St Catherine's School

Waverley

Student Number: _____

Teacher Name: _____

2014

Mathematics General 2

Trial Examination

TASK 4 45%

Instructions

- Time – 150 minutes plus 5 minutes reading
- Write using black or blue pen only.
- Approved calculators are permitted.
- All necessary working must be shown.
- Marks may be deducted for careless or poorly arranged work.

Section I

- Answer all questions on the multiple choice answer sheet attached.

Section II

- Answer all questions 26 to 30 on the exam paper in the spaces provided.
- A formulae sheet and extra writing space is attached at the rear of the paper.

Section I

Multiple choice
25 Marks
Attempt Questions 1-25
Allow 35 minutes for this section

Section II

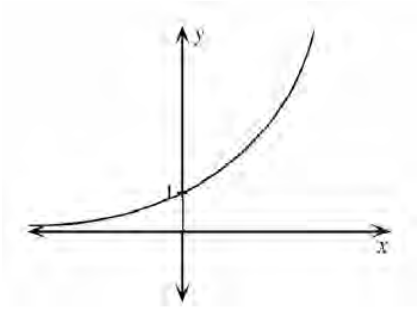
75 Marks
Attempt Questions 26-30
Allow about 1hour 55 minutes for this section
All questions are of equal value.

Section I	
Q1-25	**/25**
Section II	
Q26	**/15**
Q27	**/15**
Q28	**/15**
Q29	**/15**
Q30	**/15**
TOTAL	**/100**

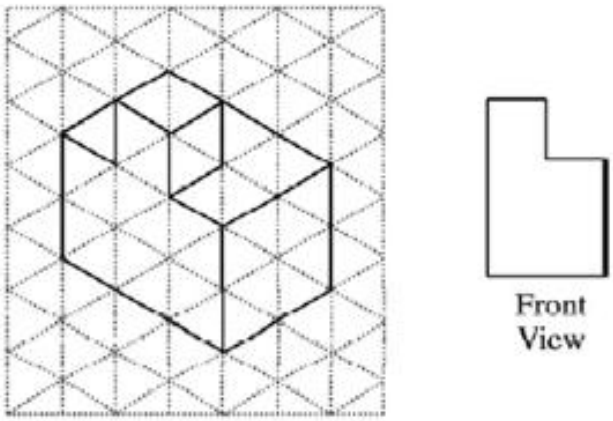
Section I

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

Use the multiple-choice answer sheet for Questions 1 to 25

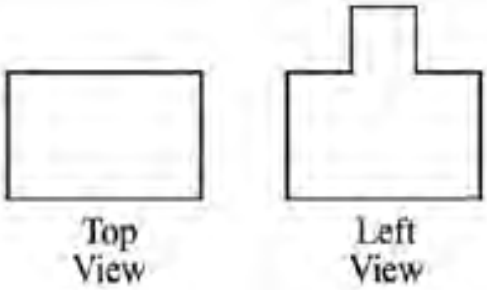
1.	Tess earns \$14.50 per hour normal rate. How much does she earn if she works for 38 hours at normal rate and 5 hours at time-and-a-half?			
	(A) \$587.25			
	(B) \$630.74			
	(C) \$659.75			
	(D) \$935.25			
2.	Caitlin is one of the five house captains who are having their group photo taken. They are going to be seated randomly in a single row. What is the probability that, for the photograph, Caitlin will be seated on either end?			
	(A) $\frac{4}{25}$	**(B)** $\frac{1}{25}$	**(C)** $\frac{1}{20}$	**(D)** $\frac{2}{5}$
3.	The first question of a survey states" Which colour car would you prefer?" This question will produce what type of data?			
	(A) Categorical		**(B)** Continuous	
	(C) Numerical		**(D)** Discrete	
4.	 Which equation best represents the graph shown above?			
	(A) $y = x^2$		**(B)** $y = 2^x$	
	(C) $y = \frac{2}{x}$		**(D)** $y = x^3$	

5.

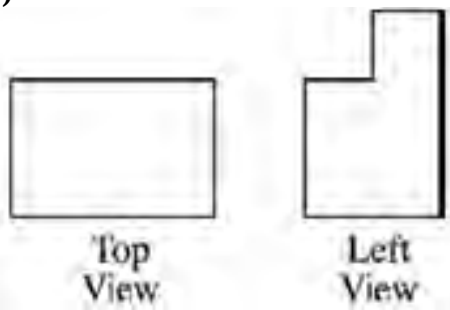


The diagram above shows the 3-dimensional representation of a solid figure on an isometric grid, and the 2-dimensional view of the front of the solid. Which of the following gives the correct views of both the top and the left of the solid?

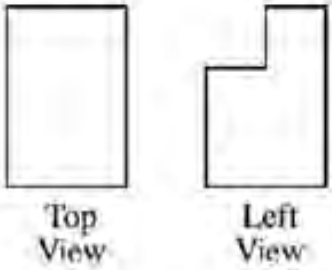
(A)



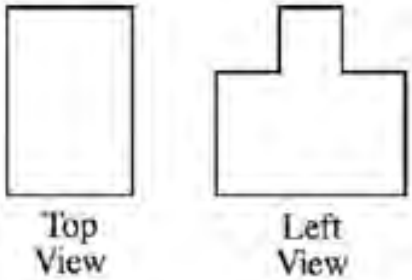
(B)



(C)



(D)



6.

Eliza's car is travelling along the freeway at 95km/h.
What is the car's approximate speed in m/s?

(A) 1.6 m/s

(B) 26.4 m/s

(C) 16.8 m/s

(D) 342 m/s

7.

Sophie's telephone bill for the period ending 15th July was $125.30.
The following additional information below was included in her latest account.

Calling patterns compared with last bill		
Local calls	down by	$17·50
STD calls	up by	$10·30
Calls to mobiles	up by	$0·75
0011 International	down by	$5·40

Use this information to calculate the total of her bill for the previous month.

(A) $91.35 **(B)** $113.45 **(C)** $137.15 **(D)** $159.25

8.

Samantha shoots an average of four goals out of every six when practising her water-polo shooting. Today at training she plans on shooting 180 goals.
How many of these goals would she expect to go in?

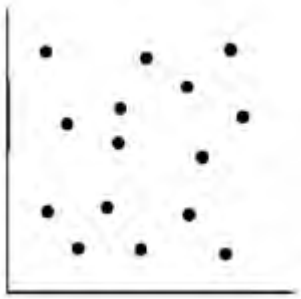
(A) 115 **(B)** 105 **(C)** 120 **(D)** 100

9.

Which of the scatter plots below is most likely to have the highest correlation coefficient?

(A)

(B)



(C)

(D)

10.	Jessica has 6500 shares with a current market value of \$2.95 per share. Jessica has received a total dividend of \$1093.30. What is the dividend yield on these shares?			
	(A) 0.057%	**(B)** 0.27%	**(C)** 5.7%	**(D)** 27%
11.	Isabella has completed four assessment tasks, each marked out of 100, giving her a mean of 71%. She wants to increase her mean to 75% after the trial. Which of the following below will calculate the mark (x) she needs to achieve in the next assessment task?			
	(A) $x = \frac{71+75}{2}$			
	(B) $\frac{71+x}{2} = 75$			
	(C) $\frac{71 \times 4 + x}{2} = 75$			
	(D) $\frac{71 \times 4 + x}{5} = 75$			
12.	Which of the following expresses $\frac{6x^2y}{3} \div \frac{2y}{5}$ in its simplest form?			
	(A) $5x^2$			
	(B) $\frac{4x^2y^2}{5}$			
	(C) $\frac{1}{5x^2}$			
	(D) $\frac{5}{4x^2y^2}$			

13.	Holly measured her height to be 182cm, correct to the nearest centimetre. What is the percentage error in her measurement?			
	(A) ± 0.0027%	**(B)** ± 0.0055%	**(C)** ± 0.27%	**(D)** ± 0.55%
14.	Raine is driving at a speed of 80 km/h. It takes Raine two seconds to react to a dangerous situation before applying the brakes. The stopping distance is given by the formula: **Stopping distance**: $d = \frac{5Vt}{18} + \frac{V^2}{170}$ How far will Raine travel in her car after applying the brakes using this formula?			
	(A) 60 m		**(B)** 82 m	
	(C) 164 m		**(D)** 246 m	
15.	Kate observed that the number of Facebook messages (M) she received where directly proportional to the number of friends (n) she had logged in on that day. Yesterday she had 10 friends and 40 messages. How many messages would she have if she had 45 friends?			
	(A) 13	**(B)** 85	**(C)** 180	**(D)** 810
16.	What is the best description between living standards and life expectancy?			
	(A) Constant correlation		**(B)** Negative correlation.	
	(C) Positive correlation.		**(D)** Zero correlation.	
17.	The mean mark in the Half –Yearly Examination in Mathematics General 2 was 68 and the standard deviation was 9. A z-score of 2 for this test would represent a mark of:			
	(A) 50			
	(B) 66			
	(C) 70			
	(D) 86			

18.

The following table shows the monthly repayments per $100 000 borrowed with reducible interest and monthly payments.

Interest Rate (% p.a.)	Term of Loan				
	5 years	10 years	15 years	20 years	25 years
6.50	1956.61	1135.48	871.11	745.57	675.21
6.75	1968.35	1148.24	884.91	760.36	690.91
7.00	1980.12	1161.08	898.83	775.30	706.78
7.25	1991.94	1174.01	912.86	790.38	722.81
7.50	2003.79	1187.02	927.01	805.59	738.99
7.75	2015.70	1200.11	941.28	831.79	755.33

Ms Yeoum bought a unit for $450 000. She borrowed the amount at 6.75% p.a. interest. The loan was to be repaid monthly over 20 years.
Using the table above, the **total amount** Ms Yeoum pays is closest to:

(A) $68 432

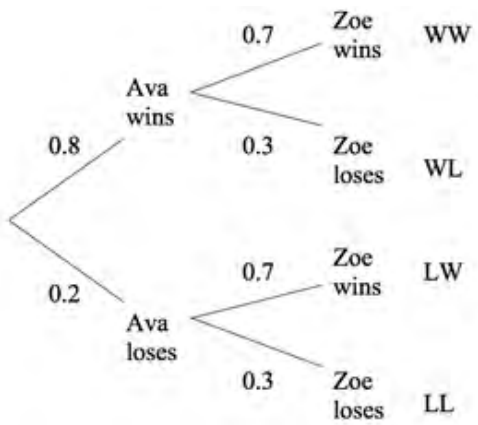
(B) $69 772

(C) $837 324

(D) $821 189

19.

Ava and Zoe are competing in two different cycling races. The probability that Ava wins her race is 0.8 and the probability that Zoe wins her race is 0.7.
The probability tree diagram shows this information.



What is the probability they win one race each.

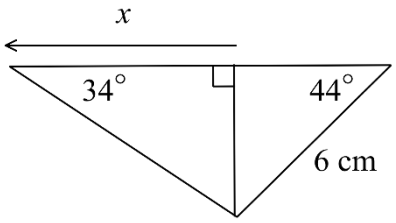
(A) 0.14

(B) 0.24

(C) 0.38

(D) 0.62

20. What is the value of x?



Not to scale

(A) $\dfrac{6\sin 44^\circ}{\tan 34^\circ}$

(B) $6\sin 44^\circ \sin 34^\circ$

(C) $\dfrac{6\tan 34^\circ}{\sin 44^\circ}$

(D) $\dfrac{6}{\sin 34^\circ \sin 44^\circ}$

21. The two-table below shows the results of a new lie detector which is used by NSW police in conjunction with random breathe testing.

	Detector Result: Told the truth	Detector Result: Lied	Total
Accurate Result	154	96	250
Inaccurate Result	21	12	33
Total	175	108	283

What percentage of people who did tell the truth were told they lied?

(A) 4.2% **(B)** 7.2% **(C)** 9.3% **(D)** 36.4%

22. Given that $\Delta = b^2 - 4ac$, then the value of b when $\Delta = 8.1 \times 10^7$, $a = 3.9 \times 10^8$ and $c = 5.4$ is closet to :

(A) 9.13×10^4

(B) 9.22×10^4

(C) 8.34×10^9

(D) 8.51×10^9

23.	Miranda has 32 GB of data storage on a USB drive? How many data files of average size 6.4 MB can she store?			
	(A) 5	**(B)** 204.8	**(C)** 5000	**(D)** 5120
24.	Ariane is given 1.8 litres of fluid over 10 hours by intravenous drip. The fluid is delivered at a rate of 30 drops per mL. What is the required drip rate, in drops per minute?			
	(A) 0.15	**(B)** 3.6	**(C)** 15	**(D)** 90
25.	Which of the following correctly expresses Y as the subject of the formula $E = A\,(S - 3Y)$?			
	(A) $Y = \frac{E - AS}{3A}$			
	(B) $Y = \frac{E}{3A} + \frac{S}{3}$			
	(C) $Y = \frac{AS - E}{3A}$			
	(D) $Y = \frac{E - A - S}{-3}$			

End of Section I

Section II

75 marks
Attempt Questions 26 to 30
Allow about 110 minutes for this section

Answer each question in the appropriate writing booklet.
Extra writing booklets are available.
All necessary working should be shown in every question.

Question 26 (15 marks)

(a) Expand and simplify $x(x+6)-3(4-x)$ **2**

(b) Izabella is leaving Sydney to go on a trip to Papeete in Tahiti.
Sydney is $(34°S, 151°\text{E})$ and Papeete is$(17°S, 149°W)$

(i) Show that there is a 20- hour time difference between the two cities (ignore time zones) **2**

(ii) Izabella's friend in Sydney sent her a text message which happened to take 5 hours to reach her in Papeete. It was sent at 10 am Saturday, Sydney time. What was the time and day in Papeete when she received the text? **2**

(c) Amelia is a real estate agent. She earns \$400 per week plus commission on any sales that she makes. Her commission is calculated using the schedule below. **2**

Value of Sale	Commission
Less than \$60 000	5%
\$60 001 – \$120 000	\$3000 plus 2% of each dollar over \$60 000
Over \$120 000	\$4200 plus 1.5% of each dollar over \$120 000

Last week Amelia sold a block of land in Mudgee for \$110 000.
Calculate Amelia's commission for that week.

(d) The daily maximum temperature for Sydney was recorded by Genevieve at

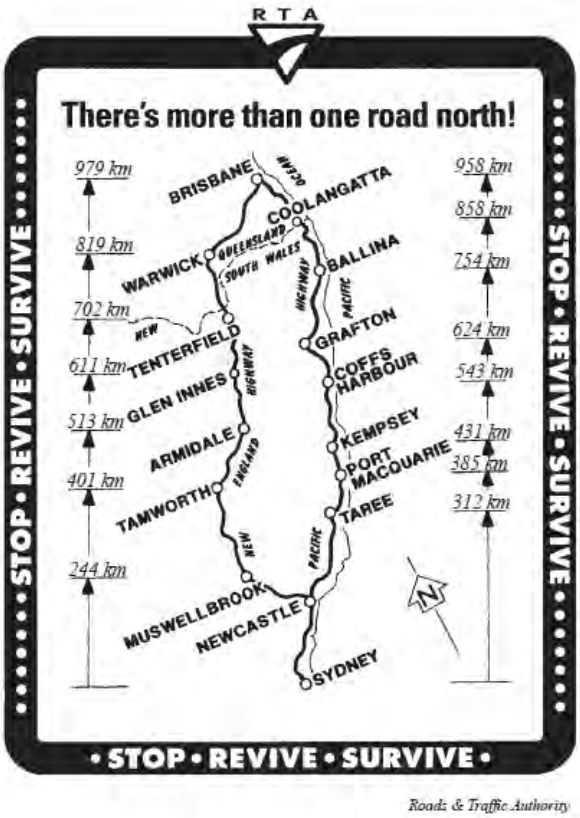
Observatory Hill on every day in January. The information is summarised in the frequency distribution table below.

Temperature C° (x)	(fx)	Cumulative Frequency (cf)
23	115	5
24	48	7
25	125	12
26	130	17
27	N	24
28	112	28
29	29	29
30	30	30
31	31	31

(i) Find the median temperature for January **1**

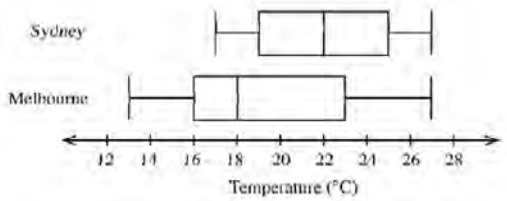
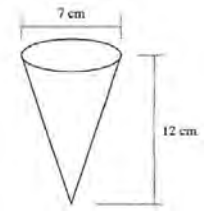
(ii) Find the value of N in the table above **1**

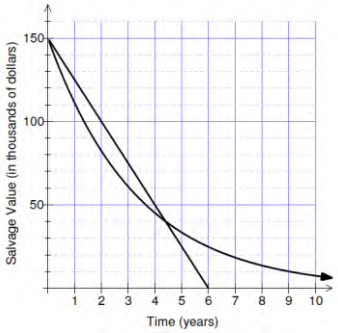
(e)



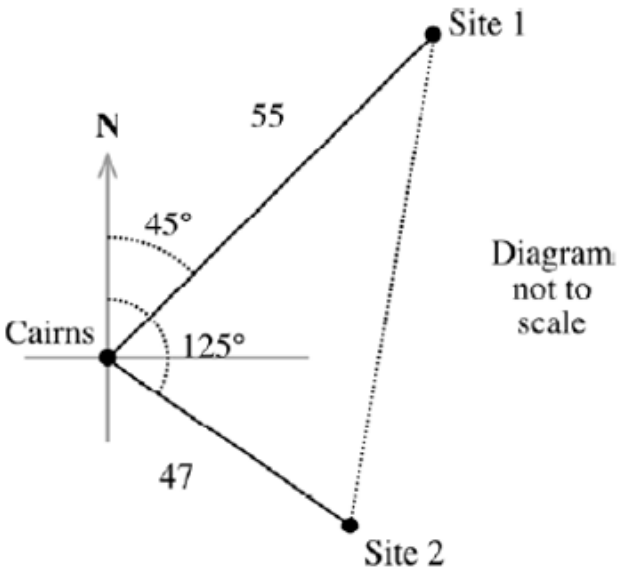
		Scarlett travels from Sydney to Brisbane via the Pacific highway and then returns home to Sydney via the New England Highway.	
	(i)	What is the total distance of Scarlett's trip?	**1**
	(ii)	Scarlett's car consumes petrol at a rate of 12 litres per 100 kilometres. Petrol costs $1.40 per litre. Find the cost of the petrol Scarlett used for the entire trip.	**2**
	(iii)	a) What is the distance between Coffs Harbour and Coolangatta?	**1**
		b) Scarlett travels at an average speed of 90km/hr for this section of the trip. How long would she estimate the drive between Coffs Harbour and Coolangatta should take? (Round to the nearest minute)	**1**

End of Question 26

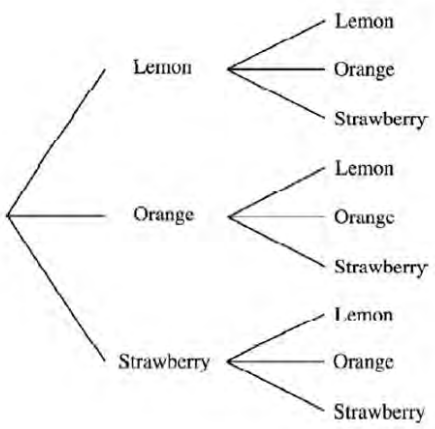
Question 27 (15 marks)			
(a)		Ashley recorded the average monthly maximum temperatures for Sydney and Melbourne and displayed them on the box and whisker plot below. 	
	(i)	Write down the inter-quartile range of temperatures for Melbourne.	**1**
	(ii)	What percentage of months in Sydney have an average maximum temperature greater than 25° C?	**1**
	(iii)	Briefly describe the skewness of the average monthly temperatures for Melbourne.	**1**
(b)		During a hot day, Laura buys an ice-cream cone. Cones are 12 cm high and have an internal diameter of 7 cm. 	
	(i)	Show that the volume of the cone is $154cm^3$, correct to the nearest cubic centimetre.	**2**
	(ii)	A spherical scoop of ice-ream, with the same radius as the top of the cone is placed at the top of the cone. Show that the volume of this one scoop is $180cm^3$, correct to the nearest cubic centimetre.	**2**
	(iii)	The shop offers 15 flavours of ice-cream. If Laura decides to have a double decker ice-cream (2 scoops). How many possible combinations will there be?	**1**

(c)		Claudia and Alex both purchase office equipment with an initial value of $150 000. Alex uses the declining balance method to calculate the depreciation of her office equipment while Claudia uses the straight line method. The graph below illustrates the depreciation of both Alex's and Claudia's office equipment. 	
	(i)	After approximately how many years does Alex's and Claudia's equipment have the same salvage value?	**1**
	(ii)	What is the value of Alex's office equipment after three years?	**1**
	(iii)	Find the amount of depreciation per year and in dollars, of Claudia's equipment.	**1**
	(iv)	Using your answer in (iii) find the equation of the straight line of depreciation for Claudia's office equipment.	**1**
(d)		At the recent winter sales Alice bought a new coat with a sale price of $118.95. The original marked price was $195.	
	(i)	Calculate the percentage discount on the coat.	**1**
	(iii)	Alice paid for the coat on her credit card. It has no interest free period. The interest rate on her credit card is 18.75% p.a. She pays the amount owing 17 days later. Calculate the total amount (including interest) she will pay for the new coat.	**2**

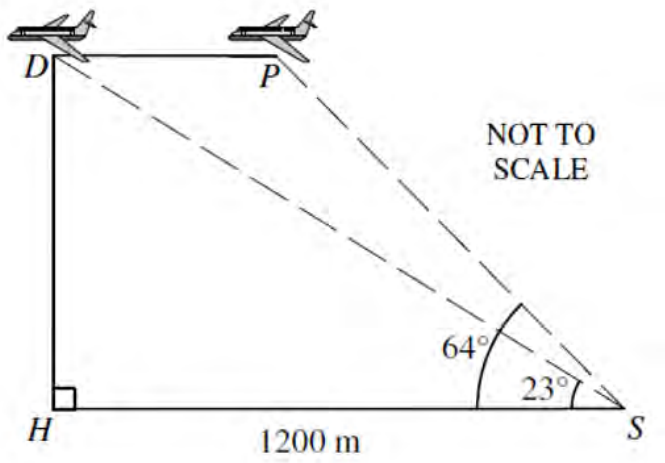
End of Question 27

Question 28 (15 marks)			
(a)		In a television game show, Amanda must choose one case out of the five cases on display. The cases contain the amounts \$15 000, \$10 000, \$1 000 \$50 and \$1. It is not known which amount is in which case.	
		Calculate Amanda's financial expectation for the television game show.	**2**
(b)		Kimberly and Eva were on two boats which sailed out of Cairns heading for popular dive sites on the Great Barrier Reef. The first sailed north-east for 55 kilometres. The second sailed on a bearing of 125° for 47 kilometres, as shown in the diagram below. 	
		Find the distance between the two dive sites. Give your answer correct to the nearest metre.	**2**
(c)		Adam needs \$25 000 to take Eve on a dream holiday to the Virgin Islands	**2**

		3 years from now. He has found an account which pays interest of 9.6% p.a., compounded monthly. What single amount of money will Adam need to invest now so that he will have enough money for the holiday?	
(d)		The lengths of Atlantic Salmon at the Thredbo fish farm are found to be normally distributed with a mean length of 520 mm and a standard deviation of 30 mm.	
	(i)	Find the expected percentage of fish with lengths between 490 mm and 550 mm.	**1**
		The fish farm rejects fish with a length which is more than two standard deviations below the mean length.	
	(ii)	What is the minimum length of salmon which the fish farm will accept?	**1**
	(iii)	What percentage of fish would you expect to be rejected by the fish farm?	**1**
(e)		Solve these equations simultaneously , showing all necessary working	**2**

		$2w + 5p = 15$ $2w - p = 3$	
(f)		A packet of 40 jubes contains 25 lemon, 10 orange and 5 strawberry jubes. Vania takes a packet into the movies at Bondi Junction and randomly chooses jubes throughout the movie.	
		The tree diagram below represents the possibilities of her first two choices, without replacement.	
			
	(i)	Complete the tree diagram by writing the correct probability on each branch.	**2**
	(ii)	Calculate the probability that Vania chooses two jubes with the same flavour.	**2**

End of Question 28

Question 29 (15 marks)		**Start a new writing booklet.**	
(a)		Stephanie, *S*, is 1200 metres from her home, *H*, when she first sees an aeroplane. The angle of elevation from Stephanie to the plane at *P* is 64°. Five minutes later the plane is directly above Stephanie's home at *D*. The angle of elevation from Stephanie to *D* is 23°. 	
		How far did the aeroplane travel from *P* to *D*, to the nearest metre?	**3**
(b)		The blood alcohol content BAC, ***B***, of an adult male after drinking beer varies inversely with his weight, ***W*** kg. If a 72kg man has a BAC, ***B*** value of 0.059 after drinking a beer.	
	(i)	Find the value of ***B,*** correct to three decimal places, of a 90 kg man who drinks the same amount as a 72 kg man.	**2**
	(ii)	What does this inverse equation imply?	**1**

(c)		Young's rule can be used to calculate a child's medicine dose. Young's rule is : $C = \frac{nA}{n+12}$ Where C is the child's dose (in mL), n is the age of the child (in years) and A is the adult dose (in mL). For a particular medicine, the adult dose is 24 mL	
	(i)	What is the dose for a 4 year old child?	**1**
	(ii)	Find the age at which the dose is double that of the dose for a 4 year old.	**3**
(d)			

Taxable Income	Tax Payable on Taxable Income
\$0 – \$6000	Nil
\$6001 – \$30000	15¢ for each \$1 over \$6000
\$30001 – \$75000	\$3600 plus 30¢ for each \$1 over \$30000
\$75001 – \$150000	\$17100 plus 40¢ for each \$1 over \$75000
Over \$150000	\$47100 plus 45¢ for each \$1 over \$150000

	(i)	Kaitlin earns an annual salary of \$86 458 from her job with a law firm. Use the tax table above to calculate the tax payable on her taxable income if she has allowable deductions of \$2500.	**2**
	(ii)	Kaitlin must also pay the Medicare Levy of 1.5% of her taxable income. Calculate the amount that Kaitlin must pay.	**1**
	(iii)	Throughout the year, Kaitlin has \$833.97 tax per fortnight deducted from her salary. Will Kaitlin receive a tax refund or will she need to pay an additional amount in tax? What is the amount of her refund or tax bill?	**2**

End of Question 29

Question 30 (15 marks)

(a) The weights and heights of ten Year 12 students were measured and recorded in the table below.

Student	A	B	C	D	E	F	G	H	I	J
Weight (kg)	74	61	57	55	82	63	51	76	70	58
Height (cm)	172	165	174	160	180	164	154	171	155	163

Calculate correct to two decimal places

(i) The correlation coefficient, r **1**

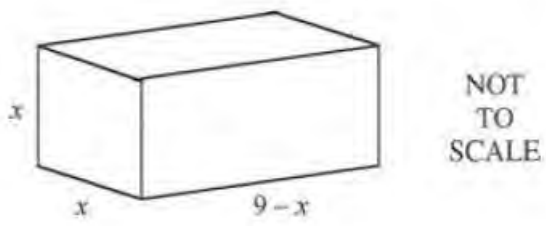
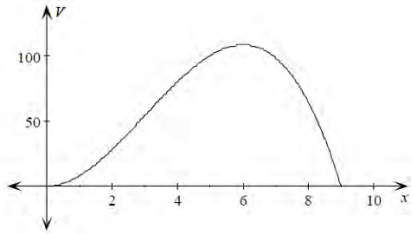
(ii) The mean and standard deviation of the weight data **1**

(iii) The mean and standard deviation of the height data **1**

(iv) Find the equation of the least-squares line of best fit **2**

(v) Another student has a weight of 80kg.
Use the equation form part **(iv)** to estimate her height. **1**

(vi) Emma proposes that the taller you are, the more you will weigh.
Do you agree with her proposal? Justify your answer. **2**

(b)		A packing carton is to be constructed as shown in the diagram below. All dimensions are in centimetres.  	
	(i)	Show that the surface area (***S***) of the carton is $S = 36x - 2x^2$.	**2**
	(ii)	Explain why the formula is only valid for the values from $x = 0$ to $x = 9$.	**1**
		The diagram below shows the graph of the volume (V) of the carton for values of x from $x = 0$ to $x = 9$. The dimensions of the carton are chosen so that its volume is a maximum.  	**1**
	(iii)	Find the value of x for which the carton has a maximum volume	**1**
	(iv)	Find the surface area of the carton when it has maximum volume.	**2**

End of exam paper

St Catherine's School

Waverley

2014

Student Number: Solutions.

Teacher Name: _____

Mathematics General 2

Trial Examination

TASK 4 45%

Instructions

- Time – 150 minutes plus 5 minutes reading
- Write using black or blue pen only.
- Approved calculators are permitted.
- All necessary working must be shown.
- Marks may be deducted for careless or poorly arranged work.

Section I

- Answer all questions on the multiple choice answer sheet attached.

Section II

- Answer all questions 26 to 30 on the exam paper in the spaces provided.
- A formulae sheet and extra writing space is attached at the rear of the paper.

Section I

Multiple choice
25 Marks
Attempt Questions 1-25
Allow 35 minutes for this section

Section II

75 Marks
Attempt Questions 26-30
Allow about 1hour 55 minutes for this section
All questions are of equal value.

Section I	
Q1-25	**/25**
Section II	
Q26	**/15**
Q27	**/15**
Q28	**/15**
Q29	**/15**
Q30	**/15**
TOTAL	**/100**

Trial HSC 2014
mathematics
General 2

Student Name or Number _____

Mathematics General 2: Multiple Choice Answer 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 ○
23.	A ○	B ○	C ○	D ●
24.	A ○	B ○	C ○	D ●
25.	A ○	B ○	C ●	D ○

2014 - Trial HSC. Solutions.

Multiple Choice

(1) $\$14.50 \times 38 + \$14.50 \times 5 \times 1.5$
$= \$659.75$

(C)

(2) $\dfrac{\text{Caitlin}, 4\times3\times2\times1}{5\times4\times3\times2\times1} + \dfrac{4\times3\times2\times1, \text{Caitlin}}{5\times4\times3\times2\times1}$

$\dfrac{24}{120} + \dfrac{24}{120} = \dfrac{48}{120}$

$= \dfrac{2}{5}$ (D)

(3). Car colour is categorical (A)

(4). exponential curve $y = 2^x$ (B)

(5). (D)

(6) 95 km/h
95000m/h

$95000 \div 3600$

26.4 m/s (B).

(7) • current month \$125.30

• latest account
$-\$17.50 + \$10.30 + \$0.75 - \$5.40$
overall down $-\$11.85$

• previous month would have been higher $\$125.30 + \$11.85$
$= \$137.15$ (C)

(8) $= \frac{4}{6} \times 180$

$= 120$ goals expected (C)

(9) Highest correlation (A)

(10) $6500 \times \$2.95 = \$19,175$ total

Dividend Total $= \$1093.30$

yield $= \frac{\$1093.30}{\$19175}$

$= 0.057$

or $= 5.7\%$ (C)

(11) $\frac{71 \times 4 + x}{5} = 75$ (D)

(12). $\frac{6x^2y}{3} \div \frac{2y}{5}$

$\frac{6x^2\cancel{y}}{\cancel{3}} \times \frac{5}{2\cancel{y}} = \frac{30x^2}{6}$

$= 5x^2$ (A).

(13) $\frac{\pm 0.5}{182} = \pm 0.00274$

$= \pm 0.27\%$ (C)

(14) $d = \frac{5vt}{18} + \frac{v^2}{170}$

$d = \frac{5 \times 80 \times 2}{18} + \frac{80^2}{170}$

$d = 82.09$

$d = 82\,m.$ (B).

(15). $y = kx$ direct variation

$m = kn$ if $m = 40$, $n = 10$

$40 = k \times 10$

$\therefore k = 4$

$m = 4n$ if $n = 45$

$= 4 \times 45$

$\therefore m = 180$ (C).

(16). Higher the living standards the higher life expectancy therefore positive correlation (C).

(17). $\bar{x} = 68$ $s = 9$ $z = 2$

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

$2 = \frac{x - 68}{9}$

$18 = x - 68$

$\therefore x = 86$ (D)

(18) \$760.36 per month for every \$100,000

$= \$760.36 \times 4.5 \times 12 \times 20$

$= \$821188.80$

is closest to:

$= \$821189$

(D).

(19). Probability they win one race each

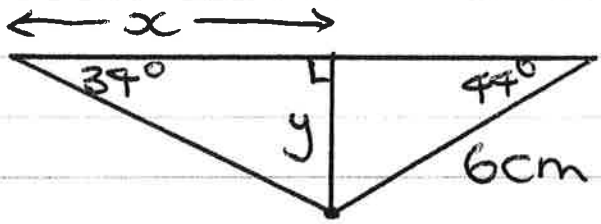
$P(\text{Ava win, Zoe loses}) = 0.8 \times 0.3$
$= 0.24$

$P(\text{Ava loses, Zoe wins}) = 0.2 \times 0.7$
$= 0.14$

Total probability $= 0.24 + 0.14$
$= 0.38$

(C).

(20).



$$\frac{y}{b} = \sin 44^\circ$$

$$y = b\sin 44^\circ$$

$$\tan 34^\circ = \frac{y}{x}$$

$$\tan 34^\circ = \frac{b\sin 44^\circ}{x}$$

$$x\tan 34^\circ = b\sin 44^\circ$$

$$x = \frac{b\sin 44^\circ}{\tan 34^\circ}$$

(A).

(21). Told the truth were $154 + 12 = 166$

were told they lied 12

$$\frac{12}{166} = 0.0722$$

$$= 7.2\%$$ (B).

(22).

$$\Delta = b^2 - 4ac$$

$$8.1 \times 10^7 = b^2 - 4 \times 3.9 \times 10^8 \times 5.4$$

$$b^2 = 8.1 \times 10^7 + 4 \times 3.9 \times 10^8 \times 5.4$$

$$b = \sqrt{8.1 \times 10^7 + 4 \times 3.9 \times 10^8 \times 5.4}$$

$$b = 9.22 \times 10^4$$ (B).

(23). 32 GB = 32768 MB

= 32768 MB ÷ 6.4 MB

= 5120 data files can be stored.

(D).

(24). 1.8L / 10 hrs.

1800mL / 10hrs

180mL / hrs

3mL / min

3ml = 90 drops

90drops / min

if fluid is delivered at 30drops per mL

(D)

25

$$E = A(S - 3Y)$$

$$E = AS - 3AY$$

$$3AY = AS - E$$

$$Y = \frac{AS - E}{3A}$$

C

Section II

75 marks
Attempt Questions 26 to 30
Allow about 110 minutes for this section

Answer each question in the appropriate writing booklet.
Extra writing booklets are available.
All necessary working should be shown in every question.

Question 26 (15 marks)

(a) Expand and simplify $x(x+6)-3(4-x)$ **2**

½ $= x^2+6x-12+3x$ ½

$= x^2+9x-12$ 1

(b) Izabella is leaving Sydney to go on a trip to Papeete in Tahiti.
Sydney is $(34°S, 151°E)$ and Papeete is $(17°S, 149°W)$

(i) Show that there is a 20- hour time difference between the two cities (ignore time zones) **2**

$151° + 149° = 300°$ 1

$1°$ is 4 minutes

$300° \times 4$ mins $= 1200$ minutes

1200 min $\div 60 = 20$ hrs. (shown) 1

(ii) Izabella's friend in Sydney sent her a text message which happened to take 5 hours to reach her in Papeete. It was sent at 10 am Saturday, Sydney time. What was the time of day in Papeete when she received the text? **2**

149°W Papeete $\xleftarrow{20\text{hrs}}$ Sydney. 151°E

2pm Fri 10am Sat.

+5hrs text = 7pm Friday. 1 1

(c) Amelia is a real estate agent. She earns \$400 per week plus commission on any sales the she makes. Her commission is calculated using the schedule below. **2**

Value of Sale	Commission
Less than \$60 000	5%
\$60 001 – \$120 000	\$3000 plus 2% of each dollar over \$60 000
Over \$120 000	\$4200 plus 1.5% of each dollar over \$120 000

Last week Amelia sold a block of land in Mudgee for \$110 000.
Calculate Amelia's commission for that week.

$= \$3,000$ ½ $+ (110\,000 - 60\,000) \times 0.02$ ½ ½

$= \$4000$ commission

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(d) The daily maximum temperature for Sydney was recorded by Genevieve at Observatory Hill on every day in January. The information is summarised in the frequency distribution table below.

Temperature C° (x)	(fx)	Cumulative Frequency (cf)	Frequency (f)
23	115	5	5
24	48	7	2
25	125	12	5
26	130	17	5
27	N	24	7
28	112	28	4
29	29	29	1
30	30	30	1
31	31	31	1
			31

(i) Find the median temperature for January **1**

middle of 31 is 16th score ∴ 26°

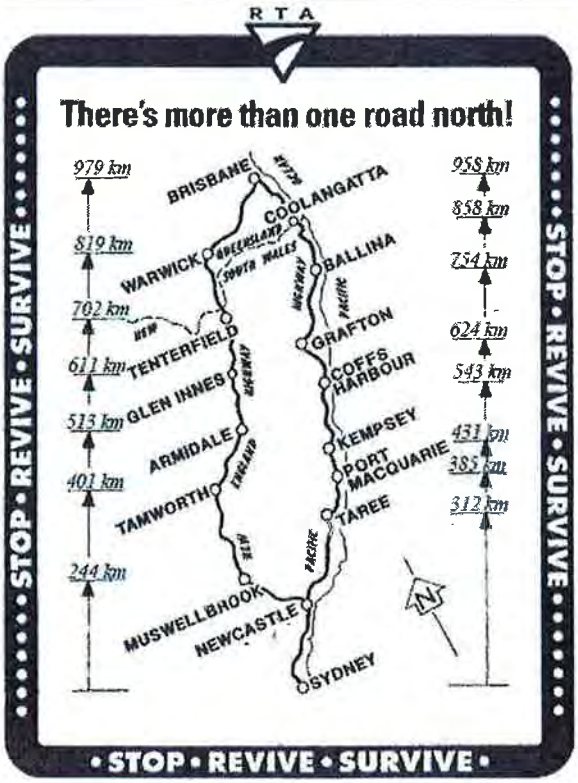
(½ mark if they recognise middle of 31)

(ii) Find the value of N in the table above **1**

$27 \times 7 = N$

$N = 189$

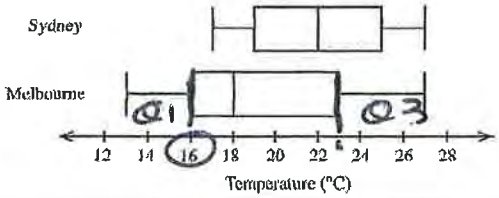
(e)



Roads & Traffic Authority

Question 27 (15 marks)

(a) Ashley recorded the average monthly maximum temperatures for Sydney and Melbourne and displayed them on the box and whisker plot below.



(i) Write down the inter-quartile range of temperatures for Melbourne. **1**

$IQR = Q_3 - Q_1 = 23° - 16°$ $IQR = 7°C$

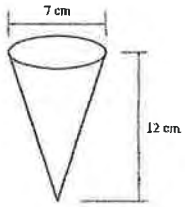
(ii) What percentage of months in Sydney have an average maximum temperature greater than 25° C? **1**

greater than 25°c is 25%

(iii) Briefly describe the skewness of the average monthly temperatures for Melbourne. **1**

positively skewed.

(b) During a hot day, Laura buys an ice-cream cone.
Cones are 12 cm high and have an internal diameter of 7 cm.



(i) Show that the volume of the cone is $154cm^3$, correct to the nearest cubic centimetre. **2**

$V = \frac{1}{3}\pi r^2 h$ (1) $r = 3.5$, $h = 12$

$V = \frac{1}{3}\pi(3.5)^2 \times 12 = 153.938...$

(1) $V = 154\ m^3$

(ii) A spherical scoop of ice-ream, with the same radius as the top of the cone is placed at the top of the cone. Show that the volume of this one scoop is $180cm^3$, correct to the nearest cubic centimetre. **2**

$r = 3.5$

$V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(3.5)^3$ (1) (1) $V = 179.594$

$= 180\ cm^3$

(iii) The shop offers 15 flavours of ice-cream. If Laura decides to have a double decker ice-cream (2 scoops). How many possible combinations will there be? **1**

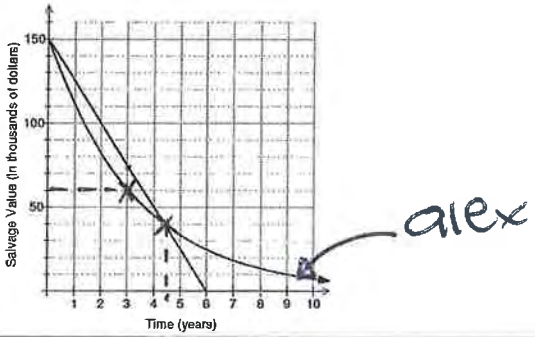
15 flavours choose two

${}^{15}C_2 = 105$ combinations.

/8

		Scarlett travels from Sydney to Brisbane via the Pacific highway and then returns home to Sydney via the New England Highway.	
	(i)	What is the total distance of Scarlett's trip?	1
		= 958 km + 979 km = 1937 km	
	(ii)	Scarlett's car consumes petrol at a rate of 12 litres per 100 kilometres. Petrol costs $1.40 per litre. Find the cost of the petrol Scarlett used for the entire trip.	2
		= 1937 ÷ 100 km ½ = 19.37 × 12 litres ½ = 232.44 litres × $1.40 1 cost = $325.42. (nearest cent.)	
	(iii)	a) What is the distance between Coffs Harbour and Coolangatta?	1
		D = 858 km − 543 km ∴ D = 315 km	
		b) Scarlett travels at an average speed of 90km/hr for this section of the trip. How long would she estimate the drive between Coffs Harbour and Coolangatta should take? (Round to the nearest minute)	1
		T = Distance / Speed = 315 km / 90 km/hr. T = 3.5 hrs ∴ Time = 3 hrs 30 mins.	

End of Question 26

(c)		Claudia and Alex both purchase office equipment with an initial value of \$150 000. Alex uses the declining balance method to calculate the depreciation of her office equipment while Claudia uses the straight line method. The graph below illustrates the depreciation of both Alex's and Claudia's office equipment. 	
	(i)	After approximately how many years does Alex's and Claudia's equipment have the same salvage value?	**1**
		4.5 years ½ mark for close answer.	
	(ii)	What is the value of Alex's office equipment after three years?	**1**
		\$60 000	
	(iii)	Find the total amount of depreciation of Claudia's equipment after three years, in dollars.	**1**
		\$150 000 in 6 yrs \$75 000 in 3 yrs ½ mark for close answer.	
	(iv)	Using your answer in (iii) find the equation of the straight line of depreciation for Claudia's office equipment.	**1**
		\$25,000 per year $S = 150\,000 - 25\,000n$	
(d)		At the recent winter sales Alice bought a new coat with a sale price of \$118.95. The original marked price was \$195.	
	(i)	Calculate the percentage discount on the coat. ½ for 61%	**1**
		$195 - 118.95 = \frac{76.05}{195} = 0.39 = 39\%$	
	(iii)	Alice paid for the coat on her credit card. It has no interest free period. The interest rate on her credit card is 18.75% p.a. She pays the amount owing 17 days later. Calculate the total amount (including interest) she will pay for the new coat.	**2**
		$I = PRT$ ½ $= 118.95 \times \frac{18.75\%}{365} \times 17$ days ½ ½ $\therefore I = 1.04$	

End of Question 27

Total = \$118.95 + \$1.04 ½
= \$119.99

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Question 28 (15 marks)

(a) In a television game show, Amanda must choose one case out of the five cases on display. The cases contain the amounts \$15 000, \$10 000, \$1 000 \$50 and \$1. It is not known which amount is in which case.

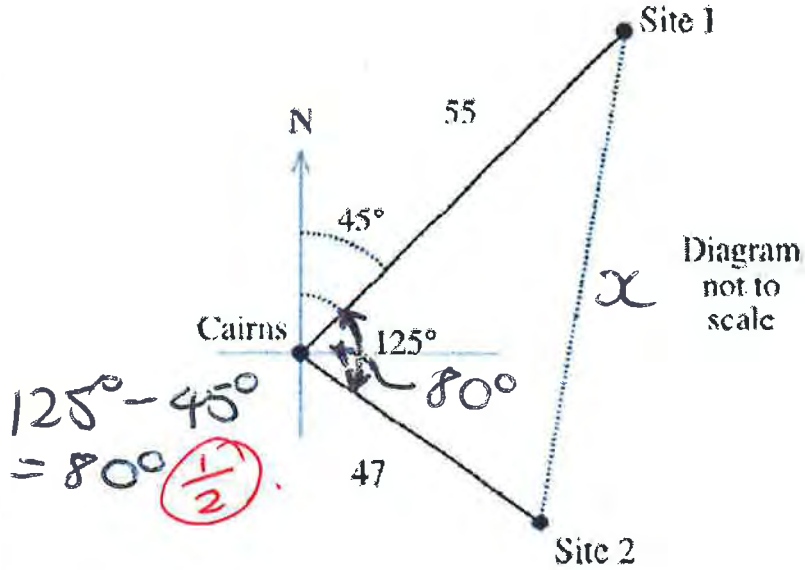
\$15 000	\$10 000	\$1000	\$50	\$1

Calculate Amanda's financial expectation for the television game show. **2**

Financial exp. $= \frac{1}{5} \times 15\,000 + \frac{1}{5} \times 10\,000 + \frac{1}{5} \times 1000 + \frac{1}{5} \times 50 + \frac{1}{5} \times 1$

$\therefore$ FE $= \$5210.20$

(b) Kimberly and Eva were on two boats which sailed out of Cairns heading for popular dive sites on the Great Barrier Reef. The first sailed north-east for 55 kilometres. The second sailed on a bearing of 125° for 47 kilometres, as shown in the diagram below.



$125° - 45°$
$= 80°$ $\frac{1}{2}$

Find the distance between the two dive sites. **2**
Give your answer correct to the nearest metre.

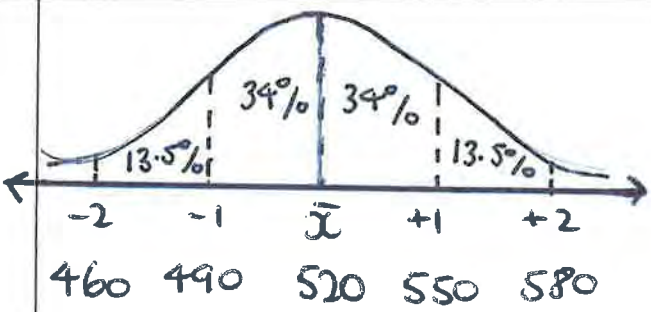
$x^2 = 55^2 + 47^2 - 2 \times 55 \times 47 \times \cos 80°$ 1

$x^2 = 4336.238\ldots$

$x = 65.850124$ km

$x = 65\,850.12$ m

$x = 65\,850$ m $\frac{1}{2}$

(c)		Adam needs \$25 000 to take Eve on a dream holiday to the Virgin Islands 3 years from now. He has found an account which pays interest of 9.6% p.a., compounded monthly. What single amount of money will Adam need to invest now so that he will have enough money for the holiday?	**2**
		$PV = \frac{FV}{(1+r)^n}$ $= \frac{25000}{(1+0.8\%)^{36}}$ (1) $= \$18\,765.530$ $\therefore PV = \$18\,765.53$ $FV = 25\,000$ $r = 9.6\%$ pa $\div 12 = 0.8$ $n = 3$ yrs $= 3 \times 12$ $= 36$ mths. (1)	
(d)		The lengths of Atlantic Salmon at the Thredbo fish farm are found to be normally distributed with a mean length of 520 mm and a standard deviation of 30 mm.	
	(i)	Find the expected percentage of fish with lengths between 490 mm and 550 mm.	**1**
		 $= 34\% + 34\%$ $= 68\%$	
		The fish farm rejects fish with a length which is more than two standard deviations below the mean length.	
	(ii)	What is the minimum length of salmon which the fish farm will accept?	**1**
		$= 520 - 30 - 30$ $= 460$ mm (2 standard deviations)	
	(iii)	What percentage of fish would you expect to be rejected by the fish farm?	**1**
		bottom half is 50% $= 50\% - 34\% - 13.5\%$ $= 2.5\%$ would be rejected	

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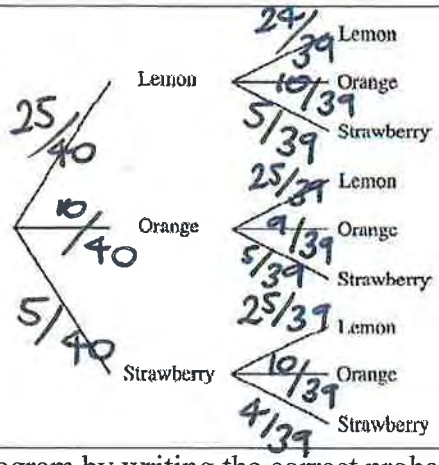
(e)		Solve these equations simultaneously , showing all necessary working	**2**
		$2w + 5p = 15$ — ① $2w - p = 3$ — ② equation ① − ② ① $6p = 12$ $\therefore p = 2$ subst into ② ① $2w - 2 = 3$ $2w = 5$ $w = \frac{5}{2}$ or 2.5 $\therefore p = 2,\ w = \frac{5}{2}$	
(f)		A packet of 40 jubes contains 25 lemon, 10 orange and 5 strawberry jubes. Vania takes a packet into the movies at Bondi Junction and randomly chooses jubes throughout the movie.	
		The tree diagram below represents the possibilities of her first two choices, without replacement.	
			
	(i)	Complete the tree diagram by writing the correct probability on each branch.	**2**
		shown above	
	(ii)	Calculate the probability that Vania chooses two jubes with the same flavour.	**2**
		P(same flavour) $= P(LL) + P(OO) + P(SS)$ $= \frac{25}{40} \times \frac{24}{39} + \frac{10}{40} \times \frac{9}{39} + \frac{5}{40} \times \frac{4}{39}$ $= \frac{5}{13} + \frac{3}{52} + \frac{1}{75}$ $= \frac{71}{156}$	$\frac{1}{2}$ each for × then add answers $= \frac{1}{2}$.

End of Question 28

/6

(c) Young's rule can be used to calculate a child's medicine dose.

Young's rule is : $C = \frac{nA}{n+12}$

Where C is the child's dose (in mL), n is the age of the child (in years) and A is the adult dose (in mL).

For a particular medicine, the adult dose is 24 mL

(i) What is the dose for a 4 year old child? **1**

$C = \frac{4 \times 24}{4+12}$ $n=4$ $A=24mL$

$\therefore C = 6mL$ (1)

(ii) Find the age at which the dose is double that of the dose for a 4 year old. **3**

Double a 4yr old dose $C=12mL$

$12 = \frac{n \times 24}{n+12}$ (1)

$12(n+12) = 24n$ (1)

$12n + 144 = 24n$

$144 = 12n$

$\therefore n = 12$ years. (1)

(d)

Taxable Income	Tax Payable on Taxable Income
\$0 – \$6000	Nil
\$6001 – \$30000	15¢ for each \$1 over \$6000
\$30001 – \$75000	\$3600 plus 30¢ for each \$1 over \$30000
\$75001 – \$150000	\$17100 plus 40¢ for each \$1 over \$75000
Over \$150000	\$47100 plus 45¢ for each \$1 over \$150000

(i) Kaitlin earns an annual salary of \$86 458 from her job with a law firm. Use the tax table above to calculate the tax payable on her taxable income if she has allowable deductions of \$2500. **2**

$86\,458 - 2500 = \$83\,958$ taxable income (½)

Tax $= 17\,100 + 0.4 \times (83\,958 - 75\,000)$ (1)

Tax $= \$20\,683.20$ (½)

(ii) Kaitlin must also pay the Medicare Levy of 1.5% of her taxable income. Calculate the amount that Kaitlin must pay. **1**

taxable income $= 83\,958 \times 1.5\%$

medicare levy $= 0.015 \times 83\,958$

$= \$1259.37$ (1)

(iii) Throughout the year, Kaitlin has \$833.97 tax per fortnight deducted from her salary. Will Kaitlin receive a tax refund or will she need to pay an additional amount in tax? What is the amount of her refund or tax bill? **2**

Total tax payable $= 20\,683.20 + 1\,259.37$

$\$21\,942.57$ (½)

Tax paid $= \$833.97 \times 26$

$= \$21\,683.22$ (½)

End of Question 29

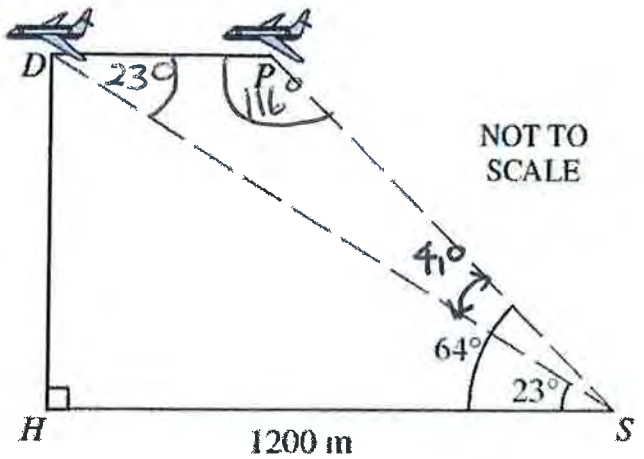
Kaitlin needs to pay an additional amount of tax $= 21\,942.57 - 21\,683.22$

$= \$259.35$ (1)

/0

Question 29 (15 marks) **Start a new writing booklet.**

(a) Stephanie, S, is 1200 metres from her home, H, when she first sees an aeroplane. The angle of elevation from Stephanie to the plane at P is 64°. Five minutes later the plane is directly above Stephanie's home at D. The angle of elevation from Stephanie to D is 23°.



How far did the aeroplane travel from P to D, to the nearest metre? **3** ½

In ΔOHS

$= \frac{1200}{OS}$

$OS = \frac{1200}{\cos 23°}$ 1

$OS = 1303.632...$

In ΔOPS

$\angle SOP = 23°$ (alt $\angle$'s)

$\angle OPS = 116°$ ($\angle$ sum Δ)

$\frac{OP}{\sin 41°} = \frac{1303.63}{\sin 116°}$ 1

$\therefore OP = 951.56...$

$\therefore OP = 952$ m ½ (nearest m

(b) The blood alcohol content BAC, B, of an adult male after drinking beer varies inversely with his weight, W kg. If a 72kg man has a BAC, B value of 0.059 after drinking a beer.

(i) Find the value of B, correct to three decimal places, of a 90 kg man who drinks the same amount as a 72 kg man. **2**

$B = \frac{k}{w}$

$0.059 = \frac{k}{72}$

$\therefore k = 4.248$ 1

then $B = \frac{4.248}{w}$

so $B = \frac{4.248}{90}$

$\therefore B = 0.047$ 1

(ii) What does this inverse equation imply? **1**

this implies that an increase in your weight will decrease BAC. 1

6.

Question 30 (15 marks)

(a) The weights and heights of ten Year 12 students were measured and recorded in the table below.

Student	A	B	C	D	E	F	G	H	I	J
Weight (kg)	74	61	57	55	82	63	51	76	70	58
Height (cm)	172	165	174	160	180	164	154	171	155	163

Calculate correct to two decimal places

(i) The correlation coefficient, r — 1

$r = 0.6253$

$r = 0.63$ (2dp) 1

(ii) The mean and standard deviation of the weight data — 1

$\bar{x} = 64.7$ ½ $\sigma_n = 9.72$ ½ (2dp)

(iii) The mean and standard deviation of the height data — 1

$\bar{y} = 165.8$ ½ $\sigma_n = 7.97$ ½ (2dp)

(iv) Find the equation of the least-squares line of best fit — ~~2~~ 3

$m = 0.63 \times \frac{7.97}{9.72}$

$\therefore m = 0.52$ 1

$b = 165.8 - 0.52 \times 64.7$

$\therefore b = 132.16$ 1

$y = mx + b$

$y = 0.52x + 132.16$

height $= 0.52 \times$ weight $+ 132.16$ 1

($-\frac{1}{2}$ not in height + weight)

(v) Another student has a weight of 80kg.
Use the equation form part **(iv)** to estimate her height. — 1

$H = 0.52w + 132.16$ $(w = 80)$

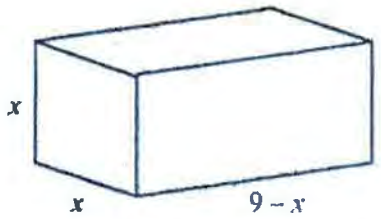
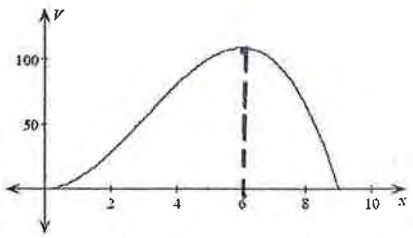
$H = 0.52 \times 80 + 132.16$ $H = 173.76$ cm.

(vi) Emma proposes that the taller you are, the more you will weigh.
Do you agree with her proposal? Justify your answer. — 2

1 the correlation is positive and moderate $r = 0.63 > 0$

yes there is a moderate positive correlation between height and weight. The taller you are the more you will weigh. 1

/9

(b)		A packing carton is to be constructed as shown in the diagram below. All dimensions are in centimetres.  NOT TO SCALE	
	(i)	Show that the surface area (S) of the carton is $S = 36x - 2x^2$.	**2**
		$SA = (x \times x) \times 2 + x(9-x) \times 4$ $\frac{1}{2}$ $= 2x^2 + 4(9x - x^2)$ $\frac{1}{2}$ $= 2x^2 + 36x - 4x^2$ $\frac{1}{2}$ $\therefore SA = 36x - 2x^2$ $\frac{1}{2}$ (shown)	
	(ii)	Explain why the formula is only valid for the values from $x = 0$ to $x = 9$.	**1**
		x must be >0 as it is a side $9 - x > 0$ also must be positive $\therefore x > 9$ x lies between 0 and 9	
		The diagram below shows the graph of the volume (V) of the carton for values of x from $x = 0$ to $x = 9$. The dimensions of the carton are chosen so that its volume is a maximum.  	**1**
	(iii)	Find the value of x for which the carton has a maximum volume	**1**
		$\therefore x = 6$ is when volume is a maximum.	
	(iv)	Find the surface area of the carton when it has maximum volume.	~~2~~ 1
		when $x = 6$ $SA = 36x - 2x^2$ $= 36 \times 6 - 2 \times 6^2$	

End of exam paper

$\therefore SA = 144 \text{ cm}^2$ 1

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