Student's name **Student's number** **Teacher's name**

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PRESBYTERIAN LADIES' COLLEGE SYDNEY 1888

2014

TRIAL
HIGHER SCHOOL CERTIFICATE
EXAMINATION

General Mathematics

General Instructions

- Reading time: 5 minutes
- Working time: $2\frac{1}{2}$ hours
- Write using blue or black pen
- Calculators may be used
- A formula sheet is provided at the back of this paper

Total Marks – 100

Section I: Pages 3-13
25 marks

- Attempt questions 1-25, using the answer sheet on page 29.
- Allow about 35 minutes for this section

Section II: Pages 14-26
75 marks

- Attempt questions 26-30, using all 5 writing booklets provided.
- Allow about 1 hour and 55 minutes for this section

Multiple Choice	26	27	28	29	30	Total
						%

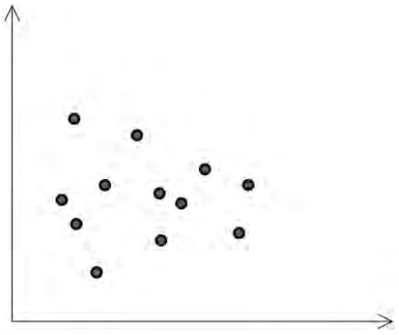
Section I

25 marks
Attempt Questions 1–25
Allow about 35 minutes for this section

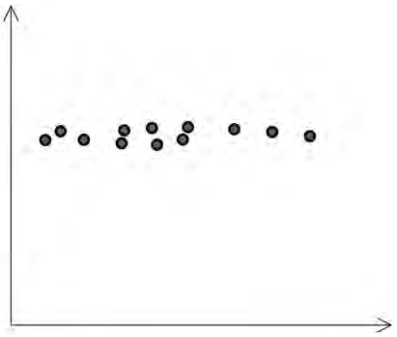
Use the multiple-choice answer sheet for Questions 1–25.

1. Which graph shows a positive correlation?

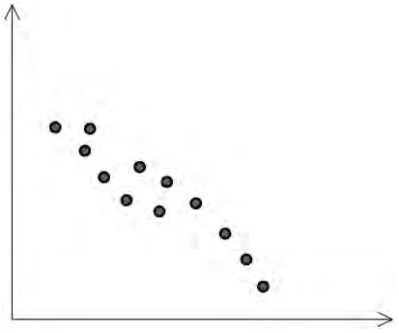
(A)



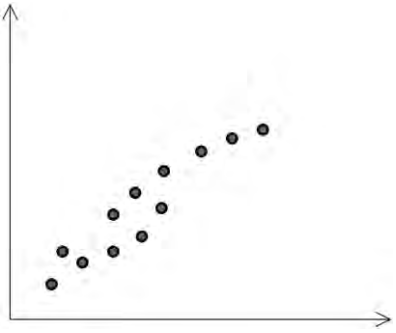
(B)



(C)



(D)



2. Simplify $\dfrac{\left(x^4\right)^4}{x^2}$

(A) x^4
(B) x^6
(C) x^8
(D) x^{14}

3. Mr Sinclair was having a picnic in Centennial Park when he noticed 3 out of the 16 ibis birds were tagged. If it is known that the total ibis population in Centennial Park is 432, what is the total number of tagged ibises in Centennial Park?

(A) 9
(B) 27
(C) 81
(D) 144

4. From a playlist of 30 songs, what is the probability, if the songs are played in a random order, that my 3 favourite songs will be the first 3 songs played? Assume that once a song has been played it will not be re-played until all songs have been selected.

(A) $\frac{1}{10}$

(B) $\frac{3}{10}$

(C) $\frac{1}{4060}$

(D) $\frac{1}{24360}$

5. Below is a copy of a supermarket receipt. What is the amount of GST included in the total?

MILK	$2.23
*COKE 375ml	$3.80
*DETERGENT	$6.58
*TEA TREE OIL	$4.12
MANDARINS	$2.75
SOUP	$1.67
TOTAL	$ _____

10%GST INCLUDED ON TAXABLE ITEMS
* = TAXABLE ITEM

(A) $1.32
(B) $1.45
(C) $2.26
(D) $6.65

6. Ms Rossides wants to borrow $20000. She will repay the loan with annual repayments. Which loan will be the cheapest?

Loan Type	***Interest Rate***	***Establishment Fee***	***Monthly Fee***
A	6% per annum flat	$400	$10
B	6% per annum compounding annually	$300	$10
C	0.5% per month, compounding monthly	$100	$10
D	0.5% per month flat	$200	$10

(A) **A**
(B) **B**
(C) **C**
(D) **D**

7. Test scores obtained when 5000 students sit for an examination are normally distributed. The scores have a mean of 71 and a standard deviation of 9. How many students are likely to have scored a mark between 62 and 89?

(A) 1768
(B) 3400
(C) 4075
(D) 4750

8. Solve the equation $4x-2(x-3)=14$.

(A) $x=4$
(B) $x=5\frac{1}{2}$
(C) $x=8\frac{1}{2}$
(D) $x=10$

9. Brian owns a car. He has been involved in an accident where a passenger is injured. Which one of the following car insurance policies will the injured passenger claim against?

(A) Compulsory Third Party Insurance (CTP)
(B) Third Party Property Damage
(C) Comprehensive Car Insurance
(D) Third Party Fire and Theft Cover

10. Use the formula $R=\sqrt[3]{\frac{3V}{4\pi}}$ to find R (correct to 2 decimal places) if $V=18.76$.

(A) 1.65
(B) 2.12
(C) 3.54
(D) 4.49

11. Joel bought 200 shares in Adelaide Bank at \$2.50. They are now worth \$4.00. Joel receives a dividend of \$0.50. What is the dividend yield?

(A) 12.5%
(B) 33%
(C) \$100
(D) \$300

12. Households were surveyed to find out the size of the house and the amount of electricity they used. The results are in the table below.

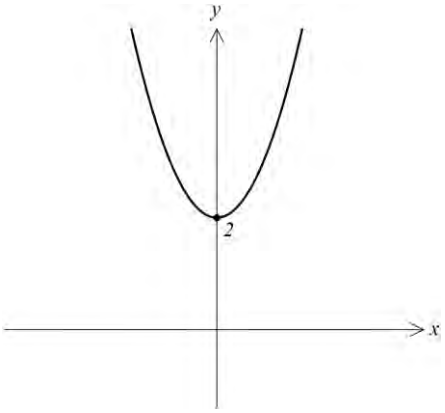
Level of power usage	**Size of house**		
	small	*medium*	*large*
Low	12	22	10
Medium	19	69	24
High	14	51	47

What is the percentage of small houses rated as having a high level of power usage?

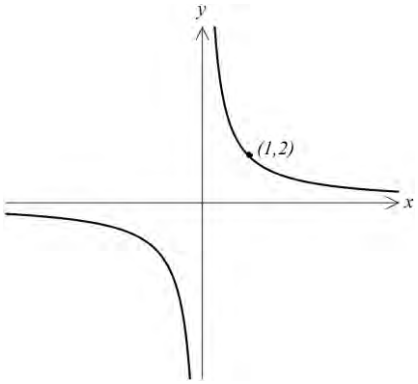
(A) 5.2%
(B) 12.5%
(C) 14%
(D) 31.1%

13. Which of the following graphs shows $y = \frac{2}{x}$?

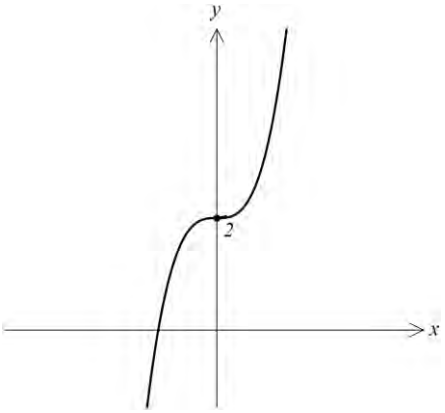
(A)



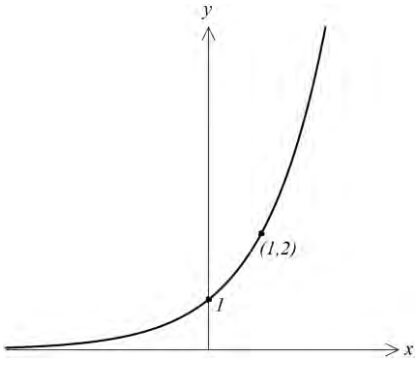
(B)



(C)



(D)

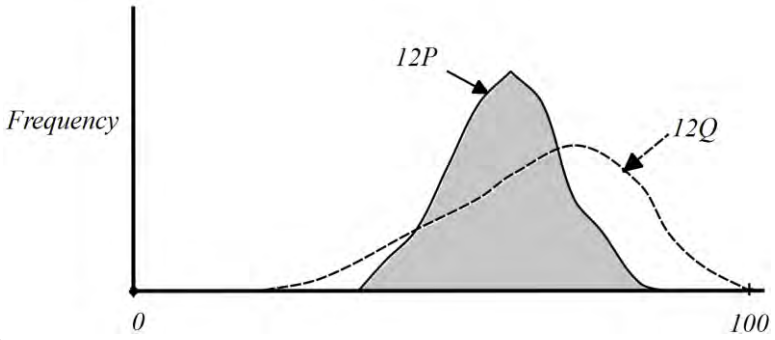


14. A phone bill of $183.54 was charged to a credit card on April 8, 2014. Simple interest was charged at a rate of 19.74% per annum for purchases using the credit card. No other purchases were made and there was no interest free period. The period for which interest was charged included the date of purchase and the date of payment.
What amount was required to pay the amount in full on May 16, 2014?

(A) $185.28
(B) $187.21
(C) $187.41
(D) $189.58

15. The graph shows the distributions of marks in a test given to classes 12P and 12Q.

Frequency Polygons of scores for 12P and 12Q



Consider:
I: 12P has a higher mode than 12Q.
II: 12Q has a larger standard deviation than 12P
Which is true?

(A) **I** only
(B) **II** only
(C) Both **I** and **II**
(D) Neither **I** or **II**

16. What is the solution to the pair of simultaneous equations

$5x+7y-3=0$ and $y=7-4x$?

(A) $x=-2,\ y=-1$
(B) $x=2,\ y=-1$
(C) $x=-1,\ y=2$
(D) $x=1,\ y=3$

17. What is the distance, in kilometres, between Santa Cruz de la Sierra with position co-ordinates $\left(18^o S, 63^o W\right)$ and Charlottetown with co-ordinates $\left(46^o N, 63^o W\right)$?

(A) 3128
(B) 6925
(C) 7037
(D) 7149

18. The distance between the treasure, located at point *T*, and the lighthouse, located at point *L*, is 16 kilometres. What scale has been used on the treasure map below?

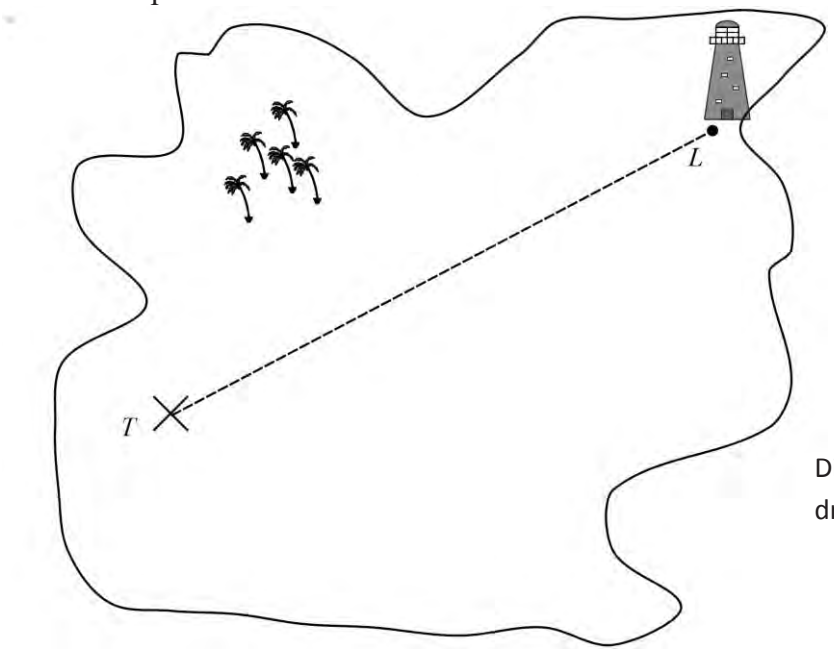
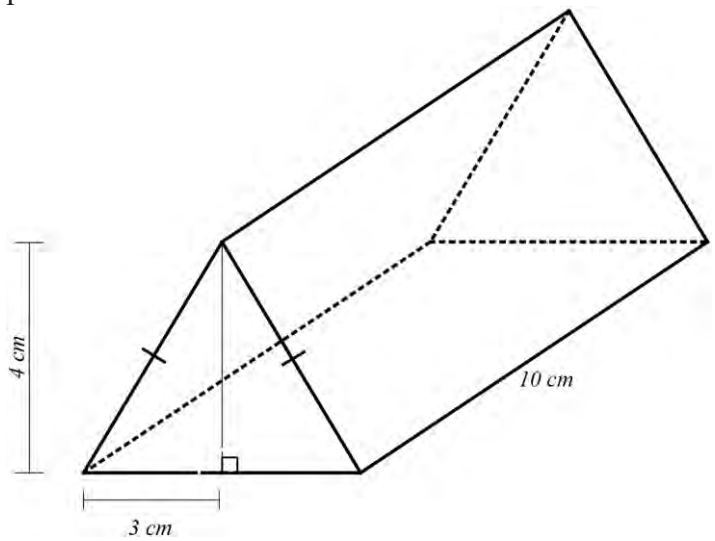


Diagram is drawn to scale

(A) 1:2
(B) 1:200
(C) 1:20000
(D) 1:200000

19. What is the surface area, in square centimetres, of this solid triangular prism?



(A) 120
(B) 124
(C) 172
(D) 184

20. One card is selected at random from a standard pack of 52 cards and the result recorded. A die is rolled and the result recorded. Which of the following events would be least likely?

(A) A red card with a 6

(B) A black card with a number that is not 6.

(C) A court card (King, Queen or Jack) and an even number.

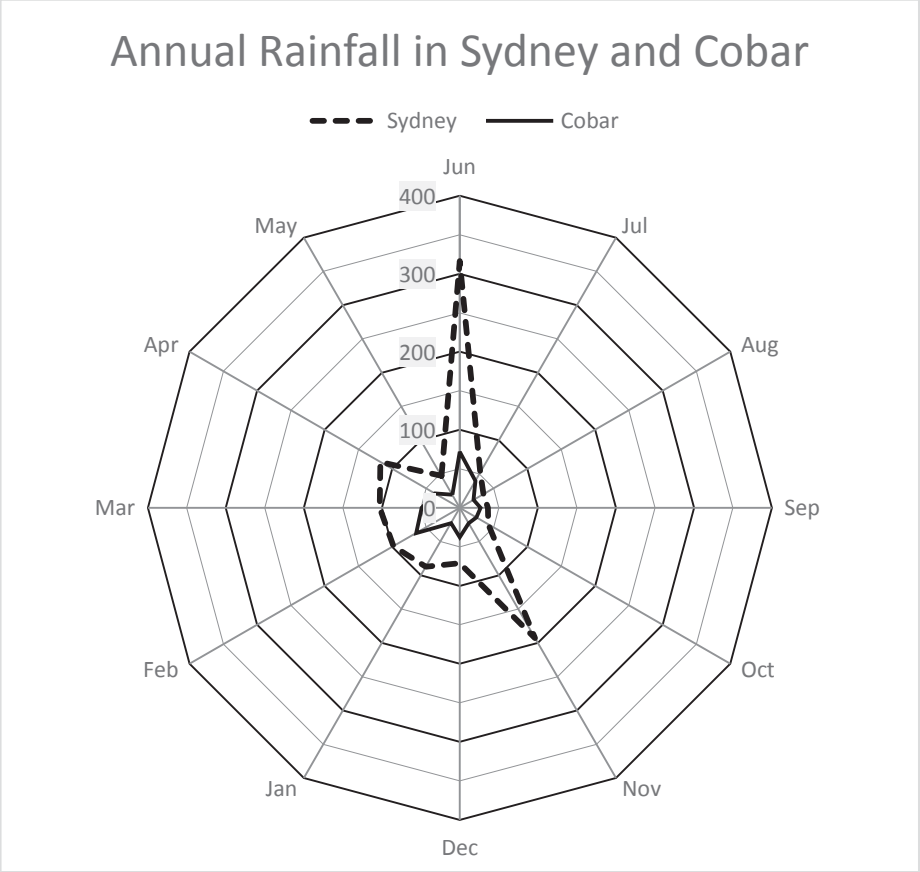
(D) The card is **not** a court card with the number being odd.

21. A washing machine has the following energy rating:

The energy consumption is calculated on 7 washes per week.
A family uses the machine 13 times each week. How much does it cost this family to run the washing machine for a year if electricity is charged at 25.9c/kWh?

(A) $53.87
(B) $71.83
(C) $100.05
(D) $133.40

22. The radar chart below displays the annual rainfall for both Cobar and Sydney. In which month was the greatest difference in rainfall?



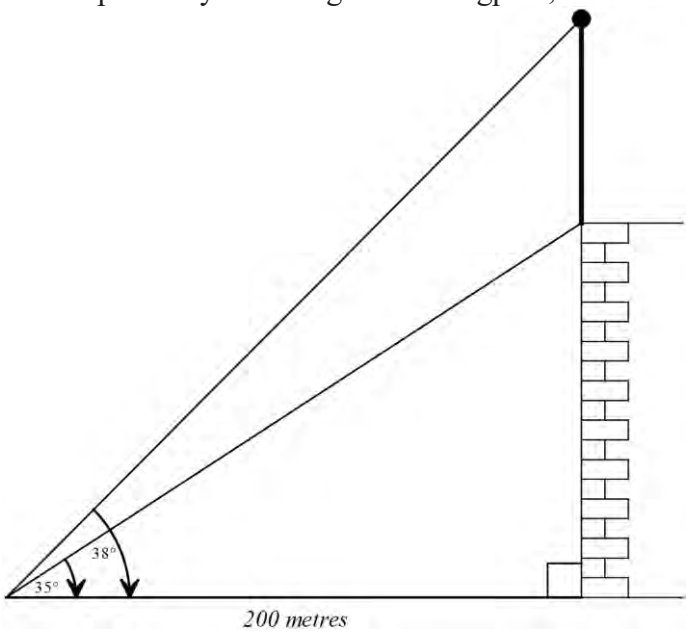
(A) January
(B) June
(C) July
(D) November

23. When Jacinta was born her grandmother began an annuity for her. She deposited $1000 on her first birthday and at each birthday up to and including her 21st birthday. If the interest rate was 4% per annum how much was the annuity worth when Jacinta turned 21?

Period	Future Value of $1 Invested						
	Interest rate per period						
	0.40%	**0.50%**	**0.60%**	**1.00%**	**4.00%**	**5.00%**	**6.00%**
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0040	2.0050	2.0060	2.0100	2.0400	2.0500	2.0600
3	3.0120	3.0150	3.0180	3.0301	3.1216	3.1525	3.1836
4	4.0241	4.0301	4.0361	4.0604	4.2465	4.3101	4.3746
5	5.0402	5.0503	5.0604	5.1010	5.4163	5.5256	5.6371
6	6.0603	6.0755	6.0907	6.1520	6.6330	6.8019	6.9753
7	7.0846	7.1059	7.1273	7.2135	7.8983	8.1420	8.3938
8	8.1129	8.1414	8.1700	8.2857	9.2142	9.5491	9.8975
9	9.1454	9.1821	9.2191	9.3685	10.5828	11.0266	11.4913
10	10.1819	10.2280	10.2744	10.4622	12.0061	12.5779	13.1808
11	11.2227	11.2792	11.3360	11.5668	13.4864	14.2068	14.9716
12	12.2676	12.3356	12.4040	12.6825	15.0258	15.9171	16.8699
13	13.3166	13.3972	13.4785	13.8093	16.6268	17.7130	18.8821
14	14.3699	14.4642	14.5593	14.9474	18.2919	19.5986	21.0151
15	15.4274	15.5365	15.6467	16.0969	20.0236	21.5786	23.2760
16	16.4891	16.6142	16.7406	17.2579	21.8245	23.6575	25.6725
17	17.5550	17.6973	17.8410	18.4304	23.6975	25.8404	28.2129
18	18.6253	18.7858	18.9480	19.6147	25.6454	28.1324	30.9057
19	19.6998	19.8797	20.0617	20.8109	27.6712	30.5390	33.7600
20	20.7786	20.9791	21.1821	22.0190	29.7781	33.0660	36.7856
21	21.8617	22.0840	22.3092	23.2392	31.9692	35.7193	39.9927
22	22.9491	23.1944	23.4431	24.4716	34.2480	38.5052	43.3923
23	24.0409	24.3104	24.5837	25.7163	36.6179	41.4305	46.9958
24	25.1371	25.4320	25.7312	26.9735	39.0826	44.5020	50.8156

(A) $20 778.60
(B) $21 861.70
(C) $29 778.10
(D) $31 969.20

24. An observer 200 metres from a building notes that the angles of elevation to the bottom and top of the flagpole on top of the building are 35° and 38° respectively. How high is the flagpole, in metres?



(A) 8.42
(B) 16.22
(C) 140.04
(D) 156.26

25. This year Patrick pays $\$21000$ in income tax. What is his taxable income?

Taxable income	Tax on this income
0 - $18,200	Nil
$18,201 - $37,000	19c for each $1 over $18,200
$37,001 - $80,000	$3,572 plus 32.5c for each $1 over $37,000
$80,001 - $180,000	$17,547 plus 37c for each $1 over $80,000
$180,001 and over	$54,547 plus 45c for each $1 over $180,000

(A) $532
(B) $9332.43
(C) $89 332.43
(D) $94 262.39

Section II

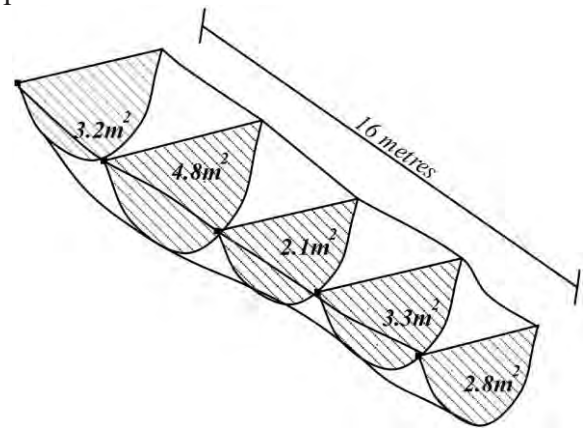
75 marks
Attempt Questions 26–30
Allow about 1 hour and 55 minutes for this section

Answer each question in a new writing booklet. Extra writing booklets are available.

In Questions 26–30, your responses should include relevant mathematical reasoning and/or calculations.

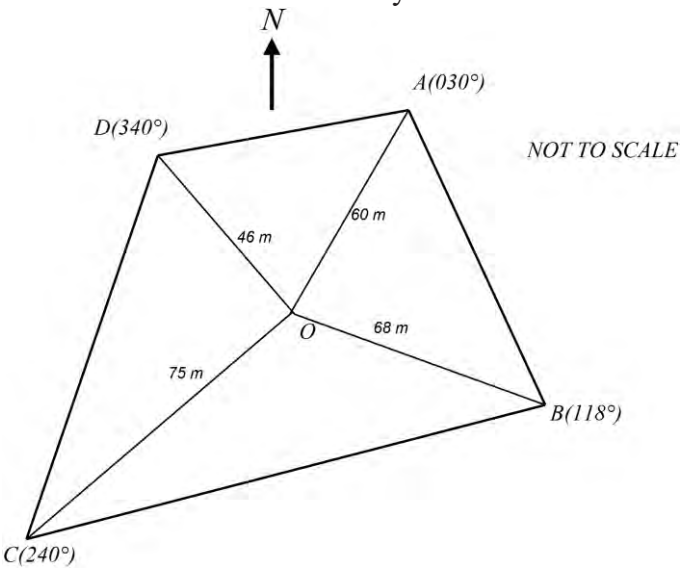
Question 26 (15 marks) Start a new Writing Booklet.

a) The equally spaced cross-sectional areas of a small dam are shown.



Using Simpson's rule twice, calculate the volume of the dam. **2**

b) The diagram below shows a radial survey of a field.



(i) Show that $\angle DOA$ is 50^o. **1**

(ii) Calculate the area of triangle DOA, correct to 2 decimal places. **1**

Question 26 continued over page

c) The following stem-and-leaf plot shows the height of 30 Year 8 students.

13	6
14	5 7 9
15	1 2 2 4 5 6 6 8 9 9
16	0 0 1 2 3 5 5 7 8 8 9
17	0 2 2 3 9

(i) Find the median. **1**

(ii) What type of data is ***height of students***? Give the best name for it. **1**

(iii) Find the interquartile range. **2**

(iv) Is there an outlier in this distribution? Support your answer with mathematics **2**

d) A roulette wheel has 18 RED slots, 18 BLACK slots and 1 GREEN slot. A ball is sent spinning along the rim of the wheel and as the wheel slows down the ball falls into one of the slots at random. A player who bets on this colour wins.

(i) What is the probability of the ball falling into the RED slot? **1**

(ii) In a series of 200 spins, what is the expected number of times that RED wins, to the nearest whole number? **1**

Question 26 continued over page

e) For her phone plan, Tahlia pays $50 per month plus other charges shown below:

Rates for use within Australia	***Cost***
Standard voice call flagfall	20c per call
Standard voice call rate	80c per 30 seconds
SMS to standard Australian mobiles	25c per message
MMS to standard Australian mobiles	60c per message
Standard video call flagfall	75c per call
Standard video call rate	$1.25 per minute
Excess data rate	5c per MB

Included in Tahlia's plan is unlimited SMS to Australian mobiles and 4GB of data.

In August, Tahlia

- Makes ten 2 minute voice calls
- Sends 1000 SMS messages(to standard Australian mobiles)
- Uses 6 GB of data

If Tahlia's parents will only pay the $50 per month, how much will Tahlia have to pay to completely pay off the bill? **3**

End of Question 26

Question 27 (15 marks) Start a new Writing Booklet.

a) Standard time in Sydney is based on the $150^o E$ meridian and that for New York is based on the $75^o W$ meridian.

(i) Mr Friend phones the casting agency in New York. It is 3:30pm on Monday in New York, what day and time is it in Sydney? **2**

(ii) Mr Friend is to meet the casting director in New York. The total flight time to New York is 18 hours 35 minutes. If Mr Friend leaves Sydney on Tuesday on the 10 am flight, what time and day will he arrive in New York? **2**

b) Rowena is in Year 12 and has sat 3 out of 4 HSC General Mathematics assessment tasks. A summary of her results is found in the table below:

	Task 1 (out of 30)	**Task 2 (out of 30)**	**Task 3 (out of 30)**
Rowena's mark	18	24	26
Mean	20	24	**A**
Standard deviation	5	2	4

(i) Find the *z*-score of Task 1. **1**

(ii) The formula for calculating *z*-scores is: **1**

$z = \dfrac{x - \bar{x}}{s}$, where $\bar{x}$ is mean and *s* is standard deviation.

Rearrange this formula to make the mean the subject.

(iii) If Rowena's *z*-score for Task 3 is 0.5, find the mean, **A.** **1**

(iv) Which Task did she do better in, relative to the rest of the group? Support your answer with mathematical reasoning. **2**

(v) Rowena did not sit the Trial Examination due to misadventure. If the weighted average of the *z*-scores of the first 3 tasks was $z = 1.5$, the mean and standard deviation of the Trial Examination was 68 and 14.5 respectively, what mark would Rowena receive as an estimate if she was given her weighted *z*-score? **1**

Question 27 continued over page

c) Kane borrows $\$500\,000$ to buy an apartment. The interest and monthly repayment are shown in the spreadsheet.

Home Loan Table
Amount=$\$500\,000$
Interest Rate p.a.= 6%
Monthly Repayment R= $\$3\,221.51$

This table assumes the same number of days each month. i.e.
Interest=Rate/12xPrincipal

Months	Principal (P)	Interest (I)	P+I	P+I-R
1	$500,000.00	$2,500	$502,500	$499,278.49
2	$499,278.49	$2,496	$501,775	$498,553.38
3	$498,553.38	$2,493	$501,046	$497,824.64
4	$497,824.64	$2,489	$500,314	$497,092.25
5	$497,092.25	$2,485	$499,578	$496,356.21
6	$496,356.21	$2,482	$498,838	$495,616.48
7	$495,616.48	$2,478	$498,095	$494,873.06
8	$494,873.06	$2,474	$497,347	$494,125.92
9	$494,125.92	$2,471	$496,597	$493,375.04
10	$493,375.04	$2,467	$495,842	$492,620.41
11	$492,620.41	$2,463	$495,084	$491,862.00
12				

(i) How much does he owe at the end of 12 months? **2**

Question 27 continued over page

Question 27 continued

After 12 months Kane inherits a large sum of money and uses it to reduce the amount outstanding on his loan to $400 000.

Kane's monthly repayment is recalculated after he makes the lump sum payment at the end of his first year.

(ii) How much is the new monthly repayment, if he is still to pay off the loan in a total of 25 years, at the same interest rate? **1**

Present Value of an Annuity of $1							
	Interest rate per period						
Period	**0.4%**	**0.5%**	**0.6%**	**1.0%**	**4.0%**	**5.0%**	**6.0%**
1	0.9960	0.9950	0.9940	0.9901	0.9615	0.9524	0.9434
2	1.9881	1.9851	1.9821	1.9704	1.8861	1.8594	1.8334
3	2.9762	2.9702	2.9644	2.9410	2.7751	2.7232	2.6730
4	3.9603	3.9505	3.9407	3.9020	3.6299	3.5460	3.4651
5	4.9406	4.9259	4.9112	4.8534	4.4518	4.3295	4.2124
6	5.9169	5.8964	5.8760	5.7955	5.2421	5.0757	4.9173
7	6.8893	6.8621	6.8350	6.7282	6.0021	5.7864	5.5824
8	7.8579	7.8230	7.7882	7.6517	6.7327	6.4632	6.2098
9	8.8226	8.7791	8.7358	8.5660	7.4353	7.1078	6.8017
10	9.7835	9.7304	9.6778	9.4713	8.1109	7.7217	7.3601
11	10.7405	10.6770	10.6141	10.3676	8.7605	8.3064	7.8869
12	11.6937	11.6189	11.5448	11.2551	9.3851	8.8633	8.3838
24	22.8405	22.5629	22.2899	21.2434	15.2470	13.7986	12.5504
60	53.2489	51.7256	50.2621	44.9550	22.6235	18.9293	16.1614
120	95.1560	90.0735	85.3666	69.7005	24.7741	19.9427	16.6514
180	128.1370	118.5035	109.8845	83.3217	24.9785	19.9969	16.6662
240	154.0933	139.5808	127.0084	90.8194	24.9980	19.9998	16.6667
252	158.5793	143.0908	129.7555	91.8527	24.9987	19.9999	16.6667
264	162.8555	146.3969	132.3123	92.7697	24.9992	19.9999	16.6667
276	166.9317	149.5110	134.6920	93.5835	24.9995	20.0000	16.6667
288	170.8172	152.4441	136.9068	94.3056	24.9997	20.0000	16.6667
300	174.5210	155.2069	138.9683	94.9466	24.9998	20.0000	16.6667
312	178.0515	157.8091	140.8869	95.5153	24.9999	20.0000	16.6667
324	181.4169	160.2602	142.6726	96.0201	24.9999	20.0000	16.6667

(iii) How much did he save by making the single lump sum payment? **2**

End of Question 27

Question 28 (15 marks) Start a new Writing Booklet.

a) A speed check is set up on the side of an expressway. It records the speed in kilometres per hour of vehicles which pass during a one hour time period. The data collected is displayed in a cumulative frequency distribution table below.

Speed	Class Centre	Cumulative Frequency
61-70	65.5	3
71-80	75.5	7
81-90	85.5	30
91-100	95.5	45
101-110	105.5	82
111-120	115.5	107
121-130	125.5	120

From the information in the table:

(i) Estimate the average speed of the cars passing the radar check. **2**

(ii) What percentage of vehicles exceeded the speed limit of 110 kilometres per hour? **2**

(iii) Within which class is the median speed of these vehicles? **1**

(iv) What was the most commonly recorded class of speeds? **1**

b) A car is bought for $\$55000$. The car can be depreciated by using either the
Straight Line Method: $1500 per year
OR
Declining Balance Method: 5% per annum
What is the difference in value between the two different methods at the end of 8 years? **2**

Question 28 continued over page

Question 28 continued

c) A water bill is shown below.

date of issue	due date	amount due
29/11/2012	03/01/2012	$239.69

i003820

POST billpay Billpay Code: 2159 Ref: 8639 9

Biller Code: 10074 Ref: 086399

Service Details
45 Rous Road GOONELLABAH NSW 2480
20mm service

Water Charges

Meter No.	Previous Reading		Current Reading		Consumption (Kls)
06W930759	30/07/2012	1337	29/10/2012	1416	79

Consumption Charge at 2.4800 per Kl (2012/13 rate)	$195.92
Fixed Fee (01/10/2012 to 31/12/2012)	$41.75
Balance Brought Forward	$2.02

Average Daily Consumption

Period ending	Kls / day
29/10/2012	0.8681
30/07/2012	0.7885
17/04/2012	0.8370
16/01/2012	0.9048

INTEREST IS CHARGED ON OVERDUE RATES AT THE RATE OF 10% p.a.

E & OE

Total Amount Due $239.69

(i) How many days is the billing period? **1**

(ii) How much did 1 kilolitre of water cost? **1**

(iii) For the next billing period, which covers 97 days, water rates will increase by 5%. How much will the **water consumption cost** be on the next bill? Assume the usage for the next period is the same as the corresponding period last year. **2**

d) Joel is an 18 year old male who weighs 65kg.
He orders a total of 4 drinks, starting at 8pm and finishing the fourth drink at 11pm.The drinks are

- **One** 375ml can of beer that states it holds 1.4 standard drinks.
- **Two** 30ml shots of vodka, where 1 shot is 1 standard drink.
- **One** 250ml can of mixer that holds 1.9 standard drinks.

(i) What is Joel's blood alcohol content (BAC) at 11pm? **2**

(ii) If the number of hours for the BAC to reach zero can be found by the formula below: **1**

$$Number\ of\ hours\ for\ BAC\ to\ reach\ zero = \frac{\text{BAC}}{0.015}$$

How long before Joel's BAC is zero? Give your answer correct to the nearest 10 minutes.

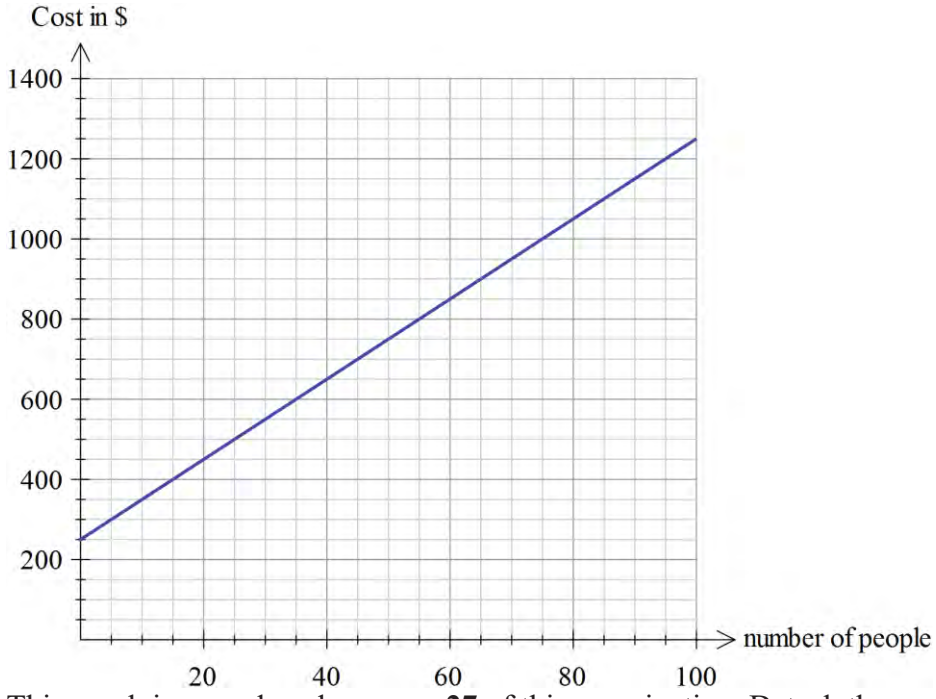
End of Question 28

Question 29 (15 marks) Start a new Writing Booklet.

a) The cost of hiring a bus for a PLC excursion is

- $250 for the bus **PLUS**
- $10 per person.

Each student is to be charged $15 to go on the bus for an excursion.
The graph below shows the cost of bus hire.



(i) This graph is reproduced on **page 27** of this examination. Detach the graph and draw in the line representing the amount PLC is charging per student. **1**

(ii) Determine the gradient of your line and give the meaning of the gradient in this situation. **1**

(iii) Find how many people need to go on the bus for PLC to "break-even". **1**

(iv) If only 60 people attend, does the school make a profit or loss and by how much? **1**

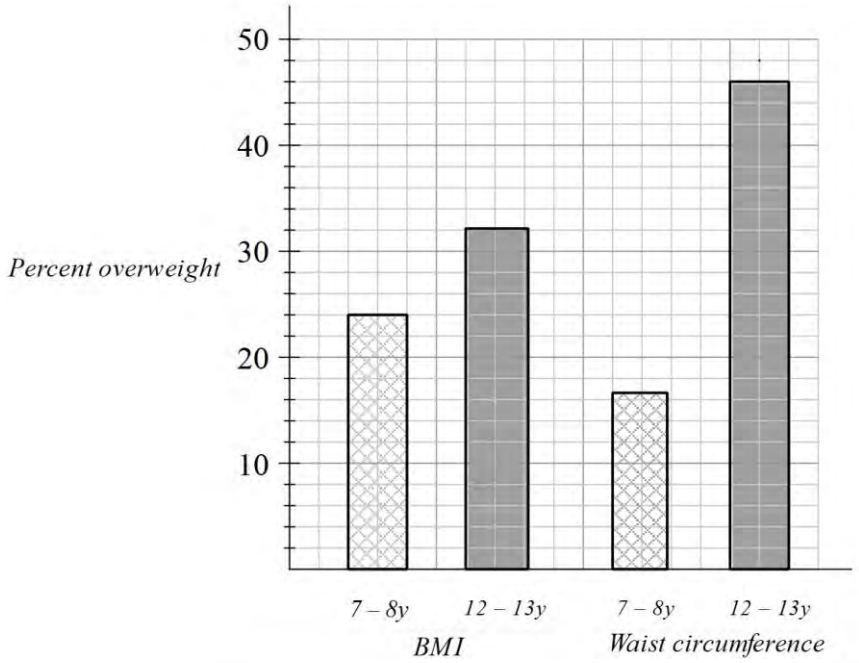
(v) The total cost when you hire 2 or more buses is

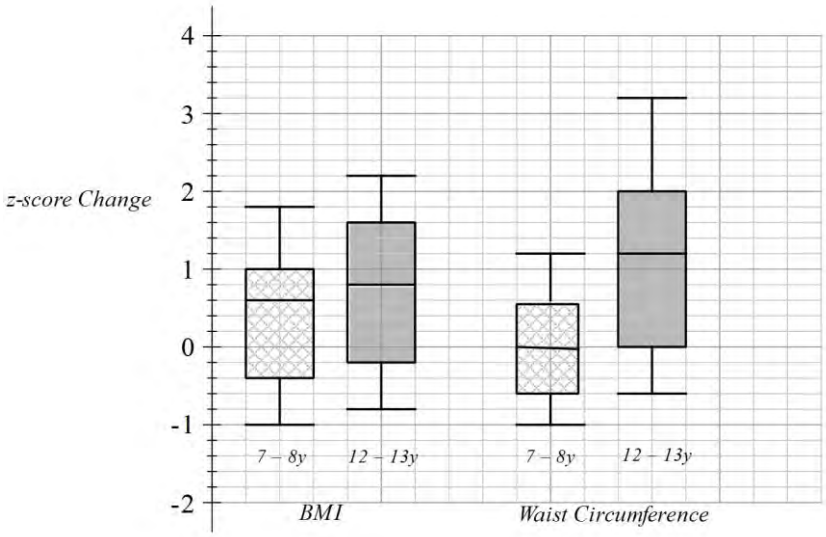
- $750 per bus with no other charges

Year 12 are attending a school camp in the Blue Mountains. If there are 130 students and each bus is licensed to carry a maximum of 60 students, will the charge of $15 per student cover the cost of the buses or will each student need to be charged more than $15? Justify your answer with mathematics. **2**

Question 29 continued over page

b) The figures below are the results from a study carried out over 5 years to measure weight changes in girls. Two measures were used to decide on whether the person was overweight: BMI and waist circumference.





(i) What percentage of the 12-13 year olds were overweight, according to their BMI? **1**

(ii) Calculate the percentage increase during this 5 year period in overweight children using the BMI measure. **1**

(iii) Which measure shows the greatest increase in weight? Give 2 reasons for your answer, supporting these with mathematics. **2**

Question 29 continued over page

Question 29 continued

c) Theo is 3 years of age and is required to take medication. The adult dosage of this medication is 500mg every 4 hours.

(i) A nurse uses Young's Rule to calculate the dosage that Theo should receive. Young's Rule is: **1**

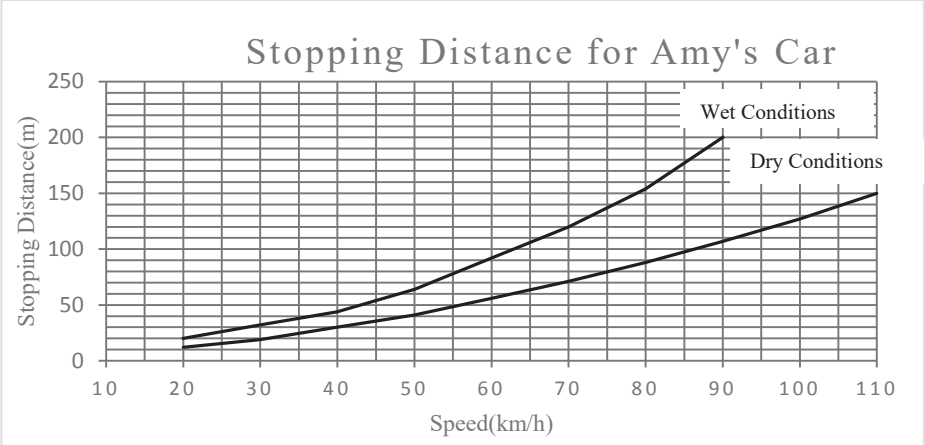
$C = \dfrac{nA}{n+12}$, where

C is the child's dose
n is the child's age in years
A is the adult dose

Find the dose that Theo would receive using Young's Rule.

(ii) Theo is to receive his medication via a drip. For this medication, the concentration is 10mg/1mL. The medication is mixed with saline in the ratio of 1:15 and this mixture is to be put through a drip over a period of 4 hours. There are 9 drips in every millilitre of this mixture. Calculate the drip rate per minute of Theo's medication. **2**

d) The graph shows the stopping distance for Amy's car when she is driving at speeds greater than 20km/h.
One graph shows the stopping distance in wet conditions, the other in dry conditions.



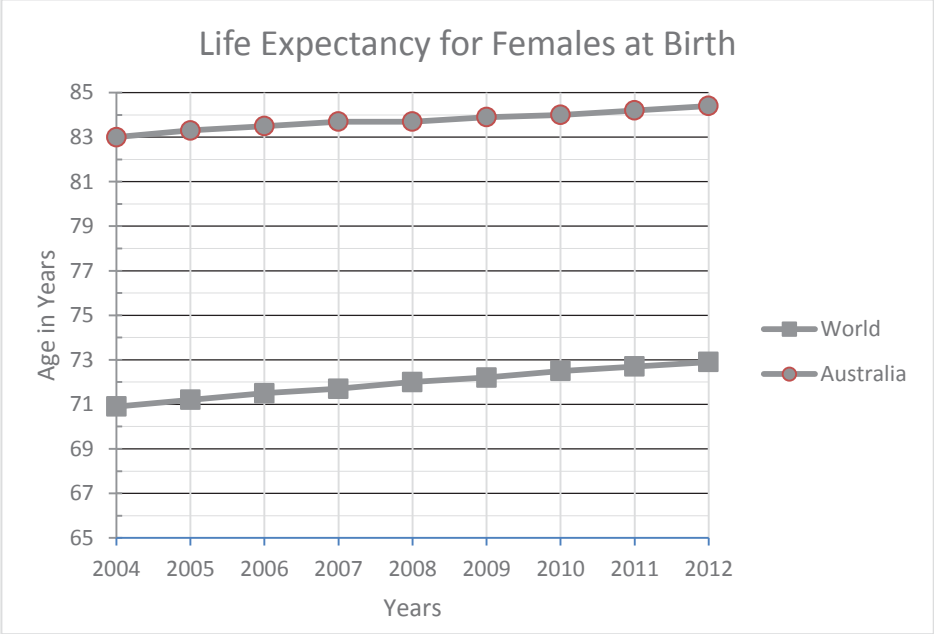
(i) What is the difference in stopping distance when Amy is travelling at 60km/h? **1**

(ii) On the freeway in dry conditions, Amy drives at 90km/h. At what speed should she travel in wet conditions in order to keep the same stopping distance? **1**

End of Question 29

Question 30 (15 marks) Start a new Writing Booklet.

a) The graph below shows a comparison in World data and Australian data for life expectancy for females at birth.



(i) What is the difference in life expectancy between the life expectancy from the world statistics and from Australia in 2012? **1**

(ii) Whose life expectancy has improved the most over the time period 2004-2012, and by how much? **1**

(iii) Give a possible reason for the greater increase. **1**

(iv) Can we expect the upward trend in life expectancy to continue indefinitely? Justify your answer. **1**

b) The table below shows the life expectancy of females in Australia from birth from 1970-2010.

1970	1980	1990	2000	2010
74.4	78.0	80.2	82.0	84.0

(i) Calculate the correlation co-efficient. **1**

(ii) Calculate the equation of the least squares line of best fit. **2**

(iii) Use your equation to calculate the life expectancy of females in Australia in 2020. **1**

Question 30 continued over page

Question 30 continued

c) The number of bacteria, y, in a culture is given by $y = 6000(1.05^x)$, where x is the time in hours.

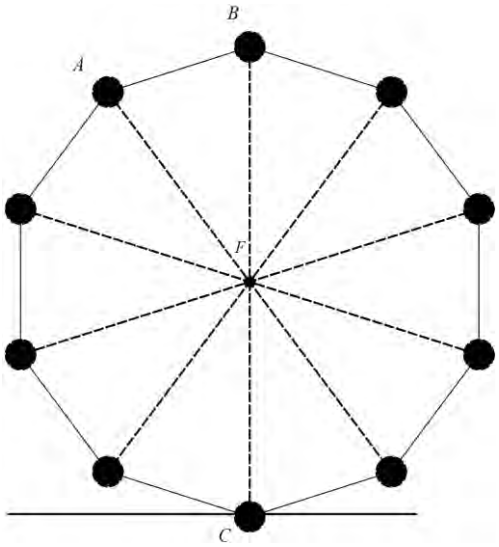
(i) Find the number of bacteria in the culture after 24 hours, correct to 1 decimal place. **1**

(ii) Find, by at least **two** trial and errors, how long it would take for the bacteria in the culture to reach 1000000. Answer in hours. **2**

d) How many seconds would it take to download a 1.2 MB file if the transfer rate is 5000 kilobits per second? **2**

e) A Ferris Wheel at Pet Show has 10 cages, equally spaced around a circle, as shown.

F is the centre of the Ferris Wheel. A and B are cages.
The distance between the cages A and B is 12.4 metres.

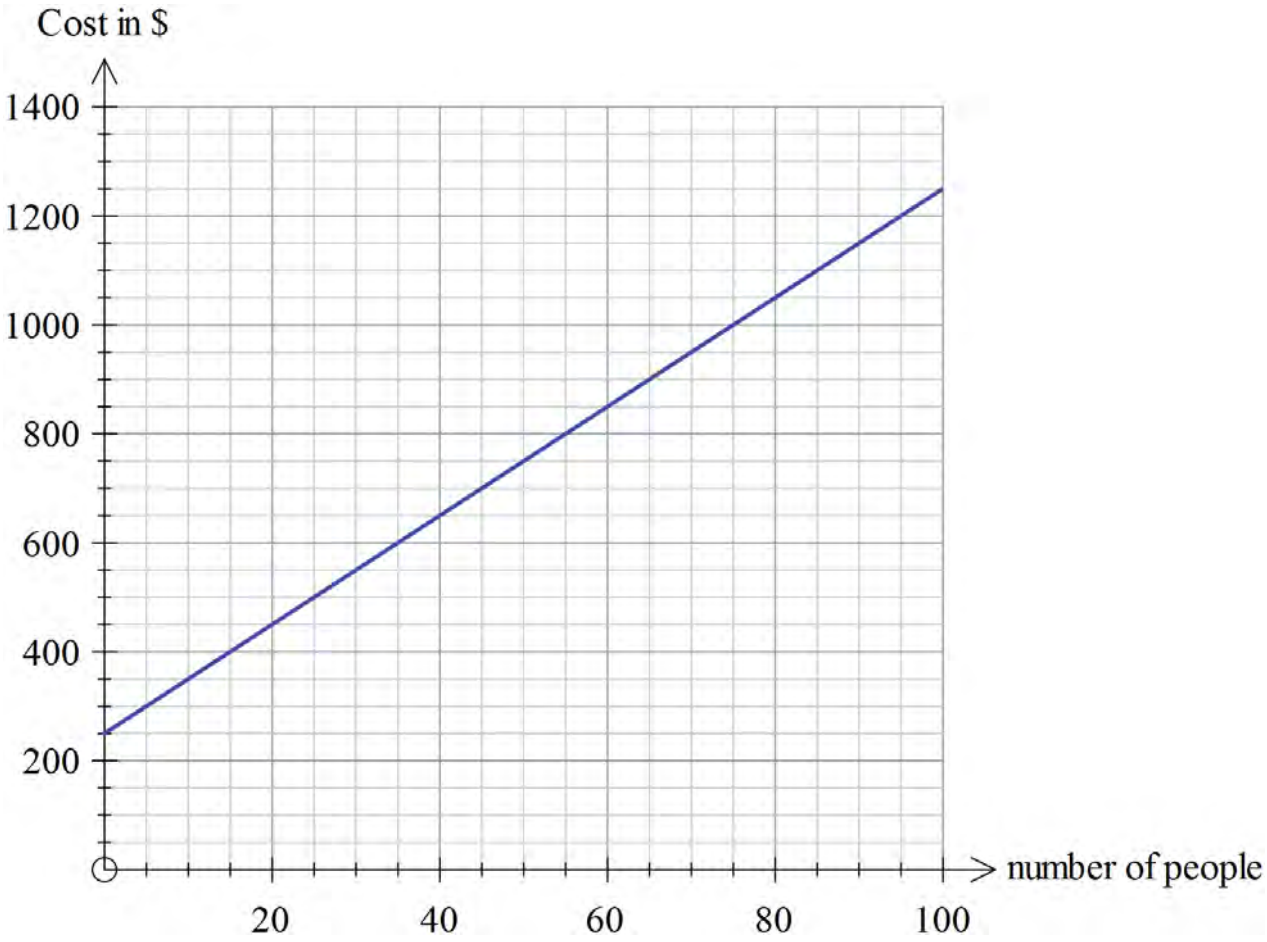


Given that $\angle AFB = 36^\circ$, use the Cosine Rule, or otherwise, to find the height of the Ferris Wheel, BC, correct to the nearest metre. **2**

End of Paper

Graph for Question 29a

Detach and include in Question 29 Writing Booklet



General Mathematics: Multiple Choice Answer Sheet

Student Number ANSWERS

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 ○
23.	A ○	B ○	C ○	D ●
24.	A ○	B ●	C ○	D ○
25.	A ○	B ○	C ●	D ○

Academic Year		Calendar Year	
Course		Name of task/exam	

M/C.

Q1. Positive correlation means dots go upward ∴ D

Q2 $\frac{(x^4)^4}{x^2} = \frac{x^{16}}{x^2}$

$= x^{16} \div x^2$

$= x^{16-2}$

$= x^{14}$

∴ D

Q3 $\frac{3}{16} = \frac{x}{432}$

$x = 432 \times \frac{3}{16}$

$= 81$

∴ C

Q4 $\frac{3}{30} \times \frac{2}{29} \times \frac{1}{28}$

$= \frac{1}{4060}$

∴ C

Q5 $3.80 + 6.58 + 4.12$

$= \$14.50.$

$110\% = \$14.50$

$1\% = \frac{14.5}{110}$

$10\% = \frac{14.5}{110} \times 10$

$= \$1.32$

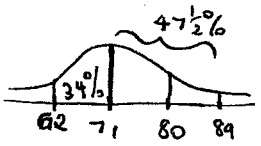
∴ A

Q6 D

∴ D

Q7 $\bar{x} = 71$

$\sigma = 9$



$81\frac{1}{2}\% \times 5000 = 4075$

∴ C

Q8 $4x - 2(x-3) = 14$

$4x - 2x + 6 = 14$

$2x + 6 = 14$

$-6 \quad -6$

$2x = 8$

$\div 2 \quad \div 2$

$x = 4$

∴ A

Q9 A

Q10 $R = 3\sqrt{\frac{3V}{4\pi}}$

$= 3\sqrt{\frac{3 \times 18.76}{4\pi}}$

$= 1.648...$

∴ A

Q11 $\frac{.5}{4} \times 100\%$

$= 12.5\%$

∴ A

Q12 $\frac{14}{45} \times 100\% = 31.\dot{1}\%$

Academic Year		Calendar Year	
Course		Name of task/exam	

Q13 B

Q14 8^{th} ---------- 20^{th}
21^{st} ---------- 30^{th} 1^{st}
2^{nd} ---------- 16^{th}

39 days.

$\therefore \left(\frac{19.74}{100} \div 365\right) \times \$183.54 \times 39$

$= \$3.87$ $\therefore 183.54 + 3.87 = 187.41$

$\therefore$ C

Q15 B

Q16 $5x + 7y - 3 = 0$ ①

$y = 7 - 4x$ ②

substitute ② into ①

$5x + 7(7-4x) - 3 = 0$

$5x + 49 - 28x - 3 = 0$

$-23x + 46 = 0$

$23x = 46$

$x = 2$.

$\therefore$ B

Q17 $18°S + 46°N = 64°$

$\frac{64}{360} \times 2\pi r = \frac{64}{360} \times 2\pi \times 6400$

$\therefore$ distance = 7149 km

$\therefore$ D

Q18 8cm = 16 km

8 cm = 16 000 m

8 cm = 16 00000 cm

$\therefore$ 8 : 1600000

= 1 : 200000

$\therefore$ D

Q19 S.A = 2 triangles + 3 rectangles

$= 2\left[\frac{1}{2} \times 6 \times 4\right] + 10 \times 5 + 10 \times 5 + 10 \times 6$

(by pyth. thm)

$= 24 + 50 + 50 + 60$

$= 184$

$\therefore$ D

Q20 $P(R\ 6) = \frac{26}{52} \times \frac{1}{6} = \frac{26}{312}$

$P(B\ \overline{6}) = \frac{26}{52} \times \frac{5}{6} = \frac{130}{312}$

$P(\text{court even}) = \frac{12}{52} \times \frac{3}{6} = \frac{36}{312}$

$P(\overline{\text{court odd}}) = \frac{40}{52} \times \frac{3}{6} = \frac{120}{312}$

$\therefore$ Least likely is A.

Q21 7 washes $\Rightarrow$ 208 kWh/yr

1 wash $\Rightarrow \frac{208}{7}$

13 washes $\Rightarrow \frac{208}{7} \times 13$ kWh

electricity cost = 0.259 × no. of kWh

$= 0.259 \times \left(\frac{208}{7} \times 13\right)$

$= \$100.05$

$\therefore$ C

Academic Year		Calendar Year	
Course		Name of task/exam	

Q22 B

Q23 4% p.a

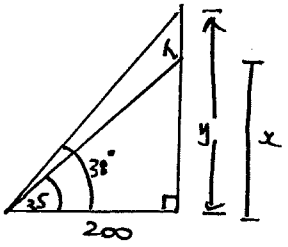
21 periods

$\$1000 \times 31.9692$

$= \$31\,969.20$

$\therefore$ D

Q24



$\tan 38° = \frac{y}{200}$

$y = 200 \tan 38$

$= 156.257....$

$\tan 35° = \frac{x}{200}$

$x = 200 \tan 35$

$= 140.04...$

$\therefore h = y - x$

$= 156.257... - 140.04$

$= 16.215..$

$\therefore$ B

Q25.

$21\,000 = 17547 + (0.37 \times (x - 80\,000))$

$3453 = 0.37 \times (x - 80\,000)$

$\div 0.37 \qquad \div 0.37$

$9332.43 = x - 80\,000$

$x = 89\,332.43$

$\therefore$ C

Academic Year		Calendar Year	
Course		Name of task/exam	

Q26

a) $V \doteq \frac{h}{3}\{A_L + 4A_M + A_R\}$

$\doteq \frac{4}{3}\{3.2 + 4(4.8) + 2.1\}$

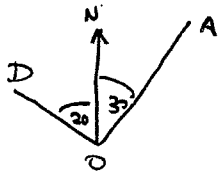
$+ \frac{4}{3}\{2.1 + 4(3.3) + 2.8\}$

$\doteq 32\frac{2}{3} + \frac{362}{15}$

$\doteq \frac{284}{5}$

$\doteq 56.8\ m^3$

b) i) $\angle DOA = \angle DON + \angle NOA$



$= 20° + 30°$

$= 50°$

ii) $A = \frac{1}{2}ab\sin C$

$= \frac{1}{2}(46)(60)\sin 50°$

$= 1057.14\ m^2$ (2 dp)

c) i) 15th score is 160

16th score is 160

$\therefore$ median = 160

ii) quantitative continuous data

iii) Interquartile range = IQR

$IQR = Q_3 - Q_1$ OR $Q_U - Q_L$

$= 168 - 154$

$= 14$

iv) To be an outlier:

scores less than $Q_L - 1.5 \times IQR$

or

scores more than $Q_U + 1.5 \times IQR$

$\therefore 154 - 1.5 \times 14 = 133$

$168 + 1.5 \times 14 = 189$

as there are no scores below 133 or above 189, there are no outliers

d) i) $\frac{18}{37}$

ii) $\frac{18}{37} \times 200 = 97.297...$

$\therefore$ we would expect Red to win approx. 97 times in every 200 spi...

e) Tahlia will pay for 10×2 min voice calls + 10 x flagfall + excess data

$\therefore 10 \times \underbrace{20^c}_{\text{flagfall}} + 10 \times \underbrace{\$3.20}_{\substack{2\text{ min} \\ \text{calls}}} + 2\ GB\ of\ data$

$= \$2 + \$32 + 2 \times 1024\ MB\ of\ data$

$= \$2 + \$32 + 2048 \times 5^c$

$= \$2 + \$32 + \$102.40$

$= \$136.40$

Academic Year		Calendar Year	
Course		Name of task/exam	

Q27

a i 150° E Sydney

75° W N.Y.

∴ 225° difference.

1° = 4 min

15° = 1 hour

$\frac{225}{15}$ = 15 hours time difference.

If 3:30 pm Monday N.Y, it will be

3:30 pm + 15 h = 6:30 am Tuesday in Sydney

ii flight time 18 h 35 mins

10 am Tues Sydney is 7 pm Mon N.Y.

7 pm mon + 18 h 35 mins = 1:35 pm Tuesday.

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

$= \frac{18 - 20}{5}$

$= -\frac{2}{5}$

ii $z \times s = x - \bar{x}$

$zs + \bar{x} = x$

$\bar{x} = x - zs$

iii $\bar{x} = 26 - 0.5 \times 4$

$\bar{x} = 24$

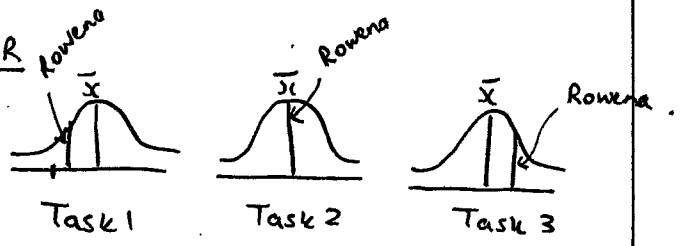
iv Task 1 : z score showed mark was below the mean

Task 2 : $z = 0$, Rowena is right on the mean.

Task 3 : $z = 0.5$, Rowena is above the mean.

∴ She did the best in Task 3.

OR



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

$1.5 = \frac{x - 68}{14.5}$

$21.75 = x - 68$

$x = 89.75$

∴ She would get 89.75

c i

12	491 862	2459.31	494321.31	491099.8

∴ owes $491 099.80

ii lump sum = 91 099.80

loan is now $400 000

∴ 6% pa = $\frac{1}{2}$% / month for 24×12 mont

400 000 ÷ 152.4441

$2623.91 / month.

Academic Year		Calendar Year	
Course		Name of task/exam	

iii Kane should have paid

25 years at $3221.51/month

$= 25 \times 12 \times 3221.51$

$= 966453$

But Kane paid

1 year at $3221.51/month lump sum and 24 years at $2623.91.

∴ Kane paid:

$12 \times 3221.51 + 91099.80 + 288 \times 2623.91$

$= 885444$

∴ He saved $966453 - 885444$

$= \$81\,009$

Q28

a

Speed	c.c.	cum freq	freq
61–70	65.5	3	3
71–80	75.5	7	4
81–90	85.5	30	23
91–100	95.5	45	15
101–110	105.5	82	37
111–120	115.5	107	25
121–130	125.5	120	13

i $\bar{x} = \frac{\sum fx\ c.c}{\sum f}$

$= \frac{12320}{120} = 102.7$ km/h

ii $\frac{38}{120} \times 100\% = 31.\dot{6}\%$

iii 101 – 110

iv 101 – 110

b Straight line

$55\,000 - 8 \times 1500 = \$43000$

Declining Balance

$55000\left(1 - 5\%\right)^8 = 36\,488.12$

∴ difference $= 43\,000 - 36\,488.12$

$= \$6511.88$

c i 30/7, 31/7, All August, All Sept, up to 29th Oct

$= 2 + 31 + 30 + 29$

$= 92$ days

ii $2.48

iii $5\% \times 2.48 = 0.124$

∴ new price is $2.604

$\$2.604 \times 97 \times 0.9048 = \$288.54$

d i $BAC_{MALE} = \frac{10N - 7.5H}{6.8M}$

$N = 1.4 + 2 + 1.9 = 5.3$ standard drinks

$H = 3$ hours

$M = 65$ kg

Academic Year		Calendar Year	
Course		Name of task/exam	

$\therefore$ BAC $= \dfrac{10 \times 5.3 - 7.5 \times 3}{6.8 \times 65}$

$= \dfrac{30.5}{442}$

$= 0.069$

ii) No. hours $= \dfrac{BAC}{0.015}$

$= \dfrac{0.069}{0.015}$

$= 4.6$ hours

$= 4$ h 36 mins

$\therefore$ 4 h 40 mins (nrst 10 mins)

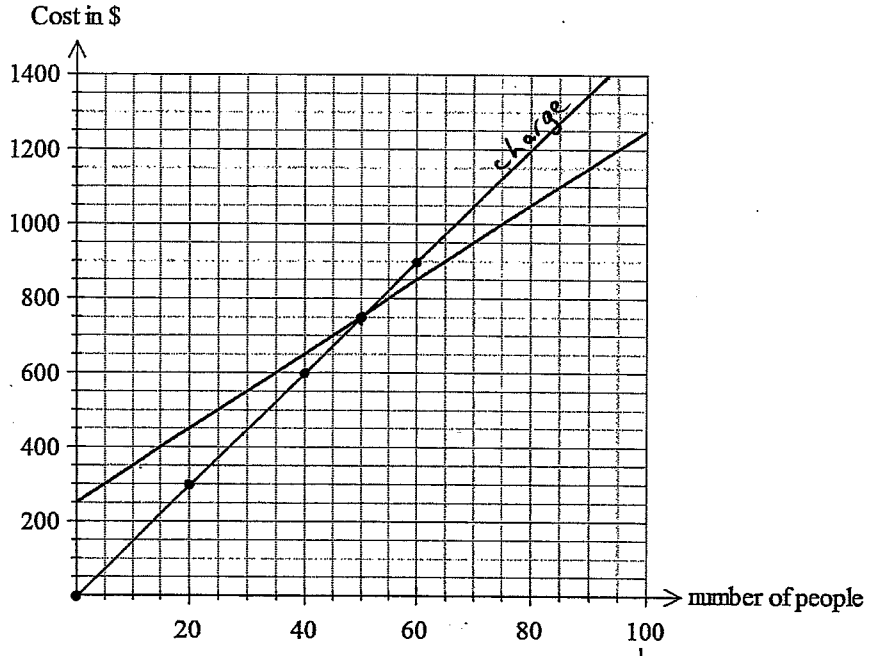
i) 15 is the gradient
this is the cost per person students are charged. i.e. it is the rate of \$15/person.

iii) 50 students

iv) If 60 people bus costs
$250 + 10 \times 60$
$= 850$
school charges $15 \times 60 = 900$
PLC makes a profit of \$50.

v) 130 students
means 3 buses
$\therefore$ cost of buses is 3×750
$= \$2250$
$2250 \div 130 = \$17.31$
$\therefore$ Students need to be charged \$17.31 to cover the cost of the buse

Q29
a i



Academic Year		Calendar Year	
Course		Name of task/exam	

b i 32%

ii was 24% increased to 32%

∴ 8% increase

iii The waist circumference. This is shown in the percent overweight from 7-8 year to 12-13 years by the increase ~~of~~ from 17% to 46%. It can also be seen in the z-score change where the top 50% of overweight children in 12-13 yr is more than all z-scores in 7-8 yr.

c i $C = \frac{nA}{n+12}$

$C = \frac{3 \times 500}{3+12}$

C = 100 mg every 4 hours

ii 10 mg / 1 mL.
med saline
1 : 15

10 mg / 1 mL

100 mg / 10 mL.

10 mL : 150 mL

∴ 160 mL in total in 4 hours

40 mL in 1 hour

$\frac{40 \text{ mL}}{60}$ in 1 min.

$\frac{4}{6}$ mL in 1 min.

9 drips in every millilitre

∴ $9 \times \frac{4}{6}$ drips / min

6 drips / min.

d i 90 m − 55 m = 35 m.

ii 90 km/h 110 m stopping distance dry.

110 m stopping = 65 km/h wet.

Q30

a i 84.5 − 73 = 11.5 yrs

ii World from 71 − 73 yrs
Aust from 83 − 84.5 yrs

∴ World by 2 yrs.

OR World 2 yrs; Aust 1.5 yrs ∴ World by $\frac{1}{2}$ year

iii Less poverty in the world so people are living longer OR better health care so people are living longer

iv No, the upward trend may continue for a number of years, but it will tend to a horizontal line.

Academic Year		Calendar Year	
Course		Name of task/exam	

b i $r = 0.9891793862$
by calculator

ii $y = 0.232x - 381.96$

iii $y = 0.232(2020) - 381.96$
$= 86.68$ yrs

c $y = 6000(1.05)^x$

i $y = 6000(1.05)^{24}$
$= 19350.59966$
$= 19\,350.6$ (1 dp)

ii more than 24 hours
try 48 hours
$y = 6000(1.05)^{48}$
$= 62\,407.6$
way too small
try 96 hours
$y = 6000(1.05)^{96}$
$= 649\,118.5$
still not enough
try 100 hours
$= 789\,007$
try 105 hours
$y = 6000(1.05)^{105}$
$= 1\,006\,995.8$
try 104 hours
not enough.
∴ 105 hours

d 1.2 MB 5000 kilo bits/sec

$t = \dfrac{1.2\text{ MB}}{5000\text{k bits/sec}}$

$1.2\text{ MB} = 1.2 \times 1024\text{ kB}$
$= 1228.8\text{ kB}$
$1228.8\text{ kB} = 1228.8 \times 1024$ bytes
$= 1258291.2$ bytes
1 byte = 8 bits
∴ $1258291.2 \times 8 = 10066329.6$ bits.

$\therefore t = \dfrac{10066329.6 \text{ bits}}{5000 \times 1000 \text{ bits/sec}}$

$= 2.01$ sec
$\doteq 2$ sec.

e $c^2 = a^2 + b^2 - 2ab\cos C$
$12.4^2 = x^2 + x^2 - 2x \times x \cos 36$
where x is distance AF and BF
$153.76 = 2x^2 - 2x^2 \cos 36$
$153.76 = 2x^2(1 - \cos 36)$
$2x^2 = \dfrac{153.76}{0.19098\ldots}$
$2x^2 = 805.09\ldots$
$x^2 = 402.5\ldots$
$x = \sqrt{402.5\ldots}$
$x = 20.06$
∴ BC = $2 \times 20.06\ldots$
$= 40$ m (nrst metre).