Killara HIGH SCHOOL

Student Number

2014

TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

General Mathematics

25th July 2013

General Instructions
Reading time – 5 minutes
Working time $2\frac{1}{2}$ hours
Write using blue or black pen
Black pen is preferred
Approved calculators may be used
A formula sheet is provided at the back of this paper
In Questions 26-30 show relevant mathematical reasoning and/or calculations
Start a new booklet for each question

Total Marks – 100

Section I - Pages 2 - 14
25 marks
Attempt Questions 1 – 25
Allow about 35 minutes for this section

Section II - Pages 15 - 32
75 marks
Attempt Questions 26 – 30
Allow about 1 hour and 55 minutes for this section

Question	Mark
1- 25	/25
26	/15
27	/15
28	/15
29	/15
30	/15
Total	/100

THIS QUESTION PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM

This assessment task constitutes 40% of the Higher School Certificate Course Assessment.

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 (Detach from paper)

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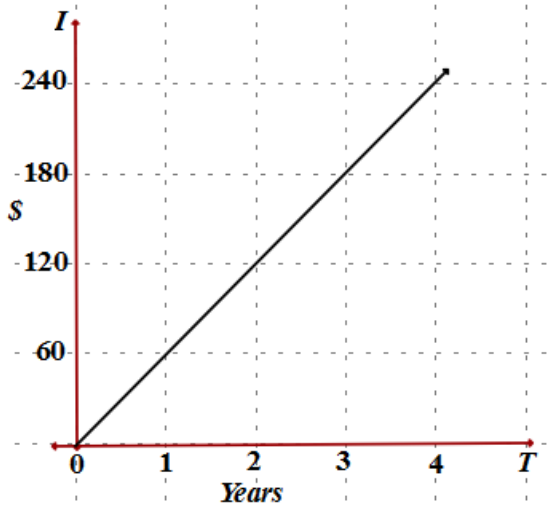
1. If $1000 is invested in an account, the interest paid is as indicated by this graph :



What is the rate of interest per annum.

(A) 0.60%

(B) 6%

(C) 60%

(D) 1.6667%

2. The stem and leaf display given below shows the number of runs Ali and Barbara scored during a number of cricket matches.

Ali		**Barbara**
6 4 1 0	0	2 9
9 2 1	1	3 6 7 8
7 1	2	0 4 5 9
5 2	3	4
7 1	4	5

Which of these statements is true?

(A) Barbara's median score is greater than Ali's.

(B) Ali and Barbara played the same number of matches.

(C) Barbara's range is greater than Ali's.

(D) Barbara's mean score is 21.

3.

Bird Type	**Cost per bird ($)**
Galah	23
Canary	35
(A) Cost of delivery $20 per bird	

The cost in dollars of buying g galahs and c canaries and having them delivered is

(A) $23g + 35c + 20$

(B) $23g + 35c + 20g + c$

(C) $23g + 35c + 20 \times 58$

(D) $23g + 35c + 20(g + c)$

4. The mean score on a Mathematics examination is 59 and the standard deviation is 11. When a score of 76 is added to the data set:

(A) the mean will decrease and the standard deviation will decrease.

(B) the mean will decrease and the standard deviation will increase.

(C) the mean will increase and the standard deviation will decrease.

(D) the mean will increase and the standard deviation will increase.

5. The braking distance of a car (d) varies directly as the square of the speed (v) at which it is travelling.

Which of these equations correctly connects d and v?

(A) $d = k v^2$

(B) $v = k d^2$

(C) $d = \frac{k}{v^2}$

(D) $v = \frac{k}{d^2}$

6. For a guessing competition, a jar containing 5 red marbles and unknown number of white marbles were used. Jesse selected a marble from the jar, recorded its colour, and then replaced the marble in the jar. Jesse repeated this procedure 200 times. Jesse's results showed a red marble being drawn 17 times. Predict the total number of marbles in the jar.

(A) 12

(B) 54

(C) 59

(D) 183

7. Simplify $\frac{4x^2y}{8xy^2}$.

(A) $2xy$

(B) $\frac{2x}{y}$

(C) $\frac{1}{2}xy$

(D) $\frac{x}{2y}$

8. Which of the following is NOT a consideration in effective questionnaire design?

(A) ask unambiguous questions

(B) adhere to requirements of privacy

(C) give an even number of choices for every question

(D) use simple language

9. The table below represents the rates applied to individuals for tax purposes.

Taxable income	**Tax on this income**
0 - $18200	Nil
$18201 - $37000	19c for each $1 over $18200
$37001 - $80000	$3572 plus ***R***c for each $1 over $37000
$80001 - $180000	$18278 plus 39c for each $1 over $80000
$180001 and over	$57278 plus 47c for each $1 over 180000

What is the value of *R*, the tax rate applied to the $37001 - $80000 income group?

(A) 32.5

(B) 33.4

(C) 34.2

(D) 35.0

10. Make G subject of the formula $V = \frac{G^2 h}{4\pi}$ for $G > 0$.

(A) $G = \frac{V^2 h}{4\pi}$

(B) $G = \sqrt{\frac{4\pi V}{h}}$

(C) $G = \frac{\sqrt{4\pi V}}{h}$

(D) $G = \sqrt{4\pi V - h}$

11. Stamp duty is levied by the Office of the State Revenue when a new vehicle is registered to a new owner. Stamp duty is paid on the market value of the vehicle.

In the financial year of 2014, the stamp duty is calculated in NSW as follows:

"3% of the value of the vehicle up to $45000

plus 5% of the value of the vehicle over $45 000"

What is the stamp duty that Jamie needs to pay when he purchases a car for $52000 ?

(A) $350

(B) $1700

(C) $2250

(D) $2600

12. Meg owns a Ford Festiva CL 1.6L 5sp Manual car. The average running costs per kilometre for a Ford Festiva is 47.91 cents / km.

Meg carpools with two friends who each pay her $8.00 per workday to cover costs. This is the amount they would pay to make the same journey on public transport.

What is Meg's effective yearly running cost for this car if she drives 15000 km to work annually. (Assume 240 working days in a year.)

(A) $2395.50

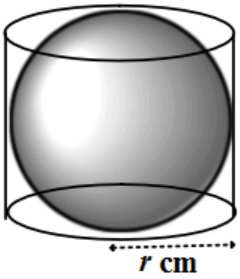
(B) $3346.50

(C) $3840

(D) $5265

13. A sphere of radius r cm exactly fits inside a cylinder.

What is the ratio of the volume of the sphere to the volume of the cylinder?



(A) 2 : 3

(B) 3 : 2

(C) 3 : 4

(D) 4 : 3

14. Carbon tax is a tax levied on the carbon content of fuels. It offers a potentially cost-effective means of reducing greenhouse gas emissions.

The table shows the results of a survey which asked: 'Do you agree with carbon tax?'

What is the probability that a person chosen at random from those surveyed was male and in favour of carbon tax?

	In favour	***Against***	***Undecided***	**TOTAL**
Male	33	60	11	104
Female	82	12	2	96
	115	72	13	200

(A) $\frac{33}{104}$

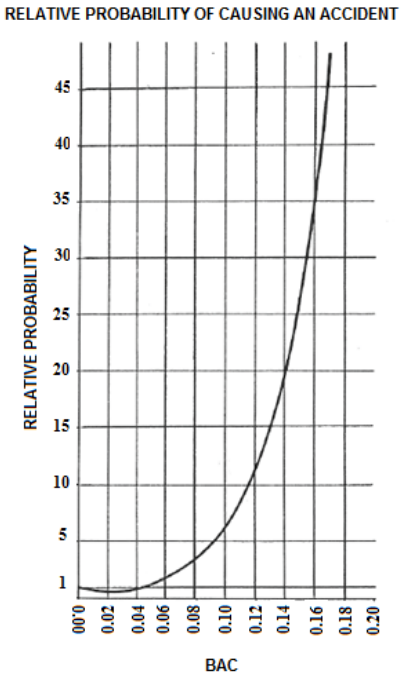
(B) $\frac{33}{115}$

(C) $\frac{33}{200}$

(D) $\frac{104}{200}$

15. This graph shows how a driver's risk of having a car accident increases as his/her BAC increases.

The consumption of three standard drinks over a period of one hour on an empty stomach increases BAC by 0.05. The consumption of each extra drink during this period increases the BAC by a further 0.02 per standard drink.



Eloise had six standard drinks in the last hour.

By how many times does Eloise increase her risk of crashing if she drives immediately after her last drink?

(A) 3 times

(B) 5 times

(C) 8 times

(D) 12 times

16. During the three months of the autumn season of 2014, Sydney received 279 mm of rain. Mr. and Mrs. Seage's family home has 225 m^2 of their roof area connected to a storm water tank.

The amount of water collected in the tank during the autumn months in litres is:

(A) 18833

(B) 62775

(C) 83700

(D) 627750

17. Mr. and Mrs. Seage have their dual flush toilet and the water efficient washing machine connected to the storm water tank in their house.

Appliance	**Average water consumption**	**Average Frequency of use**
Dual flush toilet	3.2L/flush	5 times daily
Washing machine	13.1 L/load	3 times a week
• Cost of water $2.71 per KL.		

The tank currently contains 5000 litres of water. Approximately how many days will it take the Seage family to use up this water?

(A) 90 days

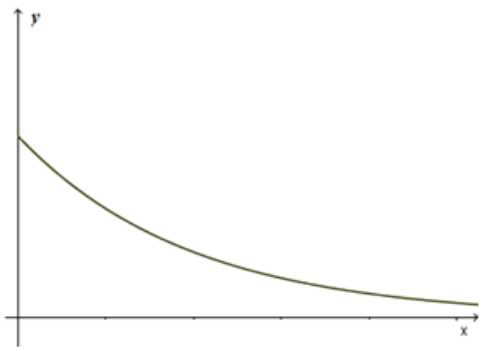
(B) 132 days

(C) 151days

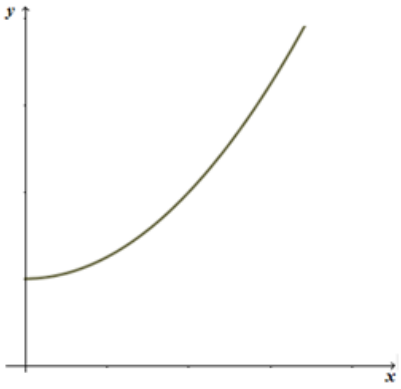
(D) 231 days

18. Which of the following curves best illustrates the graph of $y = 0.95^x$?

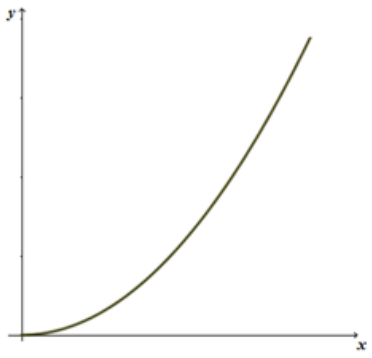
(A)



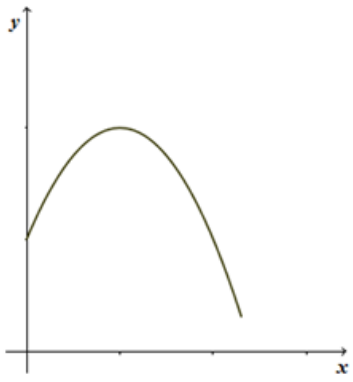
(B)



(C)



(D)



19. Which of the following rates would give the best return on $1000 invested for 5 years?

(A) 1% per month compounded monthly

(B) 3% per quarter compounded quarterly

(C) 6% per six months compounded 6-monthly

(D) 12% per annum compounded yearly

20. The formula given below shows the relationship between wingspan (in metres) and length (in metres) of a particular make of commercial aeroplane.

$$wingspan = 0.96 \times length - 2.99$$

From this equation it can be concluded that, on average for these aeroplane, wingspan

(A) decreases by 2.03 metres for each one metre increase in length

(B) increases by 0.96 metres for each one metre increase in length

(C) decreases by 0.96 metres for each one metre increase in length

(D) decreases by 2.99 metres for each one metre increase in length

21. The bearing of an aeroplane, *X*, from a control tower, *T*, is 055°. Another aeroplane, *Y*, is due east of the control tower *T*. The bearing of aeroplane *X* from aeroplane *Y* is 302°.

The size of angle *TXY* is

(A) 35°

(B) 55°

(C) 58°

(D) 113°

22. A coconut and cherry bar is made in the shape of a rectangular prism. The marketing section of the company wants to change the dimensions of the bar such that

- Its length is decreased by 10%
- Width increased by 8%
- Height increased by 2%

What is the approximate percentage change in the volume of the new bar?

(A) Volume increases by 3%

(B) Volume increases by 1%

(C) Volume decreases by 1%

(D) No change in volume

23. The height of a tower was given as 460 m to the nearest 10m. The lower and upper limits of the true measurement are:

(A) 360m and 560 m

(B) 450 m and 470m

(C) 455m and 465m

(D) 410m and 510m

24. The following table shows the future value of $1 invested at different compound interest rates for different periods of time.

Time Period \ *Interest Rate*	1%	2%	3%	4%	5%
1	1.01	1.02	1.03	1.04	1.05
2	1.02	1.04	1.06	1.08	1.10
3	1.03	1.06	1.09	1.12	1.16
4	1.04	1.08	1.13	1.17	1.22
5	1.05	1.10	1.16	1.22	1.28
6	1.06	1.13	1.19	1.27	1.34
7	1.07	1.15	1.23	1.32	1.41
8	1.08	1.17	1.27	1.37	1.48
9	1.09	1.20	1.30	1.42	1.55
10	1.10	1.22	1.34	1.48	1.63

Rachel invests $5000 for 5 years, after which time its value is $6100. Use the table above to find the annual rate of interest that she received.

(A) 2%

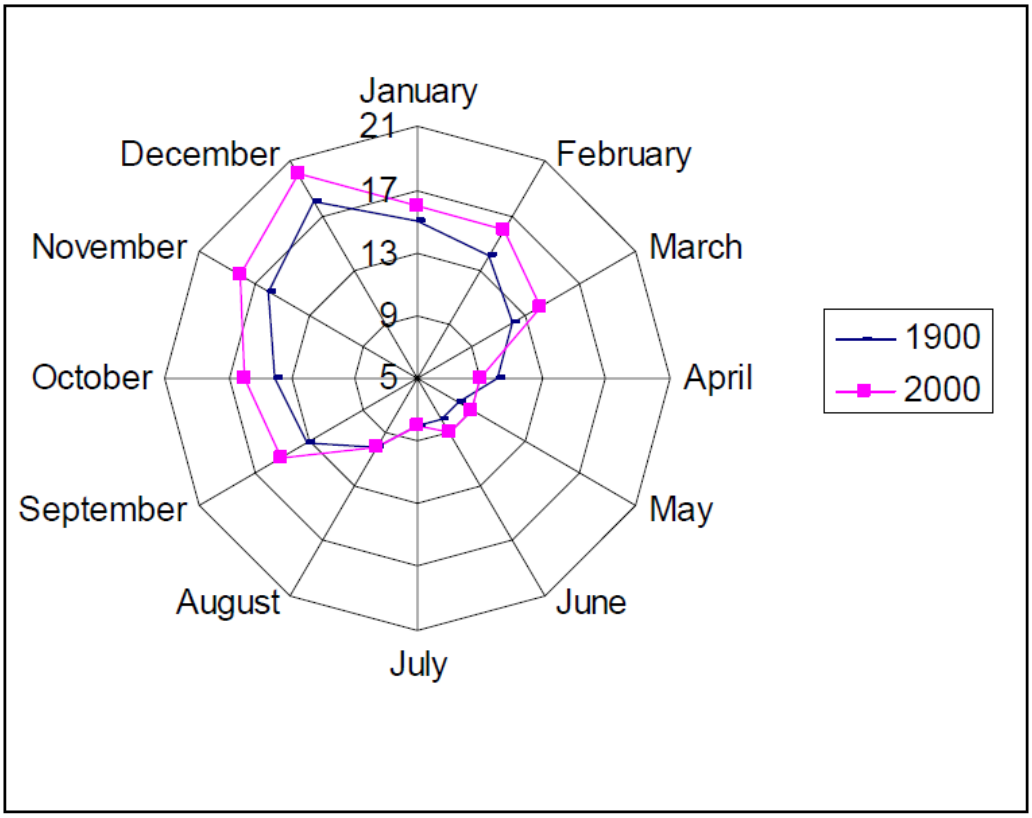
(B) 3%

(C) 4%

(D) 5%

25.. The chart below shows the average minimum temperature for the years 1900 and 2000.

What was the difference in the minimum average temperature between 1900 and 2000 for January?



(A) 1900 was 1 degree hotter.

(B) 2000 was 1 degree hotter.

(C) 1900 was 2 degrees hotter.

(D) 2000 was 2 degrees hotter.

Section II

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

Answer the questions in the spaces provided. Your responses should include relevant mathematical reasoning and / or calculations.

Extra writing space is provided on page.34 If you use this space, clearly indicate which question you are attempting.

Question 26 (15 marks)

a) Francesco attends a school that has 120 Year 7 students and 130 Year 8 students. He is conducting a survey of student mobile phone preferences and usage and plans to survey 50 students.

i) Explain how he would conduct a stratified sample. **1**

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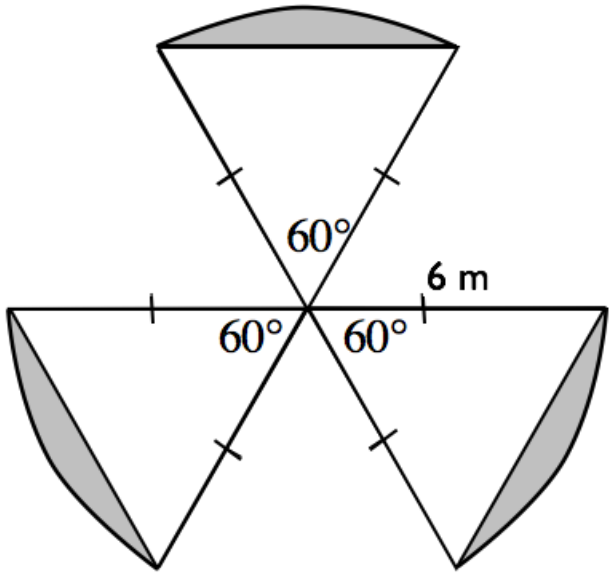
ii) Write a question that would provide categorical data involving at least 3 categories. **1**

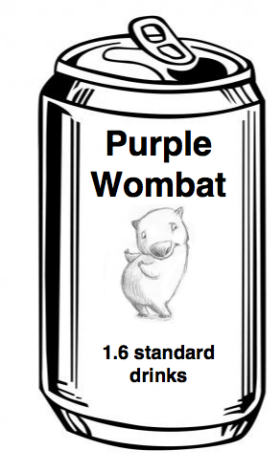
Question 26 continues on page 16

b) Find the shaded area to the nearest square metre. **3**



Question 26 continues on page 17

c) Barrack, who weighs 85 kg is at a party and consumes four "Purple Wombat" drinks. He starts drinking at 6:00 pm and finishes the fourth at 8:30 pm



i) Calculate his blood alcohol content after he finishes his fourth drink (answer correct to 4 decimal places). **1**

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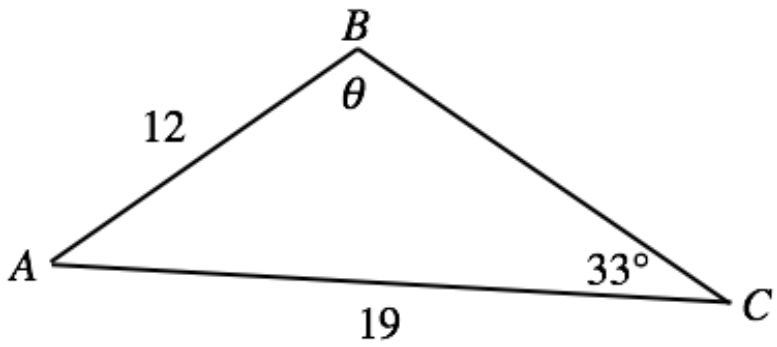
ii) To legally take charge of the free world, Barrack must have a BAC of zero. To roughly estimate how long it will take for a person's blood alcohol content (BAC) to reach zero this formula can be used.

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

At what time will Barrack be able to resume control of the free world (i.e. have a BAC of zero). **2**

Question 26 continues of page 18

d) Given that $\angle ABC$ is obtuse, calculate the size of angle θ(to the nearest degree) in the following triangle **2**



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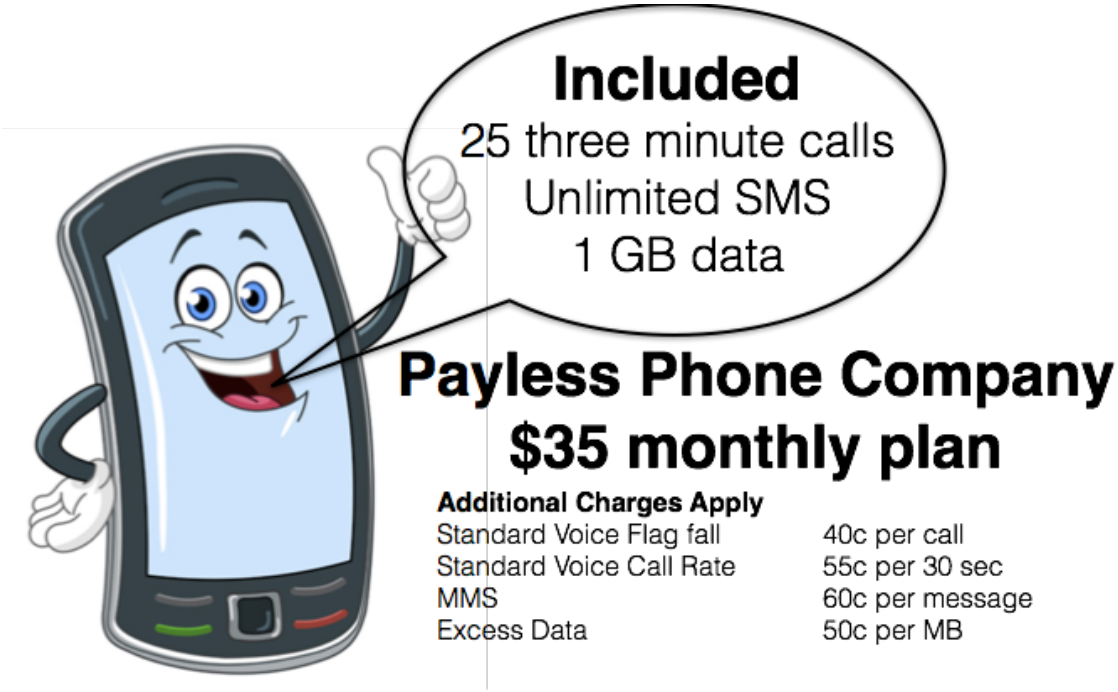
e) Jack and Jill have purchased their first home for $480 000. In addition to the purchase price, there are the following costs: **2**

• Legal Fees	$1300
• Home Insurance	$2600
• Body Corporate Fees	$3200
• Stamp duty calculated at 3.5% of the property value up to and including $300 000 plus 5.5% of the property value above $300 000	

Calculate the total amount Jack and Jill will need to pay to purchase their home.

Question 26 continues on page 19

f) For his phone, Brent pays $35 a month as indicated in the plan below **3**



In July Brent

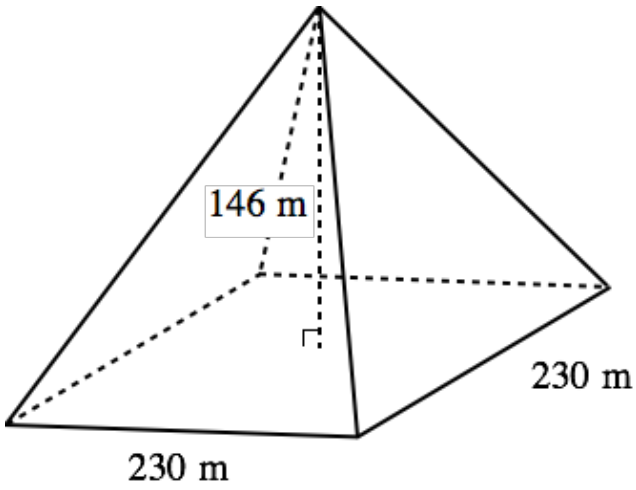
- Makes 75 three minute calls
- Sends 450 SMS messages
- Uses 2.5 GB of data
- Sends 40 MMS messages

What is the total amount of Brent's bill for July?

End of Question 26

Question 27 (15 marks)

a) The Great Pyramid of Giza has a square base of side length 230 m and a perpendicular height of 146 m.



i) Calculate the volume of the pyramid to the nearest cubic metre . **1**

---

ii) Each block used to make the pyramid is estimated to have a volume of 4 cubic metres and a weight of 1500 kilograms. Calculate the mass of the pyramid, expressing your answer in scientific notation correct to 4 significant figures. **3**

Question 27 continues on page 21

b) Fireman Sam is collecting data on the number of emergency responses per month for the Koola Rural Fire Brigade in 2013 as part of a push to get a new fire-fighting appliance. The number of calls each month is presented below.

Number of Calls per Month											
Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
10	12	7	5	3	3	2	13	28	12	5	9

i) Calculate the five number summary for this set of data and construct a box plot **3**

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ii) The local fire control officer Mr. Burn claims that the data collected for September is an **outlier**. Justify his claim. **2**

Question 27 continues on page 22

c) Nulla has been offered a job at "LOTZA Cheese" Pizza shop as a delivery driver. He is given the option of working for an hourly rate of $17.50 or working for a retainer of $5 per hour plus a commission of $1.50 on each pizza sold. Unfortunately Nulla has not been paying attention in General Mathematics and doesn't understand the difference. Which option should Nulla choose and why? Include calculations in your answer. **2**

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d) Stephanie is the supervisor of a machine that packages potato chips in a factory. The machine is designed to reject packets of chips that weigh less than 190 g. It also rejects packets of chips that weigh more than 230 g.

i) If the weight of bags is normally distributed and the mean weight is set at 210 g with a standard deviation of 20g, what percentage of packets of chips will be rejected? **2**

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ii) Management are not happy with the number of packets of chips being rejected and demand that 95% of all packets must be passed. Stephanie adjusts the machine so that each bag now has a mean of 210g and a standard deviation of 7.5g. **2**

What should she set the lower and upper bounds on the machine at, for rejecting packets in order to obtain 95% non-rejection?

End of Question 27

Question 28 (15 marks)

a) **i)** How many diffferent words can be made from the letters COMPILE? **1**

---

ii) How many of these words are there, that begin with a consonant? **1**

---

iii) If I rearrange the letters of the word COMPILE, what is the probabilty that the new word formed is POLEMIC? **1**

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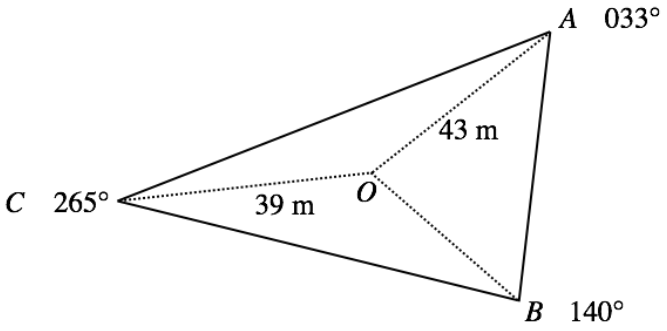
b) Find the value of each pronumeral, showing all working. **2**

$$p + q = 45$$
$$p = 2q$$

Question 28 continues on page 24

c) Mr Pi has recently purchased a block of land and has conducted a radial survey as shown below.



i) Show that $\angle AOC = 128°$

1

---

ii) Find the length of AC (answer correct to nearest metre)

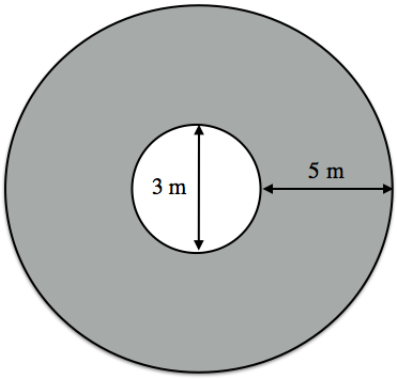
2

1

iii) Find the area of triangle AOC (answer correct to the nearest square metre)

Question 28 continues on page 25

d) Council has just laid new tiles around an ornamental pond in the shape of an annulus as shown in the diagram below. **3**



The tiles costs $22.50 per square metre.
What is the total cost of the tiles, correct to the nearest dollar?

Question 28 continues on page 26

e) A simple poker machine consists of three wheels. **3**
The ten letters shown on each wheel are:

A B C D E F G H I J

When the handle of the machine is pulled, the wheels spin, and the window on the front of the machine shows three letters in a row – one letter from each wheel. On each wheel each letter is equally likey to appear.

It costs \$1 to play the poker machine once. The payouts are as follows:

- three J's showing \$300
- exactly two J's showing \$20

What is the financial expectation for this game?

End of Question 28

Question 29 (15 marks)

a) Solve the equation **3**

$$4x+3=\frac{10x}{3}+5$$

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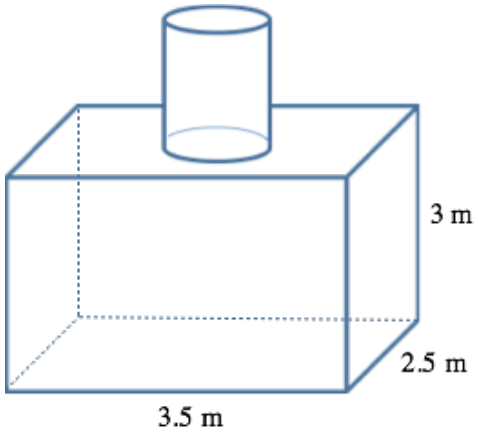
b) The diagram below shows a water tank with a cylindrical top and a rectangular prism base. The radius of the cylindrical top is 1 m and its height is 2m.



i) Calculate the capacity of the tank for the landowner. Give your answer to the nearest litre. **3**

Question 29 continues on page 28

ii) The landowner uses 1 kL of water per day on average. How many days will a full tank last? (Assume that no other water is added to the tank in during this time) **2**

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c) A manufacturer claims that the new 32GB aPhone will hold 5000 songs. McGyver estimates that the average size of a song file in his collection is 5 MB.

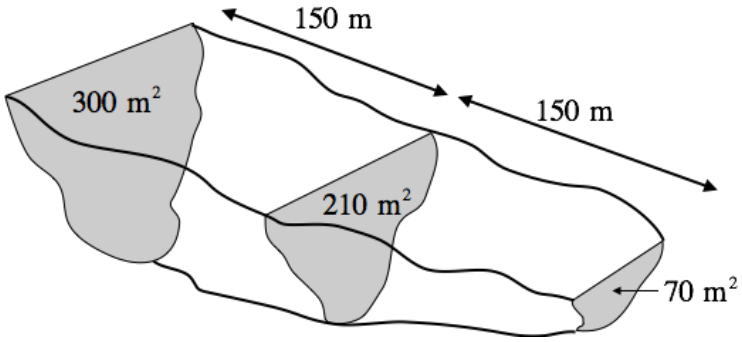
i) Use calculations to support or reject the manufactur's claim regarding the number of songs the aPhone can hold. **3**

---

ii) McGyver wishes to download a "Swiss Army Knife" app that is 11.3 MB at a download rate of 4900 kbps. How long will it take him to download the app? (answer to the nearest second) **2**

Question 29 continues on page 29

d) Farmer McDonald has a dam on his property. He takes estimates of the cross sectional area at 150 m intervals as shown in the diagram. **2**

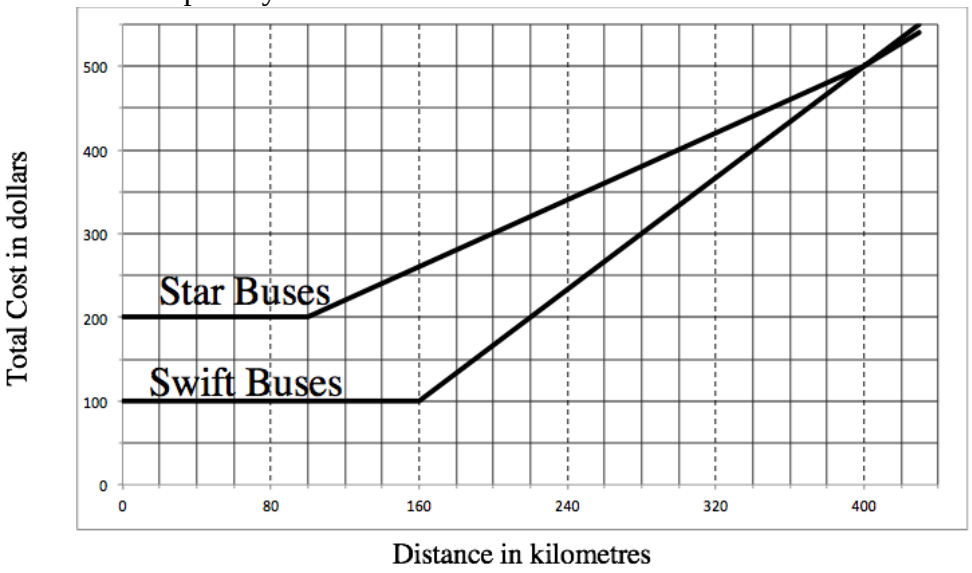


Use Simpson's Rule once to approximate the volume of his dam in megalitres.

End of Question 29

Question 30 (15 marks)

a) Star Rentals hires its mini buses at $200 per day and $1.00 per kilometre travelled in excess of 100 km per day.



i) You have hired a 'Swift" bus. What is the rate per kilometre after the first 160 km? **1**

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ii) Determine the cost of hiring a Star bus for a trip of 200 km. **1**

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iii) Calculate the distance travelled in a Swift mini-bus if the charge was $450. **2**

Question 30 continues on page 31

iv) When Year 12 excursions require the hire of mini-buses, the school will try and minimise costs. Which mini-bus company should the school choose and why? **2**

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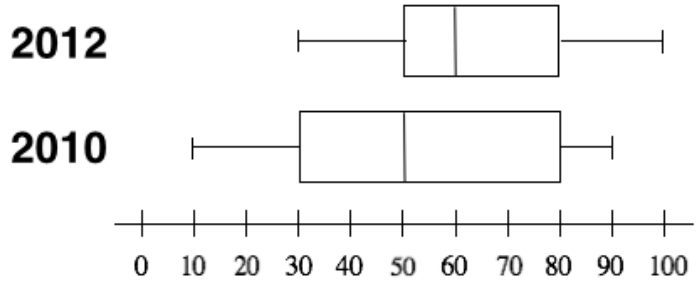
b) The well known cricket all-rounder Mr Batbowl is comparing his scores over two seasons, 2010 and 2012, using the box and whisker plots shown below. **3**



Compare and contrast the two data sets by referring to the skewness of the distributions and the measures of location and spread.

Question 30 continues on page 32

c) The western side of the Arctic ice cap, known as the Greenland ice sheet, is melting at a very fast rate. In the year 2010 it covered, on an average 1.7 million square kilometres. The average thickness of the ice sheet from the sea bed is 2 km.
Due to global warming, the ice cap is melting at the rate of 4.1% every ten years.
The volume of the ice cap after n decades can be modelled using the formula
$V = k(0.959)^n$.

(i) Explain why the value of k is 3.4×10^6. **1**

(ii) If the trend continues, what volume of the Arctic ice cap will be remaining in the year 2100? **2**

Question 30 continues on page 33

The surface of the Earth is covered by 360 million square kilometres of ocean. **3**

(iii) Jeremy thinks that the rise in the global sea level could have disastrous effect on lives of millions of people. Is he right? *(Use your calculations to find the rise in global sea level by the year 2100 to justify your answer.)*

END of PAPER ☺

Section II extra writing space
If you use this space, clearly indicate which question you are answering

Killara HIGH SCHOOL

Student Number

General Mathematics

Section I – Multiple Choice Answer Sheet

Use this multiple-choice answer sheet for questions 1 – 25. Detach this 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

A ○ B ● C ○ D ○

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Start Here →

1.	A ○	B ○	C ○	D ○	**14.**	A ○	B ○	C ○	D ○
2.	A ○	B ○	C ○	D ○	**15.**	A ○	B ○	C ○	D ○
3.	A ○	B ○	C ○	D ○	**16.**	A ○	B ○	C ○	D ○
4.	A ○	B ○	C ○	D ○	**17.**	A ○	B ○	C ○	D ○
5.	A ○	B ○	C ○	D ○	**18.**	A ○	B ○	C ○	D ○
6.	A ○	B ○	C ○	D ○	**19.**	A ○	B ○	C ○	D ○
7.	A ○	B ○	C ○	D ○	**20.**	A ○	B ○	C ○	D ○
8.	A ○	B ○	C ○	D ○	**21.**	A ○	B ○	C ○	D ○
9.	A ○	B ○	C ○	D ○	**22.**	A ○	B ○	C ○	D ○
10.	A ○	B ○	C ○	D ○	**23.**	A ○	B ○	C ○	D ○
11.	A ○	B ○	C ○	D ○	**24.**	A ○	B ○	C ○	D ○
12.	A ○	B ○	C ○	D ○	**25.**	A ○	B ○	C ○	D ○
13.	A ○	B ○	C ○	D ○					

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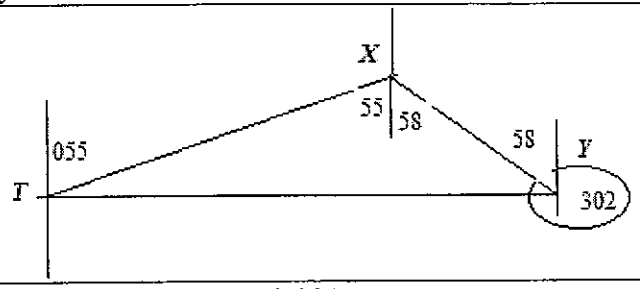
Multiple choice

1.	$\frac{60}{1000} \times 100 = 6\%$	B
2.	Ali: Median 19 Range 47 No: 13 Barbara : median 19 Range 43 No: 12 Mean 21	D
3.	$23g + 35c + \$20 \times (g + c)$	D
4.	$\bar{x} = 59 \quad \sigma = 11$; 76 is almost 2 S.D. away from the mean. Then SD will increase. So does the mean.	D
5.	$d = kv^2$	A
6.	$\frac{17}{200} = \frac{5}{n+5} \quad n + 5 = 58.8$	C
7.	$\frac{4x^2y}{8xy^2} = \frac{1x}{2y} = \frac{x}{2y}$.	D
8.		C
9.	$18278 = 3572 + R\,(80000 - 430000)$ $14706 = R \times 43000$ $R = 0.342 \quad = 34.2$ c	C
10.	$V = \frac{G^2h}{4\pi}$ $G^2 = \frac{4\pi V}{h} \quad \therefore G = \sqrt{\frac{4\pi V}{h}}$	B
11.	$0.03 \times 45000 + 0.05 \times 7000 = \$1700$	B
12.	$0.4791 \times 15000 - 2 \times 8 \times 240$ $\$7186.50 - \$3840 = \$3346.50$	B
13.	$\frac{4\pi r^3}{3} = \pi r^2 \times 2r$ 4 : 6 2 : 3	A
14.	200 people were surveyed. 33 males were in favour. $P(\text{male}) = \frac{33}{200}$	C
15.	$BAC = 0.5 + 3 \times 0.2 = 0.11$ BAC 8 times more risky	C
16.	279 mm $225m^2 \times 0.275$ m $= 62.775\ m^3$	B
17.	$3.2 \times 5 \times 4 + 13.1 \times 3/7 = 26.614..$ L/ day No. of days = $\frac{5000}{26.614....} = 231.32..... = 231$days	D
18.		A
19.	Monthly. All of them 12% p.a. Monthly, as more number of compounding effect	A
20.	$wingspan = 0.96 \times length - 2.99$ 0.96 is the gradient	B

	∴ when length increases by 1m, wingspan increases by 0.96 m	
21.		D
22.	0.9 × 1.08 × 1.02 = 0.991 1% decrease	C
23.	Error = ±5 m Limits of measurement = 460 ±5 m 455m and 465 m	C
24.	$\frac{6100}{5000} = 1.22$ From table 5 years = 4%	C
25.	1900 : 15° 2000: 16° 2000 is 1° hotter	B

Killara HIGH SCHOOL

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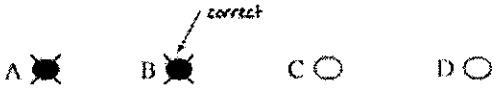


Start Here →

1.	A ○	B ●	C ○	D ○	14.	A ○	B ○	C ●	D ○
2.	A ○	B ○	C ○	D ●	15.	A ○	B ○	C ●	D ○
3.	A ○	B ○	C ○	D ●	16.	A ○	B ●	C ○	D ○
4.	A ○	B ○	C ○	D ●	17.	A ○	B ○	C ○	D ●
5.	A ●	B ○	C ○	D ○	18.	A ●	B ○	C ○	D ○
6.	A ○	B ○	C ●	D ○	19.	A ●	B ○	C ○	D ○
7.	A ○	B ○	C ○	D ●	20.	A ○	B ●	C ○	D ○
8.	A ○	B ○	C ●	D ○	21.	A ○	B ○	C ○	D ●
9.	A ○	B ○	C ●	D ○	22.	A ○	B ○	C ●	D ○
10.	A ○	B ●	C ○	D ○	23.	A ○	B ○	C ●	D ○
11.	A ○	B ●	C ○	D ○	24.	A ○	B ○	C ●	D ○
12.	A ○	B ●	C ○	D ○	25.	A ○	B ●	C ○	D ○
13.	A ●	B ○	C ○	D ○					

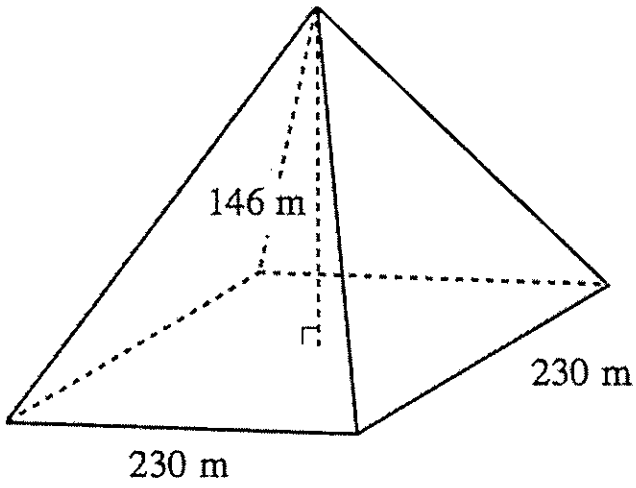
Question 26

a)(i) Francesco needs to work out the proportion of year 7 and year 8 students in the school population and use the same proportion in the sample. Y7 = $\frac{120}{250} \times 50 = 24$ in the sample Y8 = $50 - 24 = 26$ in the sample	**1 mark** Must explain clearly the concept, ratio in the sample = ratio in the population. Simple calculation is not enough.	Very poorly done. This is a type of question you must learn how to explain – such as how to choose a random sample, a systematic sample etc.
(ii) Which of the following is your network provider? O *Optus* O *Vodafone* O *Telstra* O *Other*	**1 mark** Any reasonable question with at least reasonable categories	Many students had two questions in one. Some students thought, give three categories mean give three questions. Your question needs to follow the criteria of writing questions such as the one in MC Q8.
b) Area of 3 sectors = $3 \times \frac{60}{360} \times \pi \times 6^2 = 56.548..$ Area of 3 triangles = $3 \times \frac{1}{2} \times 6^2 \times \sin 60$ = 46.765... Shaded area = 56.548... - 46.765... = 9.7836.... = 9.78 m^2.	**3 marks**: correct answer from correct working. **2 marks:** • Correctly calculates areas of three sectors and 3 triangles • One of the areas incorrect, but subtracts the areas and correctly rounds • Subtracts the areas of 3 sectors and 3 triangles and rounds correctly. **1 mark:** • Calculates areas of three of the sectors or three of the triangles 56.548..., 46.765... • Calculates areas of one of the sectors or one of the triangles 18.849... , 15.5884... • Rounds subtracted shaded area correctly	Reasonably well done. But some students failed to even copy the formula in the correct form. Some students used A = ½ bh instead of $\frac{1}{2}ab\sin\theta$ and struggled with it in an attempt to find h. You must be very familiar with the formula sheet.
c)(i) BAC for male = $\frac{10N - 7.5H}{6.8M}$ = $\frac{10 \times 6.4 - 7.5 \times 2.5}{6.8 \times 85}$ = 0.078287... = 0.0783	**1 mark:** Correct answer from correct working	Some students used the formula for females, even though the question said "he". Most common mistake was in the calculation of N. It is the no. of standard drinks. ie. $4 \times 1.6 = 6.4$
(ii) No. of hours = $\frac{0.0783...}{0.015} = 5.219....$ = 5 hours 13 min Time = 8:30 + 5h 13 min = 13h 26 min = 1:26 am.	**2 marks:** Correct answer from correct working using their value of BAC from (i) **1 mark:** • Correctly calculates the no. of hours from their BAC in (i). • Correctly calculates the time from their no. of hours.	Quite well done, though some students forgot to calculate the "time".

d) $\frac{\sin\theta}{19} = \frac{\sin 33}{12}$ $\sin\theta = \frac{\sin 33}{12} \times 19 = 0.862....$ $\theta = 59°35' = 60°$ Obtuse angle $= 180 - 60° = 120°$	**2 marks:** Correct answer from correct working **1 mark:** • Applies sine rule and calculates the acute angle $60°$ • Calculates the obtuse angle from their acute angle.	Poorly done. Many students could not see that it was sine rule at work here. Even when they did, students are still struggling with their calculator skills in finding $\sin^{-1}(0.8622..)$. Very few students go the obtuse angle right.
e) Stamp duty $= \$300000 \times \frac{3.5}{100} + \$180000 \times \frac{5.5}{100}$ $= \$20400$ Total cost $= \$480\,000 + 1300 + 2600 + 3200 + 20400$ $= \$507\,500$	**2 marks:** Correct answer from correct working **1 mark:** • Calculates stamp duty correctly • Adds their stamp duty to the other costs to calculate total price	Students need to know that the stamp duty is calculated on the listed price (market value), not including all the other fees etc. Stamp duty only on \$480000, not on \$487100.
f) Cost of 50 calls $= (0.40 + 0.55 \times 6) \times 50$ $= \$185$ Cost of excess data $= 1.5 \times 1024 \times 0.50 = \$768$ Cost of MMS $= 40 \times 0.60 = \$24$ Total cost $= \$185 + 768 + 24 + 35$ $= \$1012$	**1 mark:** Correctly cost of excess calls **1 mark:** Correctly calculates the cost of excess data **1 mark:** calculates the cost of MMS and adds all the costs to calculate the total cost.	Common mistakes: - Not including the flagfall in the cost of calls. - Excess data: 1.5GB is not 1500MB, but $1.5 \times$ 1024. - Some students failed to add the cost of the plan \$35 into it.

Question 27 (15 marks)

a) The Great Pyramid of Giza has a square base of side length 230 m and a perpendicular height of 146 m.



i) Calculate the volume of the pyramid to the nearest cubic metre . **1**

$Volume = \frac{1}{3} \times A \times h$ $= \frac{1}{3} \times 230 \times 230 \times 14.6$ $= 2574466.66$ $= 2574467 m^3$	1 mark for correct use of the formula (no mark deducted for failing to round to nearest cubic metre

ii) Each block used to make the pyramid is estimated to have a volume of 4 cubic metres and a weight of 1500 kilograms. Calculate the mass of the pyramid expressing your answer in scientific notation correct to 4 significant figures. **3**

Num. of blocks = $2574467 \div 4$ $= 643616.6$ or 643617 Mass = 643616.6×1500 $= 965425000$ $= 9.654 \times 10^8$ kg	1 mark for correctly calculating number of blocks (error carried forward from part i) 1 mark for correctly calculating mass of blocks (error carried forward) 1 mark for correct scientific notation including significant figures (error carried forward from previous)

Question 27 continues on page 21

Question 27 (continued)

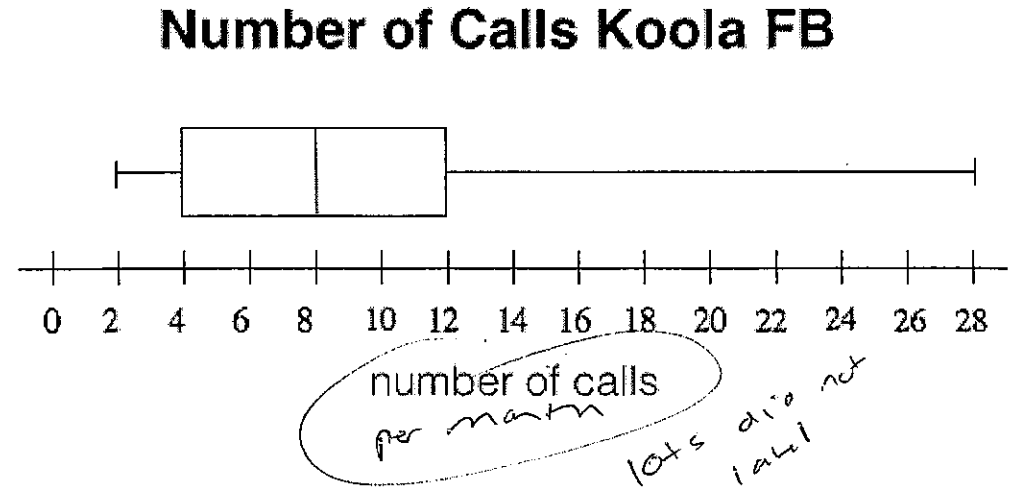
b) Fireman Sam is collecting data on the number of emergency responses per month for the Koola Rural Fire Brigade in 2013 as part of a push to get a new fire-fighting appliance. The number of calls each month is presented below.

Number of Calls per Month											
Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
10	12	7	5	3	3	2	13	28	12	5	9

i) Calculate the five number summary for this set of data and construct a box plot **3**

2 3 3 | 5 5 7 | 9 10 12 | 12 13 28 $Q_1 = 4$ $Q_2 = 8$ $Q_3 = 12$ $Min = 2$ $Q_1 = 4$ $Median = 8$ $Q_3 = 12$ $Max = 28$	2 marks for correct 5 number summary 1 mark for one error in 5 number summary 1 mark correct Box and Whisker plot including evenly labelled scale

many students can't find 5 num summary.



poorly done need to use a ruler

ii) The local fire control officer Mr. Burn claims that the data collected for September is an **outlier**. Justify his claim. **2**

$IQR = 12 - 4 = 8$ Outlier if more than $Q_3 + 1.5 \times IQR$ $= 12 + 1.5 \times 8$ $= 24$ As 28>24 then 28 is an outlier	1 mark for calculating Upper Q plus 1.5 times IQR 1 mark for correct conclusion

Question 27 continues on page 22

c) Nulla has been offered a job at "LOTZA Cheese" Pizza shop as a delivery driver. He is given the option of working for an hourly rate of $17.50 or working for a retainer of $5 per hour plus a commission of $1.50 on each pizza sold. Unfortunately Nulla has not been paying attention in General Mathematics and doesn't understand the difference. Which option should Nulla choose and why? Include calculations in your answer. **2**

Nulla would need to sell $(17.50-5)\div 1.50=8.\dot{3}$ pizzas to earn the same as working at an hourly rate So his choice will depend on how many pizzas he can deliver per hour. If it is 9 or more he is better off on the retainer plus commission	1 mark for identifying the difference between the two payment options 1 mark for calculating the number of pizzas he would need to deliver to make the same as the hourly rate

× Many chose a random number of pieces

✓ Most understood difference between hourly and commission

d) Stephanie is the supervisor of a machine that packages potato chips in a factory. The machine is designed to reject packets of chips that weigh less than 190 g. It also rejects packets of chips that weigh more than 230 g.

i) If the weight of bags is normally distributed and the mean weight is set at 210 g with a standard deviation of 20g, what percentage of packets of chips will be rejected? **2**

Rejection levels are at $z=\pm 1$ (or 1 standard deviation $\therefore$ Machine rejects $100-68=32\%$ of packets	1 mark for identifying how many standard deviations (diagram okay) 1 mark correct percentage

ii) Management are not happy with the number of packets of chips being rejected and demand that 95% of all packets must be passed. Stephanie adjusts the machine so that each bag now has a mean of 210g and a standard deviation of 7.5g. **2**

What should she set the lower and upper bounds on the machine at for rejecting packets in order to obtain 95% non-rejection

95% non-rejection = z score of $z=\pm 2$ $\therefore$ Std Dev=7.5 So Upper Bound $=210+(2\times 7.5)=225$g Lower Bound $=210-(2\times 7.5)=195$g	1 mark for calculating how many standard deviations from median 1 mark correct upper and lower bound (no mark deducted if no units)

End of Question 27

Question 28 (15 marks)

a) i) How many diffferent words can be made from the letters COMPILE? 1

$7!$ or ${}^7P_7 = 5040$

1 mark for correct answer with working.

ii) How many of these words are there, that begin with a consonant? 1

$4.6! = 2880$

or $\frac{4}{7} \times 5040 = 2880$

1 mark for correct answer with working

iii) If I rearrange the letters of the word COMPILE, what is the probabilty that the new word formed is POLEMIC? 1

$\frac{1}{5040}$

1 mark for their part (1) in answer

b) Find the value of each pronumeral, showing all working. 2

$p + q = 45$ —— (1)

$p = 2q$ —— (2)

2 marks for correct answer with working

(2) → (1) $2q + q = 45$ ~~OR~~

$3q = 45$

$q = 15$ (*)

(*) → (2) $p = 2 \times 15$

$p = 30$

$p = 30$
$q = 15$

1 mark for attempt to isolate p or q Ex $2q + q = 45$

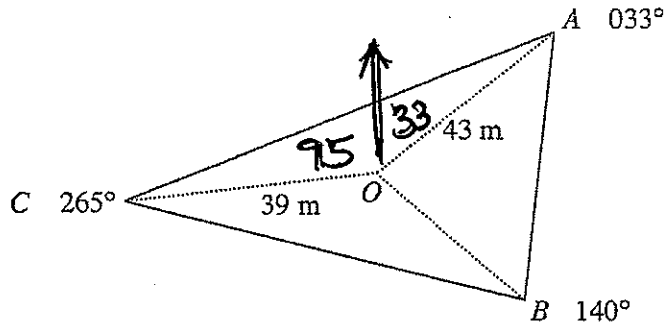
1 mark for correct substitution of answer for 1 variable into the eqn to obtain 2nd answer.

Question 28 continues on page 24

Students are reminded that they must show working

Question 28 (continued)

c) Mr Pi has recently purchased a block of land and has conducted a radial survey as shown below.



i) Show that $\angle AOC = 128°$

$95° + 33° = 128$

1 mark for one. ie $95+33=128$ or equivalent

1

ii) Find the length of AC (answer correct to nearest metre)

$AC^2 = 39^2 + 43^2 - 2 \times 39 \times 43 \cos 128°$

$AC^2 = 5434.928588...$

$AC = 73.7219...$

$AC = 74m$.

2 marks: 1 mark correct substitution into correct formula. 1 mark correct evaluation on calc.

1

CHECK ANSWER MAKES SENSE

iii) Find the area of triangle AOC (answer correct to the nearest square metre)

$A = \frac{1}{2} \times 39 \times 43 \sin 128°$

$A = 660.7470169...$

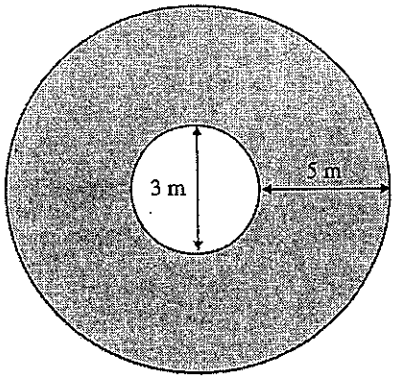
$A = 661 m^2$

1 mark correct substitution into correct formula and evaluation.

- Some students struggled to use calculator correctly.
- The word SHOW means you must show the correct numerical expression.
- Students unable to show (i) should have assumed 128° & continued with the rest of the question.

Question 28 continues on page 25

d) Council has just laid new tiles around an ornamental pond in the shape of an annulus as shown in the diagram below. **3**



The tiles costs $22.50 per square metre.
What is the total cost of the tiles, correct to the nearest dollar?

$A = \pi \times 6.5^2 - \pi \times 1.5^2$ (1)

$= 125.6637061 \text{ m}^2$ (1)

3 marks correct answer with working.

$\text{Cost} = \$22.50 \times 125.6637\ldots$

$= \$2827.43$ (1)

$= \$2827$

Two marks correct area but incorrect cost OR correct but rounded too early

Question 28 continues on page 26

Many students did $5^2 - 1.5^2$ (neglecting to add the 1.5 to the 5 to get a radius of 6.5m.

Many students rounded off too early (after finding the area) so were penalised for a rounding error in the final part.

e) A simple poker machine consists of three wheels. 3
The ten letters shown on each wheel are:

A B C D E F G H I J

When the handle of the machine is pulled, the wheels spin, and the window on the front of the machine shows three letters in a row – one letter from each wheel. On each wheel each letter is equally likey to appear.

It costs \$1 to play the poker machine once. The payouts are as follows:

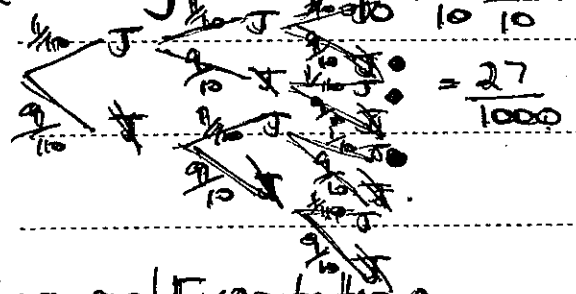
- three J's showing \$300
- exactly two J's showing \$20

What is the financial expectation for this game?

$P(\text{three J's}) = \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} = \frac{1}{1000}$.

Three marks correct answer with all working

$P(\text{exactly 2 J's}) = \frac{1}{10} \times \frac{1}{10} \times \frac{9}{10} + \frac{1}{10} \times \frac{9}{10} \times \frac{1}{10} + \frac{9}{10} \times \frac{1}{10} \times \frac{1}{10} = \frac{27}{1000}$



Two marks for two probabilities but incorrect financial expectation.

∴ Financial Expectation

$= \frac{1}{1000} \times 300 + \frac{27}{1000} \times 20 = \$1$

$= \$0.16$

Two marks for \$0.84.

1 mark for either probability correct or all probability incorrect but financial expectation expression correct from their probabilities

1 mark if no other mark & correct tree diagram given (but not if in conflict with solution)

End of Question 28

Very few students did this well.

Many students struggled to find the probability of exactly two jacks. A probability tree would have been very helpful

Question 29 (15 marks)

a) Solve the equation **3**

$4x+3=\frac{10x}{3}+5$

$-3 \quad -3$

$\left(4x=\frac{10x}{3}+2\right)\times 3$

$12x=10x+6$

$-10x \quad -10x$

$2x=6$

$\div 2 \quad \div 2$

$\therefore x=3$

(lose 1 mark for eq. error)

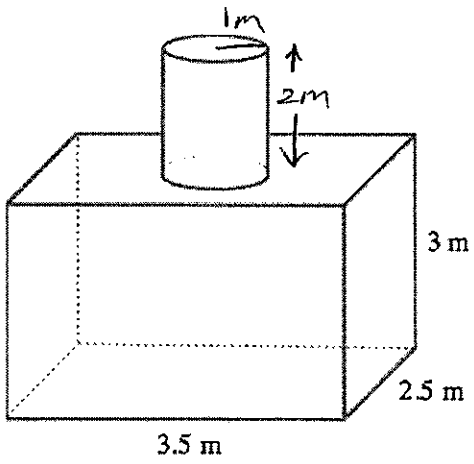
1 mark × by 3 correctly

1 mark $12x=10x+6$ (or similar)

1 mark final answer E.C.F

---

b) The diagram below shows a water tank with a cylindrical top and a rectangular prism base. The radius of the cylindrical top is 1 m and its height is 2m.



i) The landowner wants know the capactiy of the tank. Give your answer to the nearest litre **3**

$V=\pi r^2 h + lbh$

$V=\pi\times 1^2\times 2 + 3.5\times 2.5\times 3$

$V=2\pi m^2 + 26.25 m^2$

$V=32.533185\,31\ m^3$

as $1m^3 = 1kL = 1000L$

$\therefore V\approx 32,533\,L$

(if any volume part correct = 1)

1 mark correct process cylinder + rect. prism

1 mark

1 mark correct conversion

technique do E.C.F

Question 29 continues on page 28

ii) The landowner uses 1 kL of water per day on average. How many days will a full tank last? (Assume that no other water is added to the tank in during this time) **2**

$32.5\,3318531\ m^3 = 32.533818531\ kL$

$\div 1\ kL/day$ ↑ 1 mark gives tank volume correctly in kL or L

≈ 32.5 days

also pay 32 days.

1 mark final answer

paid E.C.F from i

c) A manufacturer claims that the new 32GB aPhone will hold 5000 songs. McGyver estimates that the average size of a song file in his collection is 5 MB.

i) Use calculations to support or reject the manufactur's claim regarding the number of songs the aPhone can hold. **3**

$5000 \times 5 = 25{,}000\ MB$

$1GB = 1024MB$

$25{,}000 \div 1024 = 24.414GB$

1 mark

Yes, as $24.414GB < 32GB$ it will hold 5000 songs, in fact a lot more

1 marks, valid conclusion with comparison.

note $32 \times 1024 = 32{,}768\ MB \div 5MB$ (1 mark conversion) $= 6553.6$ songs of 5MB size.

ii) McGyver wishes to download a "Swiss Army Knife" app that is 11.3 MB at 4900 kbps. How long will it take him to download the app? (answer to the nearest second) **2**

$1MB = 1024KB$ $\quad 1KB = 1024B$

$11.3 \times 1024 = 11571.2\ KB \times 1024 = 11848908.8\ B$

$1B = 8\ bits$

$11848908.8 \times 8\ bits = 94{,}791{,}270.4\ bits$ (1 mark)

$kilo\ bit/s = 1000\ bits/s$

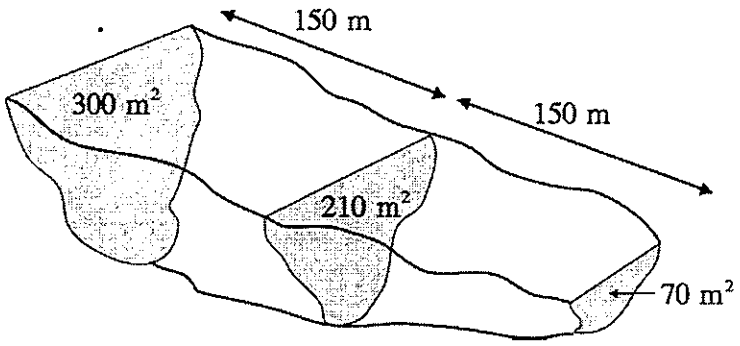
$4{,}900 \times 1000 = 4{,}900{,}000\ bps$

$94{,}791{,}270.4 \div 4{,}900{,}000 = 19.345\ secs$ (1 mark)

$\approx 19\ secs$

Question 29 continues on page 29

d) Farmer McDonald has a dam on his property. He takes estimates the cross sectional area at 150 m intervals as shown in the diagram. **2**



Use Simpson's Rule once to approximate the volume of his dam in mega litres.

$V \approx \frac{h}{3}(A_L + 4A_m + A_r)$

$V \approx \frac{150}{3}(300 + 4 \times 210 + 70)$ (1 mark)

$V \approx 60,500 m^3$

$1m^3 = 1kL$

$\therefore$ capacity $= 60,500 kL$

$1ML = 1000 kL$

$\therefore 60,500 kL \div 1000$

$= 60.5 ML$ (1 mark) o.a.

KL and ML also (1 mark if F.C.F.)

End of Question 29

Q.29 General Trial

a some didn't multiply by 3 correctly (multiply everything)
some showed 5-2 for multiple lines instead of doing 5-2=3
some multiplied by numbers ≠ 3
some changed sign from + to - without reason.

bi some used surface Area formula for cylinder
Note: volume of cylinder on H-S-C formulae sheet *
some didn't use $1m^3 = 1000L$ again on formulae sheet *
many rounded too early so final answer incorrect
some didn't give answer in litres

ii most did this question well, though some ÷ by 100 instead of 1000.

ci most did well. Some did right calculations incorrect conclusion. some tried to bet both ways with 2 answers - this always loses 1 mark.
Note: 6553 songs > 5000 songs - show a comparison.
Some didn't look at file storage conversions on formulae sheet *

ii most got incorrect, Note MB = Mega Bytes
Kbps = kilo bits per second.
some used Kbps as 1024 bps ∴ instead of 1000 bps
and were lucky answer rounded to 19 secs.

d many left answer in m^3 and ignored request for Mega Litres
many didn't know $1m^3 = 1000L = 1kL$
↑ on formulae sheet *

many students didn't know Mega = 1,000,000
∴ ML = kL ÷ 1000

General Mathematics Year 12 Trial 2014

Marking scheme for **Question 30**

Solution	Marking Scheme	Teachers comments
a) i) Rate per Km $= \frac{400}{240}$ $= \$1.67/\text{ Km}$	**1 mark** awarded for correct answer. Must show complete Answer. Ie $1.67/ Km	*The majority of students attempted this well. Some students did not round off tom the nearest cent.*
a) ii) C = 200 + 1 x 100 = $300 Or Use graph showing markings	**1 mark** awarded for calculation with correct answer, or Use of graph. Must show markings on graph.	*Some students calculated their answer. Others used their graph. A reasonable proportion of these students failed to show acceptable markings on their graph.*
a) iii) C = 100 + 1.67(d- 160) $d = \frac{350}{1.67} + 160$ = 369.58 Km = 370 Km(nearest Km)	**2 marks** awarded for calculation and correct answer. **1 mark** awarded for correct answer. **1 mark** awarded for using graph and getting correct answer.	*Many students did not calculate their answer and some that used the graph made no reference to their graph.*
a) iv) If the average distance travelled per day is less than 400km the school should choose Swift Buses because it costs less. However at the 400km mark the two graphs intersect. It will prove to be cheaper using Star Buses over distances greater than 400km. Therefore for distances greater than 400km the school should choose Star Buses.	**2 marks** awarded for correct explanation which must include in the explanation the point of intersection of the two graphs. **1 mark** awarded for a reasonable explanation excluding the point of intersection.	*A number of students made the wrong assumption that the excursion would be less than 400km and therefore Swift was the best option. Answer should be based on the information given in the question.*

b) **2010** **2012** *Slightly neg Skewed. *Slightly posit skewed. *Median=50 *Median=60 *Range=80 *Range=70 From 10 to 90 fr 30 to 100 *UQ= 80 *UQ= 80 *LQ= 30 *LQ= 50 *IQR= 50 *IQR= 30	**1 mark** awarded for correct reference to skewness. Must be comparing data. **2 marks** awarded for correct reference to IQR, Median, Range etc. Must be comparing and contrasting data.	*Many students made no or incorrect reference to skewness. Many students did not make specific comparisons and references to IQR, Median, Range, etc* *A number of students referred to the Median as the Mean.*
c) i) k represents the initial volume and since volume equals area times height, then $1.7\times10^6\times2$ $=3.4\times10^6$	**1 mark** awarded for correct explanation with correct calculation.	A lot of students gave no explanation for k.
c) ii) V = $3.4\times10^6(0.959)^9$ $=2.3\times10^6 Km^3$	**1 mark** awarded for correct substitution. **1 mark** awarded for correct answer.	*A number of incorrect substitutions, particularly* $(0.959)^{90}$ *instead of* $(0.959)^9$
c) iii) Additional volume = $3.4\times10^6-2.3\times10^6$ $=1.1\times10^6 Km^3$ $h=\frac{V}{A}$ $=\frac{1.1\times10^6}{3.6\times10^8}$ $\approx 0.003Km$ $\approx 3m$ Jeremy is correct in his assumption because a rise of approximately 3m will no doubt have disastrous effects.	**1 mark** awarded for calculating correct increase of volume **1 mark** awarded for substituting previous result into calculation giving rise in sea level. **1 mark** awarded for a reasonable explanation that connects with the previous answer.	*This question was generally poorly attempted.*