2011
HIGHER SCHOOL CERTIFICATE
TRIAL EXAMINATION

General Mathematics

General Instructions

- Reading Time - 5 minutes
- Working Time - $2\frac{1}{2}$ hours
- Write using a blue or black pen
- Board Approved calculators may be used
- A formulae sheet is provided at the back of this paper which may be detached and used throughout the paper.

Total Marks 100

Section I

Total marks (**22**)

- Attempt Questions 1-22
- Answer on the Multiple Choice answer sheet provided.
- Allow about 30 minutes for this section

Section II

Total marks (**78**)

- Attempt questions 23 – 28
- Answer on the blank paper provided, unless otherwise instructed. Start a new page for each question.
- Allow about 2 hours for this section

Section I

Total marks (22)

Attempt Questions 1-22

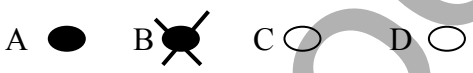
Allow about 30 minutes for this section

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.

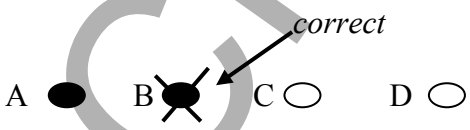
Sample

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

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 this by writing the word *correct* and drawing an arrow as follows:



1. The pay slip below has some missing amounts. What amount should be in the Total Pay section?

PAY SLIP				
Pay for hours worked at:				
	Normal Time	38		$425.60
	Overtime - (time-and-a-half)	4		
			Total Pay	

(A) $470.40

(B) $429.60

(C) $515.20

(D) $492.80

2. The measurement 7320 mm is to be rounded to 2 significant figures. Choose the correct answer:

(A) 73 mm

(B) 7300 mm

(C) 72 mm

(D) 732 cm

3. Given that $r = 5.2$ and $h = 7.6$, calculate the value of S to 2 decimal places using the formula $S = 2\pi r(r + h)$.

(A) 418.20

(B) 80.42

(C) 418.21

(D) 177.50

4. The probability of selecting an orange jellybean from a bag of jellybeans is known to be 0.23.
What percentage of the jellybeans in the bag is **not** orange?

(A) 23%
(B) 77%
(C) 50%
(D) 55%

5. A statistician was hired to estimate the number of fish in a lake. In his first sample, 2 400 fish were taken from the lake, tagged and returned to the lake. The next day a random sample of 5000 fish was caught and contained 1955 tagged fish.
The approximate number of fish in the lake was calculated to be:

(A) 9 355
(B) 7 400
(C) 6 138
(D) 6 955

6. The volume of a sphere can be calculated using the formula $V = \frac{4}{3}\pi r^3$, where r is the radius of the sphere. Correctly rearranging the formula so that r is the subject:

(A) $V = r^3 \frac{4}{3}\pi$
(B) $r = \sqrt[3]{\frac{3V}{4\pi}}$
(C) $r = \frac{4}{3}V\pi$
(D) $r = \sqrt[3]{\frac{3}{4}V\pi}$

7. Georgia wants to know the present value of an annuity which will earn 3% per annum, compounded monthly. In ten years time, the future value will be $5000. Which calculation will result in the correct answer?

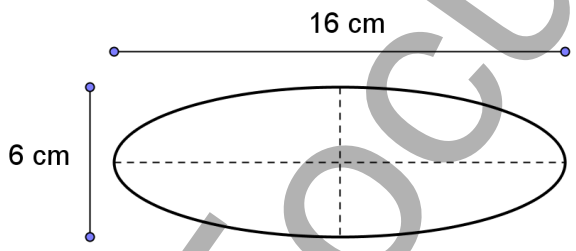
(A) $N = \dfrac{5000}{(1+0.03)^{10}}$

(B) $N = \dfrac{5000}{(1+0.03)^{120}}$

(C) $N = \dfrac{5000}{(1+0.03\div 12)^{10}}$

(D) $N = \dfrac{5000}{(1+0.03\div 12)^{120}}$

8. The approximate area of the ellipse below is:



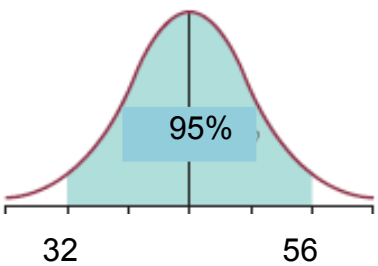
(A) 75 cm^2

(B) 96 cm^2

(C) 302 cm^2

(D) 69 cm^2

9. Which of the following summaries is true for the normal distribution in this graph?



(A) mean = 32, $\sigma = 24$

(B) mean = 44, $\sigma = 6$

(C) mean = 95, $\sigma = 24$

(D) mean = 56, $\sigma = 12$

10. In Year 12 at a certain high school, 32% of students study Biology, 24% study Chemistry and 14% study both of these subjects.
A two-way table has been drawn below, but is not completed.

	Biology	No Biology	
Chemistry	14	10	24
No Chemistry	18		76
	32		100

Complete the table to find the probability that a randomly chosen Year 12 student is **not** studying either of these subjects:

(A) 44%
(B) 68%
(C) 58%
(D) 140%

11. Jane purchased a new laptop for her business at the end of 2009 for $3 990. Use the declining balance method to determine the value of the laptop at the end of 2011, using a depreciation rate of 30% per annum.
The value of the laptop to the nearest dollar is:

(A) $558
(B) $1 955
(C) $2 394
(D) $1 197

12. The environment committee at a school is building a garden which is to contain 3 plants. Donations from a local nursery have left them with seeds for 5 varieties of native plant, 3 flowering plants and 4 types of fruit-bearing plants.
They have decided to select 1 native plant, 1 flowering plant and 1 fruit-bearing plant.
How many different combinations can they select for their garden?

(A) 60
(B) 12
(C) 180
(D) 36

13. Tim has just received his credit card statement. He has been charged 18.25 % per annum on his outstanding balance of $475, which was outstanding for 24 days.
He has noticed errors on his credit card statements before and wishes to check the amount of interest that he should have been charged.

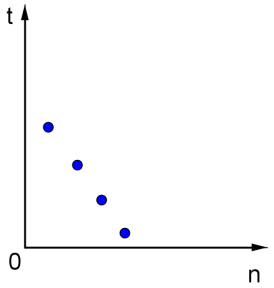
Which calculation should he use?

(A) $\$475 \times \frac{0.05}{100} \times 24$
(B) $\$475 \times \frac{18.25}{100} \times 24$
(C) $\$475 \times \frac{18.25}{365} \times 24$
(D) $\$475 \times \frac{0.05}{365} \times 24$

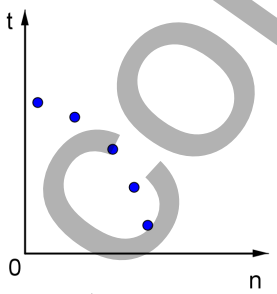
14. The time taken to paint a house varies inversely with the number (n) of people cleaning the house.

Which graph represents this relationship?

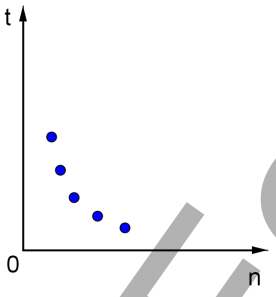
(A)



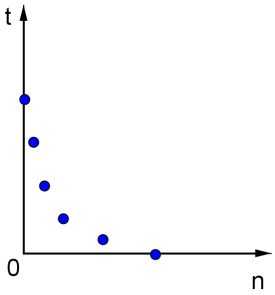
(B)



(C)

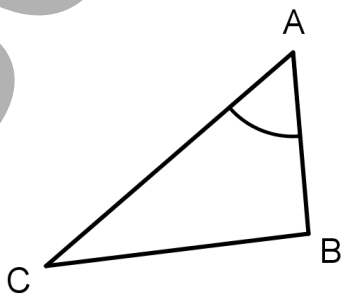


(D)



15. In ΔABC, AC = 32 m, AB =22 m, BC = 20.8 m and $\angle CAB = 40°12'$.

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



NOT TO SCALE

(A) 352 m^2

(B) 148 m^2

(C) 227 m^2

(D) 272 m^2

16. The location of Town X is 35°N 30°E. The location of Town Y is 65°N 105°E. Which of the following is true? (Ignore day-light savings.)

(A) Town X is five hours ahead of Town Y.

(B) Town X is two hours ahead of Town Y.

(C) Town X is five hours behind Town Y.

(D) Town X is two hours behind Town Y.

17. Geoffrey is a race car driver. His lap times are recorded along with the average lap times of all competitors (including Geoffrey) in the table below:

Lap Number	**Geoffrey's Lap Time**	**Average lap time for all competitors**
1	2 minutes 18 seconds	2 minutes 19 seconds
2	1 minute 58 seconds	2 minutes 3 seconds

Which of the following statements is definitely true?

(A) All the drivers completed their second lap faster than their first lap.

(B) When compared to other competitors, Geoffrey's second lap time was better than his first lap time.

(C) Geoffrey slowed down on his second lap.

(D) Geoffrey was the fastest driver overall.

18. James plays a game involving the tossing of two coins. One turn at this game costs $1. The possible outcomes are listed below along with their payoffs:

- 2 Heads pays $5
- 1 Head and 1 Tail pays $2
- No heads and 2 Tails pays nothing.

The financial expectation for this game is:

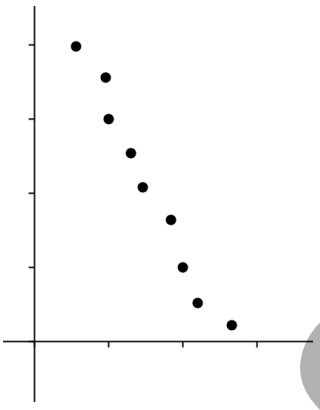
(A) $2.25

(B) -$1.00

(C) $4.00

(D) $1.25

19. Choose the most accurate description of the data in the scatterplot:



(A) A strong negative trend.

(B) A strong positive linear trend.

(C) A weak non-linear trend.

(D) A weak positive trend.

20. The straight lines with equations $3x + y = 1$ and $x + y = 3$ intersect at point A. The coordinates of A are:

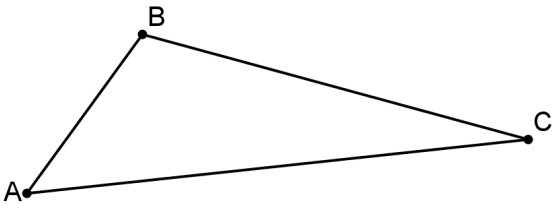
(A) (1, 3)

(B) (3, 1)

(C) (-1, 3)

(D) (-1, 4)

21. In ΔABC, AB = 4 cm, BC = 7 cm and AC = 9 cm. The size of the largest angle is closest to:



NOT TO SCALE

(A) 107°

(B) 113°

(C) 51°

(D) 121°

22. Fiona decides to make voluntary contributions to her superannuation fund. She will put in $50 per week until she retires in 26 years time.
Fiona's superannuation fund earns 5.2% per annum and is compounded weekly.
To the nearest dollar, at retirement, Fiona will have superannuation amounting to:

(A) $143 127
(B) $5 600 000
(C) $2 631
(D) $143 126

End of Section 1

Section II

Marks

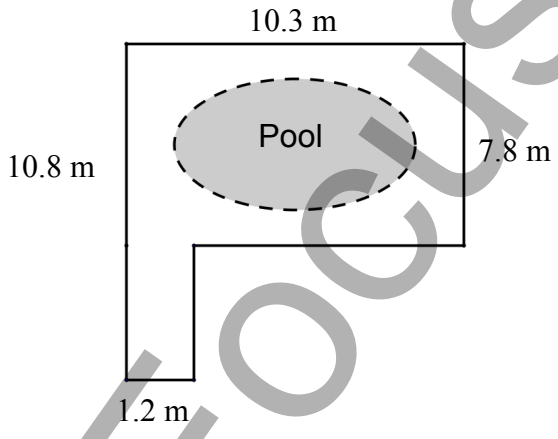
Total Marks (78)
Attempt Questions 23 - 28
Allow about 2 hours for this section.

Answer all questions, starting each question on a new sheet of paper with your name and question number at the top of the page. Do not write on the back of sheets.

Question 23 (13 marks) Start a new sheet of paper.

a) Fully simplify $3x - 4(x + 5) + 2$ **2**

b) The Williams family have a new pool. The diagram below shows a ground plan of the pool area.



NOT TO SCALE

(i) The area around the pool is to be paved. Given that the area of the pool is approximately 19 square metres, calculate the area to be paved. **2**

(ii) The pavers chosen by the Williams family are rectangular with dimensions 12 cm × 25 cm. How many pavers will be required? **2**

(iii) The pavers are sold in packs of 400 at a cost of $360 per pack. By considering how many packs the Williams family will need to order, work out the cost of the pavers. **2**

c) Craig offered to buy Kylie an ice cream. Kylie asked for 3 scoops. She wanted chocolate on the bottom, banana in the middle and strawberry on top.

When Craig went to buy the ice cream, he remembered the flavours, but forgot what order Kylie wanted them in.

Calculate the probability that the flavours are in the correct order if placed on randomly. **2**

Question 23 (continued) **Marks**

d) After completing a spelling test, Carly was told that she had achieved a z -score of -1.

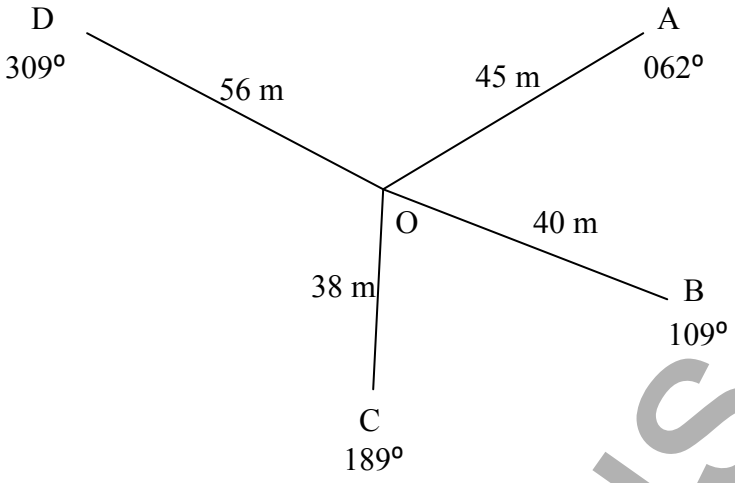
(i) How does Carly's result compare with those of her peers? Explain your answer in terms of the mean and standard deviation. **2**

(ii) If the average test mark was 85 and the standard deviation was 3, calculate Carly's actual mark. **1**

End of Question 23

Question 24 (13 marks) Start a new sheet of paper. **Marks**

a) The following sketch was made during a radial survey of a field.



(i) What is the size of $\angle BOC$? **1**

(ii) Calculate the area of ΔBOC correct to the nearest square metre. **2**

(iii) Find the distance from B to C. (Round to 2 decimal places). **2**

b) Carrots were grown in two separate plots using seeds from the same pack. Fertiliser X was used in one plot, while Fertiliser Y was used in the other plot. Both plots were cared for equally in terms of water and climate. The frequency distributions table below show the lengths of the fully grown carrots from each plot.

FERTILISER X		
Length (cm)	Frequency (f)	Cumulative Frequency (cf)
13	2	2
14	18	20
15	13	33
16	10	43
17	5	48
18	2	50
19	0	50
20	0	50
Σf	50	

FERTILISER Y		
Length (cm)	Frequency (f)	Cumulative Frequency (cf)
13	0	0
14	0	0
15	5	5
16	7	12
17	12	24
18	13	37
19	8	45
20	5	50
Σf	50	

Marks

Question 24 (continued)

(i) **On page 26** of this exam paper, a box-and-whisker diagram has been drawn showing the data for the carrots grown using Fertiliser X. On the same diagram, draw the box-and-whisker plot for the Fertiliser Y carrots. **2**

(ii) The interquartile range of the carrots grown in Fertiliser X is 2 cm. Calculate the interquartile range for the data for Fertiliser Y carrots. **1**

(iii) Consider the shape of the distributions, skewness and measures of location and spread. Using this information, discuss why you would agree or disagree with the following statement: **2**

"There is little difference between the data from the two plots, therefore Fertiliser X and Fertiliser Y are equally effective."

c) Solve the equation $\frac{-3(4+x)}{2} = 9$ to find the value of x. **3**

End of Question 24

Question 25 (13 marks) Start a new sheet of paper. **Marks**

a) A courier company purchased a delivery van in December 2009 for $80 000. In December each year, beginning in 2010, the value of the van depreciates by 12% using the declining balance method.

(i) What will the van's value be in December 2014? **2**

(ii) If the accountant used straight-line depreciation, how much less would the van's value be in December 2014? **2**

(iii) Explain why straight-line depreciation would reduce the value of the van so much more in the same period of time. **1**

b) A jar containing jelly beans only has three colours left. There are 10 red, 8 yellow and 6 purple jelly beans.

John reaches into the jar without looking and pulls out 2 jelly beans.

(i) Draw a probability tree diagram to show all the possible combinations that John could have selected. **3**

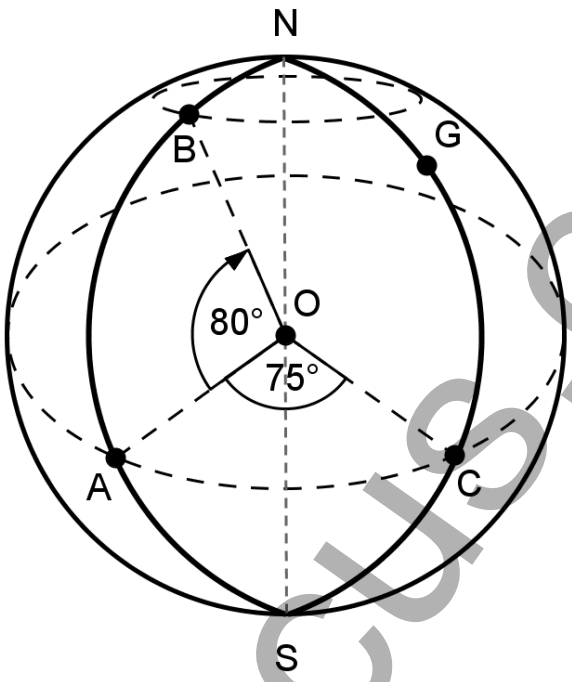
(ii) Calculate the probability that John has at least 1 red jelly bean. **2**

c) For the equation: $200 = 10 \times 1.12^n$, calculate the value of n correct to 1 decimal place. **3**

End of Question 25

Question 26 (13 marks) Start a new sheet of paper. **Marks**

a)



In the diagram of the Earth, O represents the centre and G represents Greenwich. The points A and C lie on the equator.

$\angle AOC = 75°$ and $\angle AOB = 80°$

(i) What is the latitude of point B? **1**

(ii) Given that the approximate radius of the Earth is 6 400 km, calculate the distance from point A to point C, giving your answer correct to the nearest kilometre. **2**

(iii) Given that 1 nautical mile is approximately equal to 1.852 km, calculate the time a ship would take to travel from point A to point B, if it is travelling at an average speed of 17 knots. **2**

Question 26 (continued)

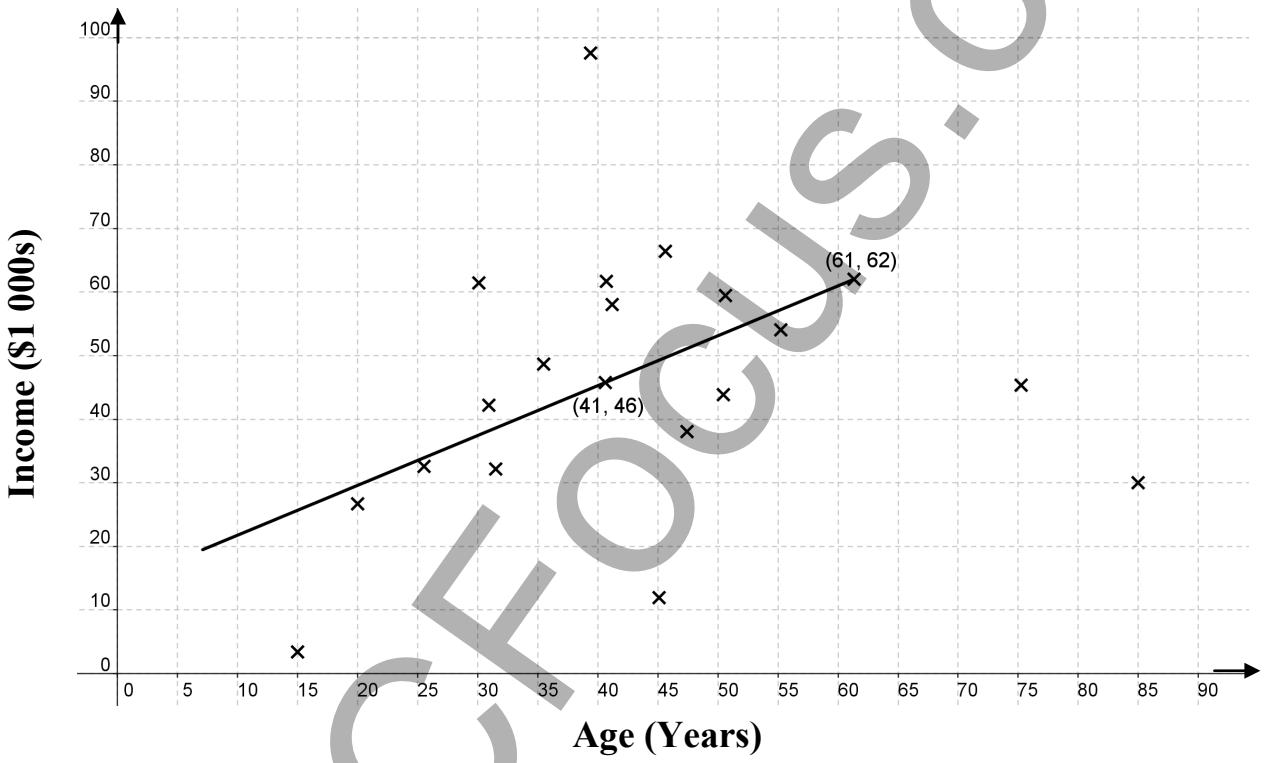
Marks

b) Julia has a credit card with an annual interest rate of 12.25% and no interest-free period.

(i) What is the daily interest rate charged on Julia's credit card? **1**

(ii) Find the amount of interest she would be charged for a purchase of $750.85 that was fully repaid in 16 days. **1**

c) A sample of 20 randomly selected people was conducted in a shopping centre. Participants were asked to state their age and their annual income. The results are displayed in the scatterplot below with a line of best fit drawn.



(i) Calculate the gradient of the line of best fit shown. **1**

(ii) What is the equation of the line of best fit shown? **2**

(iii) Use your equation to calculate the expected income of an 80 year old person. **1**

(iv) Consider the incomes shown for the two participants over 65 years of age. Give one reason why this fits or does not fit with your answer to part (iii). **1**

(v) Describe the correlation between Age and Income for people aged from 5 to 65 years (as shown in the line of best fit). **1**

End of Question 26

Question 27 (13 marks) Start a new sheet of paper. **Marks**

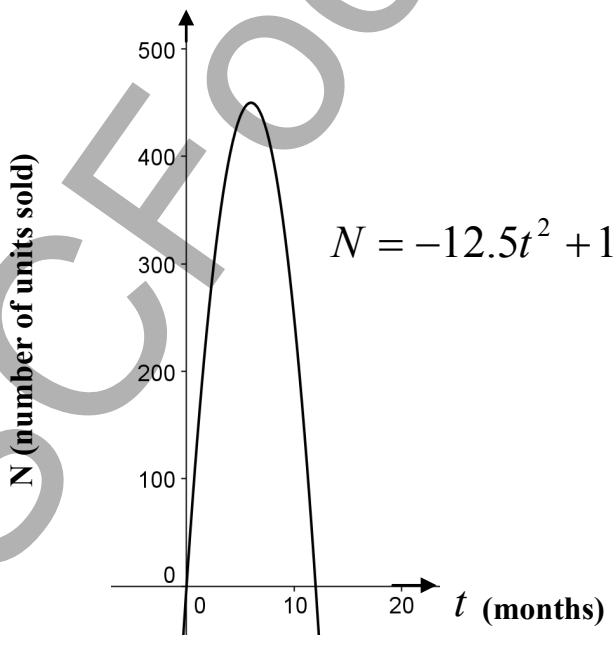
a) Upon winning a lottery prize, Jim was offered his choice of the following two prizes:

Prize 1	**Prize 2**
An annuity of $500 per year for 10 years earning 5% per annum. No withdrawals may be made until the end of the 10 years.	A lump sum of $5 000 paid immediately.

(i) Calculate the future value of Prize 1. **2**

(ii) How much should the lump sum in Prize 2 be if it is to be equivalent in value to Prize 1 (if it is also invested at 5% p.a. for 10 years)? **2**

b) **Monthly Sales of Product X.**



The monthly sales of Product X followed the quadratic relationship graphed above.

(i) Using the equation for (*N)* how many units of Product X sold in the 4^{th} month? **2**

(ii) In what month were maximum sales recorded? **1**

Question 27 (continued) **Marks**

c) The net weight printed on a cereal box is 375 g. However, to avoid customer complaints, the company decides to fill the boxes to 380 g.
The machine which fills the boxes is set to 380 g, although there is always some variation.
The weight of the filled boxes follows a normal distribution with a mean weight of 380 g and a standard deviation of 2.5 g.

(i) Calculate the probability that a box selected randomly will contain less than 375 g of cereal. **1**

(ii) The company manager has set a target that less than 16% of all boxes will contain more than 385 g of cereal. **2**
Assuming that the standard deviation is unchanged, and the mean is equal to the weight setting on the machine, what weight should the machine be set at?

d) One hundred new cars were tested to see how many defects occurred during the manufacturing process. The results are in the frequency table below:

Number of Defects	Frequency
0	2
1	7
2	24
3	31
4	20
5	12
6	4

(i) Calculate the mean number of defects found. **1**

(ii) Calculate the standard deviation for this sample. (Give your answer correct to 2 decimal places.) **1**

(iii) In a sample of 500 cars, how many cars would you expect to have more than 3 defects? **1**

End of Question 27

Question 28 (13 marks) Start a new sheet of paper. **Marks**

a) Karen needs to borrow \$26 500 to buy a car. She wants to repay the loan over a period of 10 years. XYZ Finance have offered her an interest rate of 5.5% per annum.

XYZ Finance Monthly Repayment Amounts per \$1000 borrowed				
Interest Rate (p.a.)	Term of Loan (years)			
	5	**10**	**15**	**20**
5.0%	18.87	10.61	7.91	6.60
5.5%	19.10	10.85	8.17	6.88
6.0%	19.33	11.10	8.44	7.16
6.5%	19.57	11.35	8.71	7.46

(i) Use the table above to calculate Karen's monthly repayment if she borrows the money from XYZ Finance. **1**

(ii) What is the total amount Karen will pay for her car? **1**

(iii) Karen sees an advertisement for a cheaper loan. The competitor's interest rate is 5.3% per annum.

Use the formula for present value of an annuity to calculate Karen's monthly repayments if she chooses this cheaper loan and still repays it in 10 years. **3**

(iv) How much interest will Karen save over the term of the loan if she chooses the cheaper loan? **2**

b) The time taken to clean a building varies inversely with the number of people cleaning.

Let T represent time taken and N represent the number of cleaners.

It is known for a particular building, that with 5 cleaners, it takes 6 hours to clean.

(i) Write an equation relating the variables T and N, and a constant k. **1**

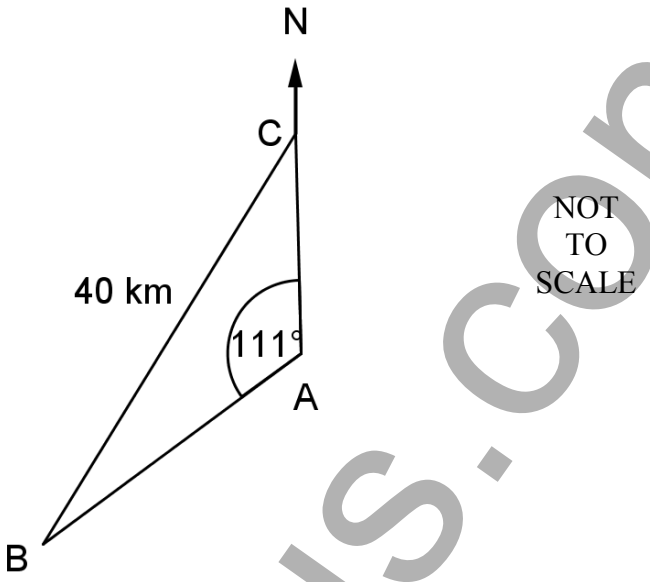
(ii) Find the value of k. **1**

(iii) Leanne says "With twice as many people it will take half the time." Use mathematical calculations to show that she is correct. **1**

Question 28 (continued)

Marks

c)



In the diagram above, C is due North of A, $\angle BAC = 111°$ and the distance from B to C is 40 km.

(i) Given that the bearing of C from B is $037°T$, show that $\angle ABC = 32°$. **1**

(ii) Calculate the distance from A to C to the nearest kilometre. . **2**

End of Examination

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

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

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

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

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

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

Formula for a z-score

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

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:

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

Multiple Choice Answer Sheet

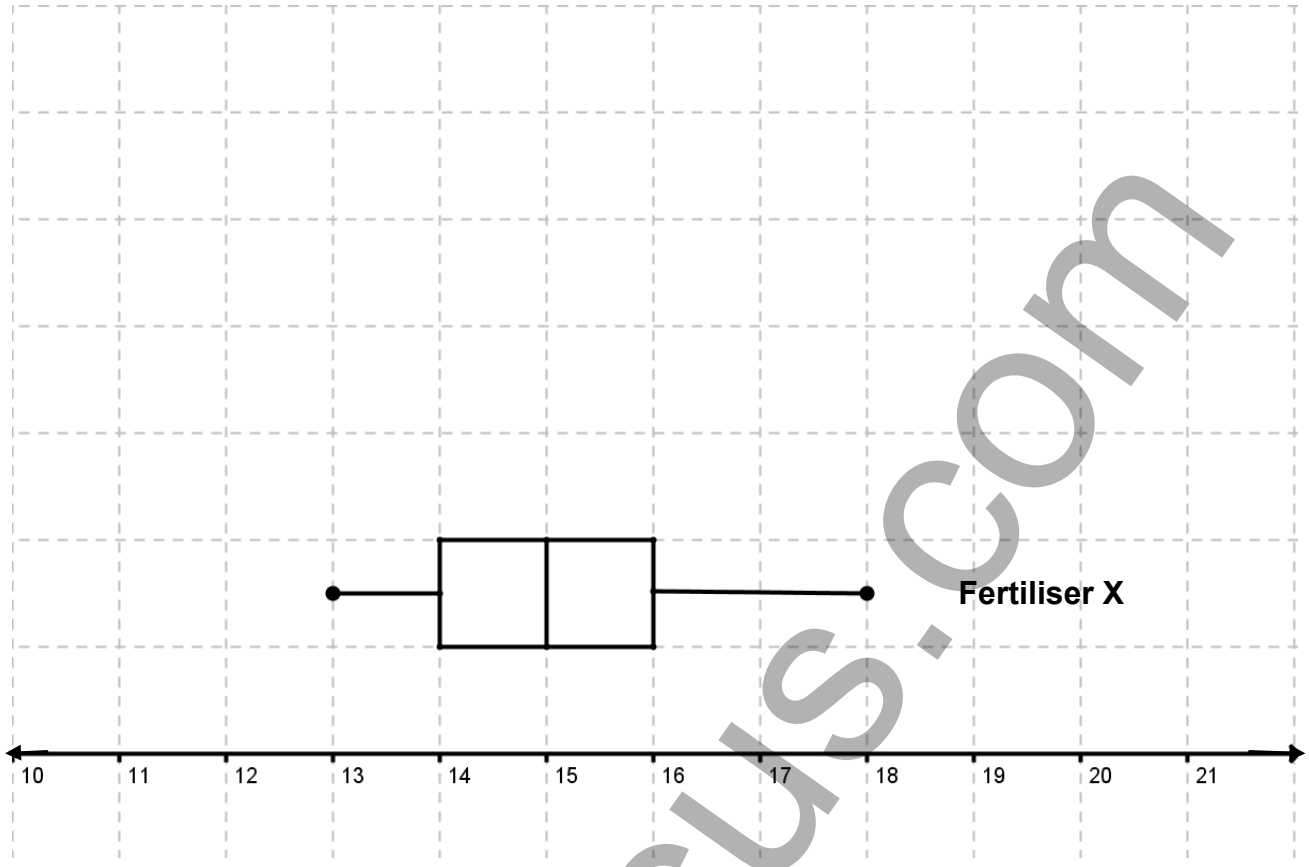
Name _____

Completely fill the response oval representing the most correct answer.

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 ⬭

Question 24 (b) **NAME:**_____

Box-and-whisker plot for Carrots grown using Fertiliser X and Fertiliser Y



WESTERN REGION

2011
TRIAL HSC
EXAMINATION

General Mathematics

SOLUTIONS

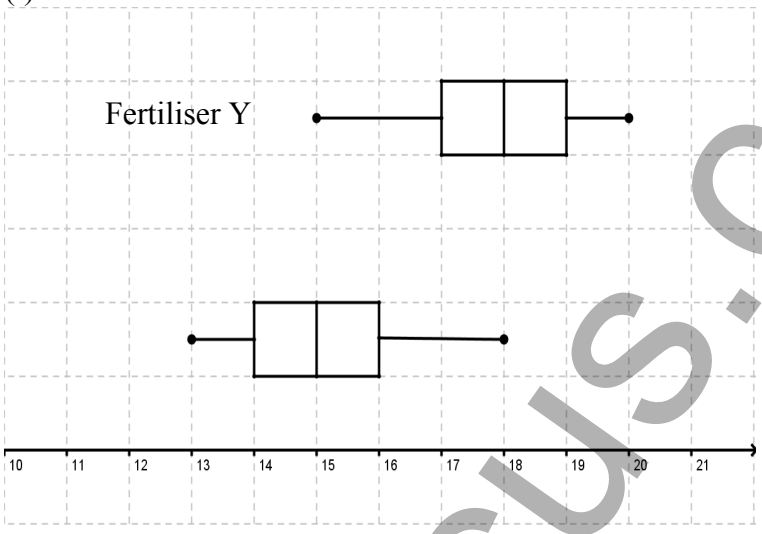
Multiple Choice Answer Sheet

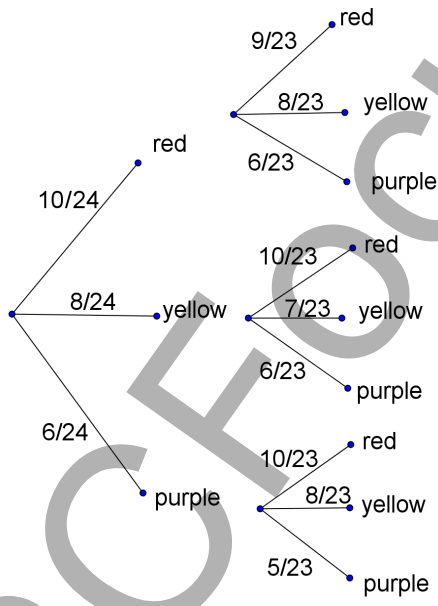
Name Marking Sheet.

Completely fill the response oval representing the most correct answer.

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 ○

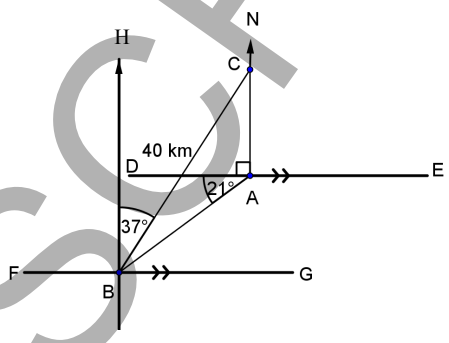
Question 23	HSC Trial Examination – Mathematics General		2011
Part	**Solution**	**Marks**	**Comment**
a)	$3x - 4x - 20 + 2$ $= -x - 18$	1 1	
b)	(i) Total area = 10.3 x 7.8 + 1.2 x 3 square metres Paved area= 83.94 – 19 = 64.94 square metres (ii) Area of one paver = (0.12 x 0.25) = 0.03 sq m Number of pavers = 64.94÷0.03 ≈ 2165 (iii) 2165÷400=5.4 therefore need 6 packs 6 x \$360 = \$2 160	1 1 1 1 1 1	
c)	3! = 6 combinations of 3 flavours P(choc, banana, strawberry) = 1/6	1 1	Students may use a probability diagram here.
d)	(i) Carly's score is 1 standard deviation below the mean – so her score is below the group's average.(34% below the class average) (ii) 85-3=82	2 1	
		/13	

Question 24	HSC Trial Examination – Mathematics General		2011
Part	**Solution**	**Marks**	**Comment**
a)	(i) Angle BOC = 189°-109°=80° (ii) Area=1/2 x 38 x 40sin80° = 748 square metres (iii) $BC^2 = 38^2 + 40^2 - 2\times 38\times 40\cos 80$ $= 2516.10954$ BC = 50.16 m	1 1 1 1 1	
b)	(i)  (ii) IQR=Q_U-Q_L = 19-17 = 2 cm. (iii) Statement is incorrect. Median is 3 cm higher for Fertiliser Y. Fertiliser Y is negatively skewed and Fertiliser X is positively skewed. Both distributions have same IQR, however top 50% of scores for Fertiliser Y is above all scores for Fertiliser X. You could conclude that Fertiliser Y is more effective.	2 1 2	2 marks for all 5 numbers correctly plotted. 1 mark for at least 3 of the 5 numbers correctly plotted.
c)	$-12-3x=18$ $-3x=30$ $x=-10$	1 1 1	
		/13	

Question 25	HSC Trial Examination – Mathematics General		2011
Part	**Solution**	**Marks**	**Comment**
a)	(i) $S = V_0(1-r)^n$ $= 80000(1-0.12)^5$ $= \$42218.55$ (ii) D=0.12 x 80000 = \$9600 $S = V_0 - Dn$ = 80000-\$9600 x 5 =\$32 000 Difference in depreciated values = \$42218.55-\$32000 =\$10 218.55 (iii) The declining balance method takes only a percentage of remaining value off instead of percentage of original value etc.	1 1 1 1 1	
b)	(i)  (ii) $\frac{10}{24}\times\frac{9}{23}+\frac{10}{24}\times\frac{8}{23}+\frac{10}{24}\times\frac{6}{23}+\frac{8}{24}\times\frac{10}{23}+\frac{6}{24}\times\frac{10}{23}=\frac{185}{276}$	3 2	3 marks if completely correct. 2 marks if diagram set up correctly and less than 5 errors in probabilities 1 mark if diagram set up correctly, but many errors in probabilities 1 mark for 1 or 2 combinations missing.
c)	$20 = 1.12^n$ By experimenting, $26 < n < 27$ $n \approx 26.4$	1 1 1	
		/13	

Question 26	HSC Trial Examination – Mathematics General		2011
Part	**Solution**	**Marks**	**Comment**
a)	(i) $80°N$	1	
	(ii) Distance AC $= \frac{75}{360} \times 2 \times \pi \times 6400 \text{ km}$	1	
	$= 8377.58 \approx 8378 \text{ km}$	1	
	(iii) $8378 \div 1.852 = 4523.5 \text{ nautical miles}$	1	Answer may be given to any appropriate level of accuracy.
	$4523.5 \div 17 = 266 \text{ h } 5 \text{ min}$	1	
b)	(i) $12.25 \div 365 \approx 0.03356\% \text{ per day}$	1	
	(ii) $750.85 \times \frac{0.033561643}{100} \times 16 = \$4.03$	1	
c)	(i) gradient $= \frac{62-46}{61-41} = \frac{16}{20} = \frac{4}{5}$	1	
	(ii) $y = mx + b$		
	$I = mA + b$		
	$46 = \frac{4}{5} \times 41 + b$	1	
	$46 - 32\frac{4}{5} = b$		
	$b = 13\frac{1}{5}$		
	$I = \frac{4}{5}A + 13\frac{1}{5}$	1	
	(iii) $y = \frac{4}{5} \times 80 + 13\frac{1}{5}$		
	$= \$77200$	1	
	(iv) People over the age of 65 may have reduced incomes due to retirement.	1	
	(v) Medium, positive linear correlation	1	
		/13	

Question 27	HSC Trial Examination – Mathematics General		2011
Part	**Solution**	**Marks**	**Comment**
a)	(i) $A = 500\left\{\dfrac{(1.05)^{10}-1}{0.05}\right\}$	1	
	$= \$6288.95$	1	
	(ii) $N = \dfrac{6288.95}{(1.05)^{10}}$	1	
	$= \$3860.87$	1	
b)	(i) $N = -12.5 \times 4^2 + 150 \times 4$ $= 400$ units.	2	1for equation 1 for answer
	(ii) vertex of parabola at $t = \dfrac{-150}{2 \times -12.5}$	1	
	$= 6$ Or can estimate from graph So maximum sales were recorded in the 6th month.		
c)	(i) 50% above 380 g + 47.5% between 375 g and 380 g = 97.5% greater than or equal to 375 g. This means 2.5% probability that a box has less than 375 g.	1	
	(ii) For 16% to be less than 385 g, the z-score for 385 must be 1.	1	
	$\dfrac{385-\mu}{2.5} = 1$		
	$385 - \mu = 2.5$		
	$\mu = 382.5$ g	1	
d)	(i) mean = 3.12	1	
	(ii) sample standard deviation = 1.32	1	
	(iii) 36 out of 100 cars in our sample had more than 3 defects. For 500 cars, we would expect $5 \times 36 = 180$ cars to have more than 3 defects.	1	
		/13	

Question 28	HSC Trial Examination – Mathematics General		2011
Part	**Solution**	**Marks**	**Comment**
a)	(i) Monthly repayment $= 10.85 \times 26.5 = \$287.53$ (ii) Total amount repaid $= \$287.53 \times 120$ months $= \$34503.60$ (iii) $26500 = M\left\{\dfrac{(1+\frac{0.053}{12})^{120}-1}{\frac{0.053}{12}(1+\frac{0.053}{12})^{120}}\right\}$ $26500 = M(92.99043126)$ $M = \$284.98$ (iv) Total repaid with cheaper loan $= \$284.98 \times 120$ $= \$34197.60$ Interest saved $= \$34503.60 - \$34197.60$ $= \$306$	1 1 1 1 1 1 1	Students may achieve more accuracy by not rounding until final answer. Rounding at each step will give solutions provided here.
b)	(i) $T = \dfrac{k}{N}$ (ii) $6 = \dfrac{k}{5}$ $k = 30$ (iii) $T_1 = \dfrac{30}{N}$ If N is doubled, $T_2 = \dfrac{30}{2N}$ $= \dfrac{15}{N} = \dfrac{T_1}{2}$ So doubling N, halves T.	1 1 1	
c)	(i)  $\angle ABG = 21°$ (alternate angles in parallel lines equal) $\angle ABC = 90° - 21° - 37°$ (complementary angles) $= 32°$ (ii) $\dfrac{AC}{\sin 32°} = \dfrac{40}{\sin 111°}$ $AC = \dfrac{40 \sin 32°}{\sin 111°}$ ≈ 23 km	 1 1 1	A marked diagram showing the 37° and the alternate 21° would suffice – formal proof not required.
		/13	