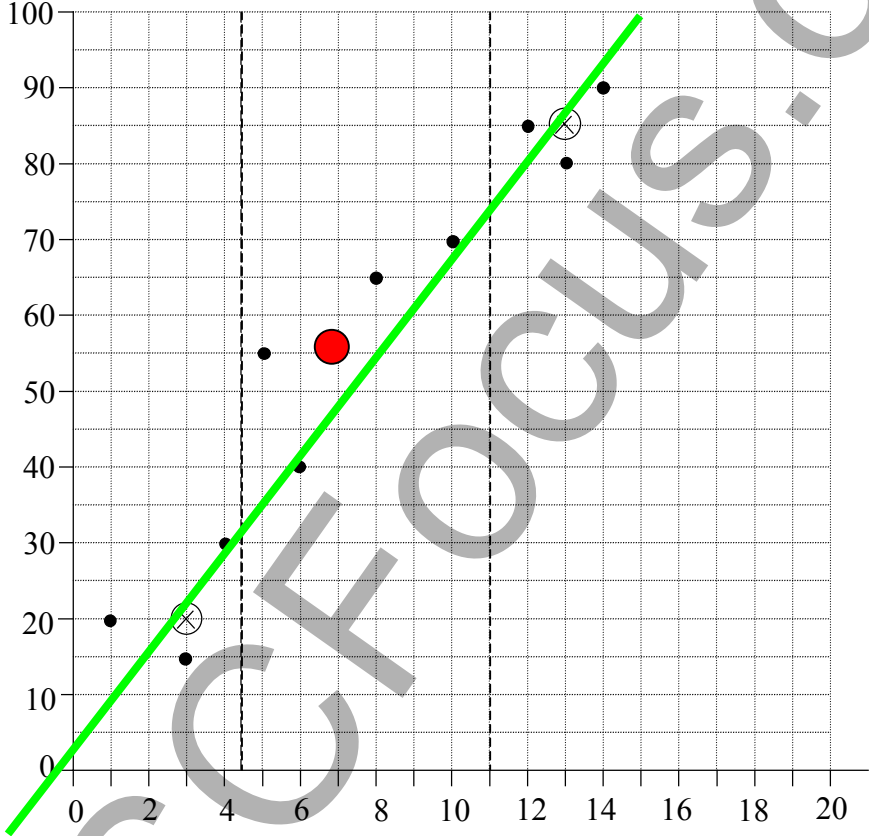
Question 27(c)

Marking guidelines

Criteria	Marks
i. $\angle AOB = (360^\circ - 350^\circ) + 69^\circ = 79^\circ$	1
ii. $AB^2 = 98^2 + 104^2 - 2 \times 98 \times 104 \times \cos 79^\circ$	1
$AB = \sqrt{16\,530.5}$	
$AB = 128.57$ m (correct to 2 decimal places)	1
iii. Area $\triangle AOB = 0.5 \times 98 \times 104 \times \sin 79^\circ$ $= 5\,002$ m ² (nearest sq. metre)	1

Question 28(a)

Marking guidelines

Criteria	Marks
i. (5, 55) (6, 40) (8, 65) (10, 70) 5, 6, 8, 10 gives median 7 40, 55, 65, 70 gives median 60 Hence middle median point is (7, 60) [marked on graph below] 	1 1
ii. Marked on graph above, allow tolerance of line width.	1
iii. Using $y = mx + b$ $m \approx \frac{40}{6} = 6.7 \quad b \approx 5$ Gives equation $y = 6.7x + 5$ Graphics calculation may give equation. to be $y = 6.5x + 5.16$	1 1 1

Question 28(b)**Marking guidelines**

Criteria	Marks
i. Consumption at 60 km/hr is 9 L/100 km	1
ii. 30 km/hr gives 12 L/100 km = 2.4 L/20 km	1
iii. $C = 0.01 \times 80^2 - 80 + 33$ $= 17 \text{ L/100 km}$	1
iv. Speed of zero, means the car is not moving so NO petrol is being used.	1

Question 28(c)**Marking guidelines**

Criteria	Marks
i. $25^2 = 15^2 + 20^2$ $625 = 225 + 400$, which is true Hence $\triangle XYZ$ is right-angled	1
ii. $\tan \angle XYZ = \frac{15}{20}$ $\angle XYZ = \tan^{-1}\left(\frac{15}{20}\right)$ $\angle XYZ = 37^\circ$	1 1