39

Student's Name: _____

Student Number: _____

Teacher's Name: _____

ABBOTSLEIGH

2012
HIGHER SCHOOL CERTIFICATE
Trial Assessment 4

General Mathematics

General Instructions

- Reading time – 5 minutes.
- Working time – $2\frac{1}{2}$ hours.
- Write using black or blue pen.
- Board-approved calculators may be used.
- All necessary working should be shown in every question.
- Make sure your HSC candidate Number is on the front cover of each booklet.
- Start a new booklet for Each Question.
- Answer the Multiple Choice questions on the answer sheet provided.

Total marks – (100)

- Attempt Sections 1 and 2.
- All questions are of equal value.

Section 1 Pages 3 - 10

25 marks
- Attempt Questions 1–25.
- Allow about 38 minutes for this section.

Section 2 Pages 11 - 22

75 marks
- Attempt Questions 26-30.
- Allow about 1 hr and 52 mins for this section.

SECTION 1

25 marks
Attempt Questions 1 – 25
Use the multiple-choice answer sheet
Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

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

(A) ○ (B) ● (C) ○ (D) ○

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

(A) ● (B) ⊗ (C) ○ (D) ○

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

correct ←

(A) ⊗ (B) ⊗ (C) ○ (D) ○

SECTION I

1 Expand and simplify $10-3(2x-1)$

(A) $14x-7$
(B) $9-6x$
(C) $2x+6$
(D) $13-6x$

2 The price of a wallet is \$77, which includes 10% GST. What is the amount of GST included in this price?

(A) \$7
(B) \$7.70
(C) \$69.80
(D) \$70

3 The company Apple tests every 10^{th} iPad. What type of sampling is this?

(A) biased
(B) random
(C) stratified
(D) systematic

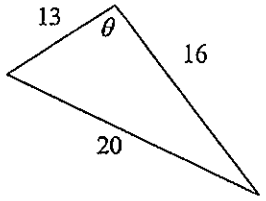
4 A calculator displays an answer:

0.0206054

What is the number to three significant figures?

(A) 0.02
(B) 0.0206
(C) 0.020605
(D) 0.021

5 What is the size of angle θ in this triangle?



Not to scale

(A) 53°
(B) 87°
(C) 40°
(D) 50°

6 An investor has 400 shares with a current market value of $2.55 per share. The company declares a dividend yield of 16%. What is the dividend on this investment?

(A) $0.41
(B) $40.60
(C) $163.20
(D) $16320

7 Use the formula $y=\sqrt{u^2+2as}$ to find the approximate value of y given that $u=6$, $a=2.5$ and $s=12$

(A) 9.7
(B) 9.8
(C) 96
(D) 97.9

8 Jessica solved the following equation, but has made two errors in her working. Which 2 steps contain an error from the previous line?

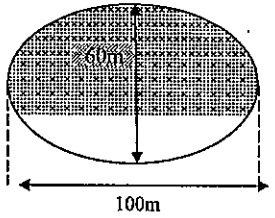
$$5(2x+1)-2(x+3)=12$$
$$10x+5-2x+6=12 \ldots\ldots \textit{line}1$$
$$8x+11=12 \ldots\ldots \textit{line}2$$
$$8x=23 \ldots\ldots \textit{line}3$$
$$x=\frac{23}{8} \ldots\ldots \textit{line}4$$

(A) Lines 1 and 2
(B) Lines 1 and 3
(C) Lines 1 and 4
(D) Lines 2 and 3

9 Each dimension of a rectangular mirror is increased by 8%. The percentage increase in the area of the mirror is closest to:

(A) 8%
(B) 15%
(C) 16%
(D) 17%

10 Abbotsleigh wants to put new grass in the front of the school which is in the shape of an ellipse. If grass costs $7.50 per square metre, what is the total cost to the nearest dollar?



Not to scale

(A) $4712
(B) $18850
(C) $35343
(D) $179071

11 Smarties are packed following a normal distribution with a mean weight of 60g and a standard deviation of 2g. Quality control reject packets whose weight is more than one standard deviation below the mean. What would be the minimum weight accepted by the company?

(A) 54g
(B) 56g
(C) 58g
(D) 62g

12 The probability that a set of traffic lights shows red, amber or green is equally likely. A person is driving down a road with 3 sets of traffic lights. The probability that all three sets of traffic lights will be green is given by:

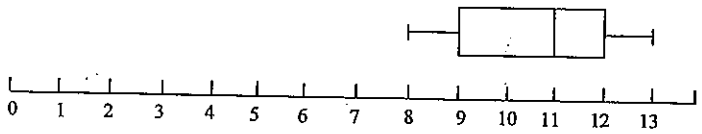
(A) $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$

(B) $\frac{1}{3}\times\frac{1}{3}\times\frac{1}{3}$

(C) $\frac{1}{3}\times\frac{1}{2}\times\frac{1}{3}$

(D) $\frac{1}{3}$

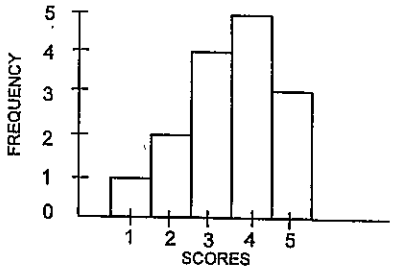
13 This box-and-whisker plot represents a set of scores.



What is the interquartile range of this set of scores?

(A) 1
(B) 2
(C) 3
(D) 5

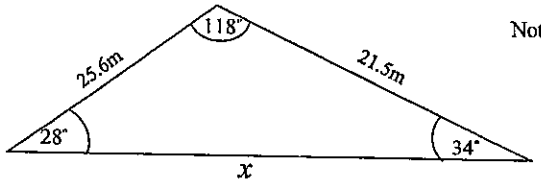
14 The histogram shows the scores obtained on a quiz marked out of 5.



The mean mark is closest to:

(A) 3
(B) 3.5
(C) 4
(D) 5

15 The correct value for x is:



Not to scale

(A) $x=\frac{25.6\sin 34^\circ}{\sin 28}$

(B) $x=\frac{25.6\sin 118^\circ}{\sin 34^\circ}$

(C) $x=\frac{25.6\sin 118^\circ}{\sin 28^\circ}$

(D) $x=\frac{21.5\sin 118^\circ}{\sin 34^\circ}$

16 Sarah's gross income last year was $60 000. She had allowable tax deductions of $5000. Sarah paid 1.5% of her taxable income for the Medicare Levy. How much was Sarah's Medicare Levy?

(A) $750
(B) $825
(C) $900
(D) $975

17 The positions of School Captain, Vice Captain and Sports Captain are to be chosen from a committee of 5 girls. In how many ways can the three positions be chosen?

(A) 3
(B) 10
(C) 60
(D) 125

18 Bernadette, Pete and John invested in a home in the ratio 4:7:9. On selling the home, John made a profit of $11250. What was Pete's profit?

(A) $3927.50
(B) $5000
(C) $8750
(D) $14464.29

19 Julie weighs herself on her bathroom scales and finds she weighs 65.5kg, to the nearest 0.5kg. What is the lower limit of her weight?

(A) 65.25kg
(B) 65.5kg
(C) 65.0kg
(D) 66.0kg

20 The table of values below gives four points which lie on a straight line.

x	3	5	7	10
y	5	11	17	26

The equation of this straight line is:

(A) $y=3x+4$
(B) $y=4x-3$
(C) $y=3x-4$
(D) $y=4-3x$

21 Hayley borrows $360 000 to buy a unit. Interest is charged at 6.2% per annum, compounded monthly.

How much does she owe at the end of the first month, after she has made a $3800 repayment?

(A) 358 140
(B) 358 060
(C) 334 080
(D) 337 880

22 Penny has seen five movies. The ticket prices were $13, $8, $10, $10 and $10. The next movie she plans to see is in 3D and the ticket price is $35. Which of these will not change after Sally sees the next movie?

(A) The median of her ticket prices
(B) The mean of her ticket prices
(C) The range of her ticket prices
(D) The total cost of her tickets

23 The table shows the repayment per $1000 on a monthly reducible loan.

	Interest rate p.a.						
Term in years	7%	7.25%	7.50%	7.75%	8%	8.25%	8.50%
5	19.8012	19.9194	20.0379	20.1570	20.2765	20.3963	20.5164
10	11.6108	11.7401	11.8702	12.0011	12.1328	12.2653	12.3985
15	8.9883	9.1286	9.2701	9.4128	9.5566	9.7014	9.8474
20	7.7530	7.9036	8.0559	8.2095	8.3644	8.5207	8.6782
25	7.0678	7.2281	7.3899	7.5533	7.7182	7.8875	8.0522
30	6.6530	6.8218	6.9921	7.1641	7.3377	7.5127	7.6891

The amount paid per month on a loan of $200 000 over 25 years at 7.50% would be?

(A) $7.3899
(B) $147.80
(C) $738.99
(D) $1477.98

24 The back to back stem and leaf plot shows the marks obtained on a class assignment.

MARKS OBTAINED		
Girls		Boys
	0	8
6	1	7
7 4 3	2	0 2 4
9 8 □ 5 3	3	2 4 4 6 9
7 5 5 2	4	1 3 5

The number represented by □ could **NOT** be:

(A) 0
(B) 5
(C) 6
(D) 8

25 Ku-ring-gai Council is completing a scientific study using the 'capture – recapture' technique. They are trying to estimate the number of kookaburras. They capture 80 kookaburras, tag them, and then release them. Later 30 kookaburras are caught and 6 of those have tags. The size of the kookaburras population can be estimated as:

(A) 16
(B) 40
(C) 400
(D) 2400

End of Section 1

Section 2

Question 26: (15 marks) Use a SEPARATE writing booklet

(a) Solve: **Marl**

(i) $4x^2 + 7 = 71$ **2**

(ii) $\sqrt{x+5} = 3$ **2**

(iii) $\frac{n-6}{7} = \frac{2}{5}$ **2**

(b) A box contains 24 chocolates, 10 are hard centred and 14 are soft centred. Melissa takes two chocolates and eats them. What is the probability that:

(i) The first chocolate chosen is hard centred? **1**

(ii) Both are hard centred? **2**

(iii) At least one is soft centred? **1**

(c) On the television show the Voice, viewers voted for their favourite judge. The results of the top two judges were recorded in the two-way table:

	Male viewers	Female viewers	TOTALS
SEAL	1250	1750	3000
DELTA	2000	A	2800
TOTALS	3250	2550	B

(i) Calculate the values of A and B. **2**

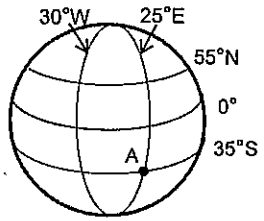
(ii) If a female viewer was selected at random from all the female viewers, what is the probability that she voted for SEAL? **1**

Question 26 continues on next page

Question 26: (continued)

Marks

(d)



Not to scale

(i) State the position of Town A on the earth's surface, giving latitude and longitude. **1**

(ii) If you travel 12° due south and 30° due west from Town A, give your new position stating latitude and longitude. **1**

End of Question 26

Question 27: (15 marks) Use a SEPARATE writing booklet

Marks

(a) Sally is preparing her annual budget for 2012. Her expected income is:

- $80 every week as a tennis coach
- Interest earned from an investment of $4000 at a rate of 5% per annum.

Her planned expenses are:

- $25 every week on transport
- $20 every week on lunches
- $50 every month on entertainment

Sally will save her remaining income. She uses the spreadsheet below for her budget:

	A	B	C	D	E	F	G	H
1				Sally's Annual Budget for 2012				
2								
3		Income				Expenses		
4								
5	Wages			$4,160		Transport		$Ⓨ
6	Interest on investment			$Ⓧ		Lunches		$1,040
7						Entertainment		$Ⓩ
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								

(i) Determine the values of Ⓧ, Ⓨ and Ⓩ. (Assume there are exactly 52 weeks in a year.) **3**

(ii) At the beginning of 2012, Sally starts saving. Will Sally have saved enough money during 2012 for a holiday costing $1400 if she keeps to her budget? Justify your answer with suitable calculations. **1**

Question 27 continues on next page

Question 27: (continued)

Marks

(b) Melissa is paid \$528 per week. For her four weeks of annual leave, she receives her normal pay plus a holiday loading of 17.5%.

Calculate Melissa's total pay for the 4 weeks that she is on holiday. **2**

(c) Anique earned \$558.60 last week. She is paid \$11.40 an hour for the first 40 hours and time and a half for any hours after that.

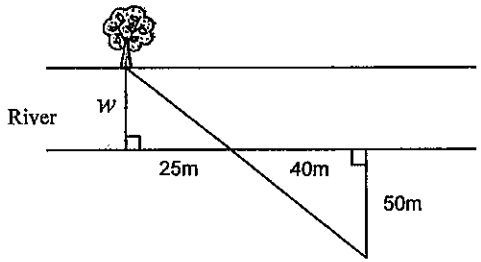
How many hours did Anique work last week? **2**

(d) A shop sells three sizes of soft drink bottles. Maddie wants to buy exactly 3L of this soft drink. What is the cheapest way she can do this? **1**

Show working to justify your answer.

(e) The width of a river w can be determined using similar triangles. Calculate the width of the river. **1**

Not to scale

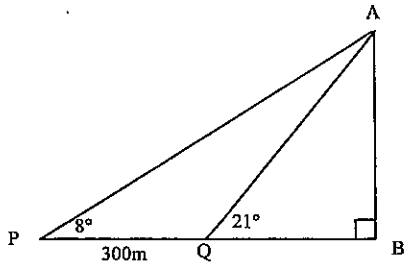


Question 27 continues on next page

Question 27: (continued)

Marks

(f)



Not to scale

When Michelle is standing at P on horizontal ground, the angle of elevation of the top of the building AB is 8°. She walks 300m to Q from where the angle of elevation is now 21°.

(i) Find angle PAQ **1**

(ii) Using the Sine Rule, find the length of AQ to the nearest metre **2**

(iii) Once Michelle has reached Q, how far is she then from the base of the building? (to the nearest metre) **2**

End of Question 27

Question 28: (15 marks) Use a SEPARATE writing booklet

Marks

(a) A car is advertised at $28 600. It can be bought on terms for a 20% deposit and repayments of $180 per week for 3 years.

Calculate:

(i) the deposit; **1**

(ii) the total cost of the car if bought on these terms; **1**

(iii) the total interest paid; **1**

(iv) the interest rate per annum. **1**

(b) The 2012 Olympic Games will be held in London. London is located at (51°N, 0°) and Sydney is located at (34°S, 151°E). If the opening ceremony starts in London at 5.00pm on 27th July, what **date** and **time** would you need to watch television in Sydney to see a live broadcast of the start of this event? **3**

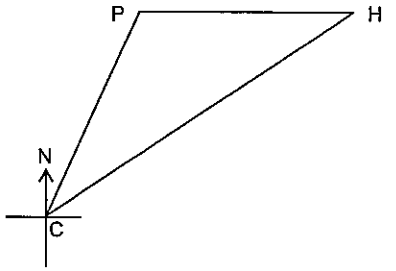
(c) The salvage value of a computer depreciates from the purchase price of $4000 to zero in 5 years. Using straight line method of depreciation, calculate the annual amount of depreciation. **2**

Question 28 continues on next page

Question 28: (continued)

Marks

(d) A group of Abbotsleigh girls walk from Camp C, on a bearing of 042° for 8km until they reach Camp P. They then walk due east for 10km reaching camp H.



Not to scale

(i) Copy the diagram into your booklet and mark in all the given information. **1**

(ii) Show that $\angle CPH = 132^\circ$ **1**

(iii) Use the cosine rule to find the distance the Abbotsleigh girls are from Camp C, when they are at Camp H. **2**

(iv) On what bearing would the Abbotsleigh girls have to travel to take the direct route from H to C? **2**

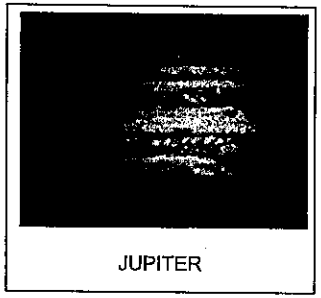
End of Question 28

Question 29: (15 marks) Use a SEPARATE writing booklet

Marks

(a) Given $E = mc^2$, find m in scientific notation, to three significant figures, if $E = 9.6 \times 10^{18}$ and $c = 3 \times 10^8$. **2**

(b)

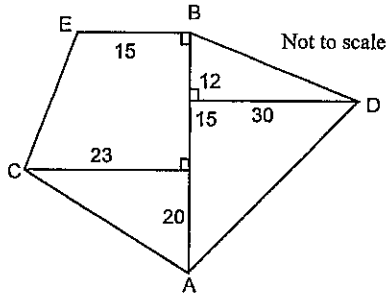


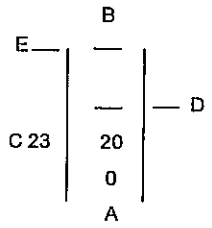
JUPITER

The diameter of the planet Jupiter is 142 984 kilometres. Calculate the surface area, in square kilometres, of the planet Jupiter. Give your answer in scientific notation correct to four significant figures. **2**

(c) A surveyor conducting an offset survey of a paddock makes the following field sketch as shown (measurements in metres).

Copy and complete the note book entry **2**



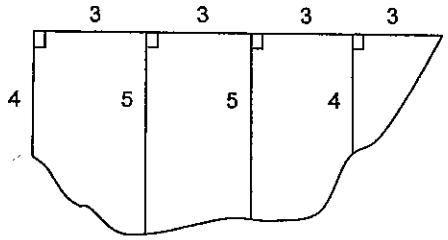


Question 29 continues on next page

Question 29: (continued)

Marks

(d) A lake has a cross-section as shown below, with measurements in metres. Use two applications of Simpson's rule to approximate the area of the lake. **3**



Not to scale

(e) Laura compared her examination results in Mathematics and English

	Mean	Standard Deviation	Laura's Mark
Mathematics	80	12	92
English	68	10.5	89

(i) Calculate Laura's z-score for Mathematics **1**

(ii) Laura's z-score for English is 2. What does this mean? **1**

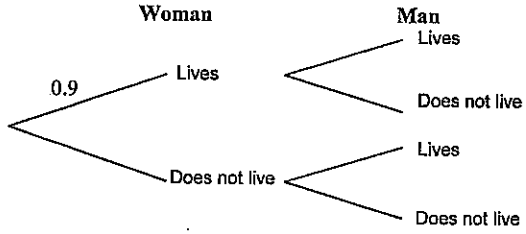
(iii) In which subject did Laura perform better relative to her classmates? Explain your answer. **1**

Question 29 continues on next page

Question 29: (continued)

Marks

(f) The probability that a 60 year old woman lives to be 70 is 0.9 and the probability that a 60 year old man lives to be 70 is 0.8.



(i) Copy the tree diagram above and complete the probability along each branch. 1

(ii) A 60 year old man and 60 year old woman are chosen at random. What is the probability that both the man and woman will be alive in 10 years' time? 1

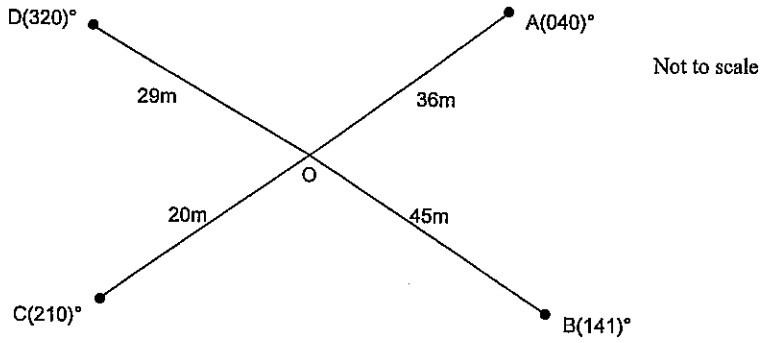
(iii) There are 150 married couples that are each 60 years of age. For how many of these couples would it be expected that both partners survive to the age of 70 years? 1

End of Question 29

Question 30: (15 marks) Use a SEPARATE writing booklet

Marks

(a) The following notebook entry was made during a radial survey of a field.

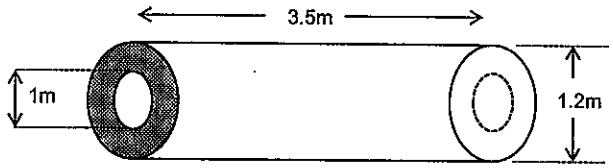


(i) What is the size of $\angle DOA$? 1

(ii) Calculate the area of triangle DOA. (Give your answer to the nearest square metre.) 2

(iii) Find the distance from D to A. (Give your answer to the nearest metre.) 2

(b) An active tunnel was constructed in concrete for the meerkats at Taronga Zoo.



(i) Find the shaded cross-sectional area of the concrete tunnel. (Answer to two decimal places.) 2

(ii) Find the volume of concrete required to make a tunnel of length 3.5 metres. (Answer to one decimal place.) 1

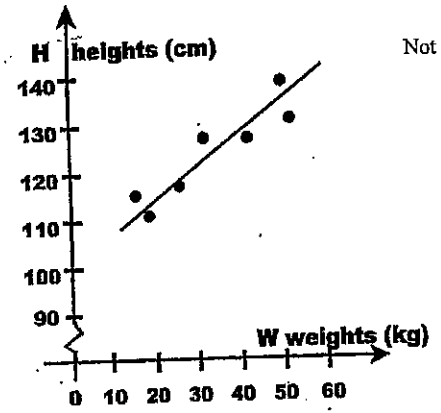
(iii) Only the outer curved surface area of the tunnel needs to be painted in Jungle Green. How many square metres of tunnel need to be painted? (Answer to one decimal place.) 2

Question 30 continues on next page

Question 30: (continued)

Marks

(c) The heights (H) and weights (W) of several chimpanzees were plotted and a line of best fit drawn.



Not to scale

(i) Find the intercept on the H-axis. 1

(ii) Calculate the gradient of the line of best fit. 1

(iii) Write down an equation relating H and W. 2

(iv) What conclusion can you draw about the relationship between the weights and heights of the chimpanzees? 1

End of paper

2012 General Maths TRIAL Solutions

Multiple Choice

1) $10 - 3(2x-1)$
$= 10 - 6x + 3$
$= 13 - 6x$
(D)

2) \$77 = 100% + 10% GST
$= 110\%$
$\therefore 1\% = \frac{\$77}{110}$
$= \$0.70$
$\therefore 10\% = \$7$
(A)

3) Testing every 10th is systematic
(D)

4) $0.0206054 = 0.0206$ (3 s.g. figs).
(B)

5) Use cosine Rule:
$\cos\theta = \frac{13^2 + 16^2 - 20^2}{2 \times 13 \times 16}$
$\cos\theta = \frac{25}{416}$
$\therefore \theta = \cos^{-1}\left(\frac{25}{416}\right)^\circ$
$= 86.55\ldots^\circ$
$= 87^\circ$ (nearest degree)
(B)

6) $400 \times (16\% \text{ of } \$2.55)$
$= 400 \times 0.16 \times \$2.55$
$= \$163.20$
(C)

Q7. $y = \sqrt{(6)^2 + 2(2.5)(12)}$

$= 9.7979...$

$= 9.8$ (best approx. value)

(B)

Q8. $5(2x+1) - 2(x+3) = 12$

$10x + 5 - 2x + 6 = 12$ $(-2 \times (+3) = -6)$ $\therefore$ Line 1 incorrect

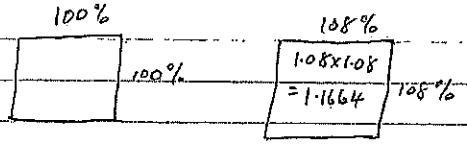
$8x + 11 = 12$ (correct from previous error)

$8x = 23$ $(12 - 11 = 1$ $\therefore$ Line 3 incorrect)

$x = \frac{23}{8}$ (correct from previous error)

(B)

Q9.



The increased area is 1.1664 times the area of original. This is closest to 1.17 = 17%

(D)

Q10. $A = \pi ab$ $a = 30$, $b = 50$

$\therefore A = \pi \times 30 \times 50$

$= 4712.38... m^2$

Total cost $= \$7.50 \times 4712.38...$

$= \$35342.91...$

$= \$35343$ (nearest $)

(C)

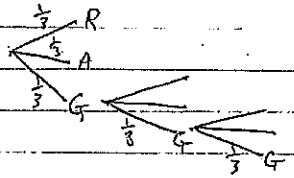
Q11. $\bar{x} = 60$, $\sigma = 2$

$\therefore \bar{x} - \sigma = 60 - 2$

$= 58$

(C)

Q12.



$P(GGG) = \frac{1}{3} \times \frac{1}{2} \times \frac{1}{3}$

(B)

Q13) I.Q.R $= 12 - 9$

$= 3$

(C)

Q14) mean $= \frac{1\times1 + 2\times2 + 3\times4 + 4\times5 + 5\times3}{1+2+4+5+3}$

$= 3.5$

(B)

Q15) Using Sine Rule: $\frac{x}{\sin 118} = \frac{25.6}{\sin 34} = \frac{21.5}{\sin 28}$

using underlined:

$x = \frac{25.6 \sin 118}{\sin 34}$

(B)

Q16) Taxable income $= \$60000 - \$5000$

$= \$55000$

Medicare Levy $= 0.015 \times \$55000$

$= \$825$

(B)

Q17) choices for Sch.Capt × Vice Capt × Sports Capt $= 5 \times 4 \times 3$

$= 60$

(C)

18). John's profit represent 9 parts out of 20 equal parts

i.e $\frac{9}{20} = \$11250$

$\therefore \frac{1}{20} = 11250 \div 9$

$= \$1250$

Pete's profit is 7 parts

i.e $7 \times \$1250 = \$8750$

(C)

19) Julie's weight is 65.5 ± 0.25

i.e lower limit $= 65.5 - 0.25$

$= 65.25$

(A)

20) Choose two coordinates to find gradient

(3, 5) and (5, 11)

$m = \frac{11-5}{5-3} = \frac{6}{2} = 3$

Now substitute $m=3$ and the point (3, 5) into $y = mx + b$

$5 = 3(3) + b$

$5 = 9 + b$

$\therefore b = -4$

so, $y = 3x - 4$

(C)

21) 6.2% p.a. $= \frac{\left(\frac{0.062}{100}\right)}{12}$ per month.

$\therefore$ Amount owing = Principal + 1 months interest − \$3800 repayment

$= 360000\left(1 + \frac{\left(\frac{0.062}{100}\right)}{12}\right)^1 - 3800$

$= \$358060$

(B)

22) 8, 10, 10, 10, 13 then 8, 10, 10, 10, 13, 35

↑ median = 10 ↑ median = 10

$\therefore$ The median has not changed

(A)

23) The amount paid per month per \$1000 = \$7.3899

$\therefore$ for a loan of \$200,000

$= 200 \times \$7.3899$

$= 1477.98$

(D)

24) 9 8 □ 5 3 need to be in numerically descending order

$\therefore \square \neq 0$

(A)

25. $\frac{\text{Entire pop}}{80 \text{ tagged}} = \frac{30}{6 \text{ tagged}}$

$\therefore$ Entire pop $= \frac{30 \times 80}{6}$

$= 400$

(C)

Section 2
Question 26

a(i) $4x^2 + 7 = 71$

$4x^2 = 64$

$x^2 = 16$

$x = \pm\sqrt{16}$

$= \pm 4$

(ii) $\sqrt{x+5} = 3$

$x + 5 = 3^2$

$\therefore x = 9 - 5$

$= 4$

(iii) $\frac{n-6}{7} = \frac{2}{5}$

$5(n-6) = 2 \times 7$

$5n - 30 = 14$

$5n = 44$

$n = \frac{44}{5}$

(b)(i) $P(\text{hard}) = \frac{10}{24} = \frac{5}{12}$

(ii) $P(\text{hard, hard}) = \frac{10}{24} \times \frac{9}{23} = \frac{15}{92}$

(iii) At least one is soft $= 1 - P(\text{hard, hard})$

$= 1 - \frac{15}{92}$

$= \frac{77}{92}$

c(i) $A = 2800 - 2000 = 800$

$B = 3000 + 2800 = 5800$

(ii) $\frac{1750 \text{ females}}{2550 \text{ females}} = \frac{35}{51}$

Q26 continued

d(i) A (35°S, 25°E)

(ii) 35°S + 12°S = 47°S

25°E − 30°W = 5°W

i.e (47°S, 5°W)

Q27

a(i) X = interest on investment

$= 0.05 \times \$4000$

$= \$200$

Y = transport costs

$= \$25 \times 52$

$= \$1300$

Z = entertainment costs

$= \$50 \times 12$

$= \$600$

(ii) total 2012 income = 4160 + 200

= $4360

total 2012 expenses = 1300 + 1040 + 600

= $2940

∴ Savings = income − expenses

= 4360 − 2940

= $1420

Sally has saved enough for a $1400 holiday.

Q27 continued

(b) Total pay for 4 weeks holiday
= 4 weeks normal pay + 4 weeks holiday loading
= 4 × $528 + 4 × 0·175 × 528
= 2112 + 369·6
= $2481·60

(c) Let x equal the number of overtime hours.

∴ 40 × $11·40 + x × 1·5 × $11·40 = $558·60
$456 + x × $17·10 = $558·60
x × $17·10 = 102·60
∴ x = $\frac{102·60}{17·10}$
= 6

∴ Anique worked 6 hours overtime,
So she worked 46 hours in total.

(d) * 1L = $0·99 /L
* 1·5L = $1·38
∴ 1L = $\frac{1·38}{1·5}$
= $0·92/L ← cheapest per L
2L = $1·85
∴ 1L = $\frac{1·85}{2}$
= $0·925/L
The 1·5L is the cheapest.

(e) $\frac{w}{50} = \frac{25}{40}$

∴ w = $\frac{25 \times 50}{40}$

= 31·25 m

Q27 cont.

(f)(i) ∠PQA = 180 − 21 (∠PQA makes a straight with ∠AQB)
= 159°

∴ ∠PAQ = 180 − (8 + 159) (using ∠sum of a Δ)
= 13°

(ii) $\frac{AQ}{\sin 8} = \frac{300}{\sin 13}$

∴ AQ = $\frac{300 \sin 8}{\sin 13}$

= 185·60... m (store this number)
= 186 m (to nearest m)

(iii) Use Δ AQB and SOH CAH TOA

cos 21 = $\frac{QB}{AQ}$

∴ QB = cos 21 × AQ
= 173·276...
= 173 m (to the nearest m)

Michelle will be 173m from the base of the building.

Q28

a (i) Deposit = 20% of $28600
= 0·2 × 28600
= $5720

(ii) Total cost = deposit + weekly repayments
= 5720 + 180 × 52 × 3
= 5720 + 28080
= $33800

(iii) Interest = 33800 − 28600 = $5200

(iv) The amount "borrowed" = $28600 − $5720 = $22880

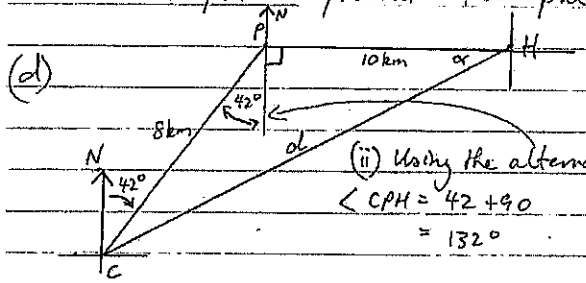
Using I = PRT where I = 5200, P = 22880, T = 3

R = $\frac{I}{PT} = \frac{5200}{22880 \times 3}$ = 0·0757575...
≐ 7·6 % p.a. (1d.p.)

(b) Longitudinal angle between London + Sydney is 151°.
Each 15° represents 60 min difference in time
151 ÷ 15 = 10.066... hrs
(×60) = 604 minutes difference
Need to add 604 minutes onto London time
i.e. 5pm + 10hrs 4min
= 03:04 the next day
i.e. 3:04 am on 28 July.

(c) $4000 ÷ 5 = $800
∴ The computer depreciates $800 p.a.

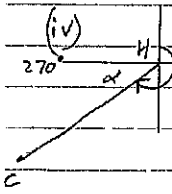
(d)



(ii) Using the alternate angle
∠CPH = 42 + 90
= 132°

(iii) $d^2 = 8^2 + 10^2 - 2(8)(10)\cos 132$
$= 271.06...$
$\therefore d = \sqrt{271.06}$
$= 16.4639...$
$= 16.5$ km (to 1 d.p.)

(iv)



Bearing from H to C is $270 - \alpha$
Use Sine Rule to find α:
$\frac{\sin\alpha}{8} = \frac{\sin 132}{d}$
$\therefore \sin\alpha = \frac{8\sin 132}{16.4639...}$
$= 0.3611$
$\therefore \alpha = 21.167°$
$\therefore$ Bearing $= 270 - 21.167 = 248.8°$

Q 29

(a) $m = \frac{E}{c^2} = \frac{9.6 \times 10^{18}}{(3 \times 10^8)^2}$
$= 106.66...$
$= 107$ (to 3 sig figs)
$= 1.07 \times 10^2$ (in scientific notation)

(b) SA (sphere) $= 4\pi r^2$
$= 4\pi \left(\frac{142984}{2}\right)^2$
$= 6.422805 \times 10^{10}$ km^2
$= 6.423 \times 10^{10}$ km^2

(c)

		B		
E	15	47		
		35	30	D
C	23	20		
		0		
		A		

(d) $A = \frac{3}{3}\left(4 + 4(5) + 5\right) + \frac{3}{3}\left(5 + 4(4) + 0\right)$
$= 29 + 21$
$= 50$ m^2

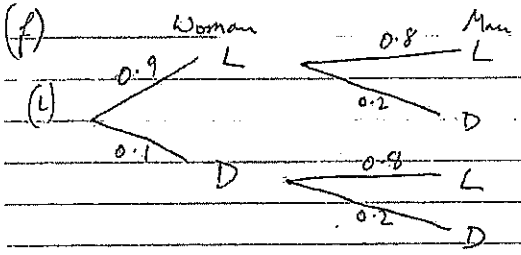
(e)(i) $Z = \frac{92 - 80}{12} = \frac{12}{12} = 1$

(ii) Her mark was 2 standard deviations above the mean mark.

(iii) Although Laura's Maths mark is higher, her mark in English is better as she has a higher Z-score.

Q29 cont

(f)

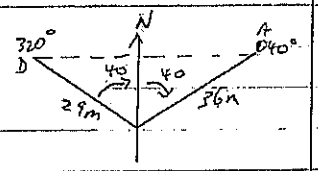


(ii) $P(LL) = 0.9 \times 0.8 = 0.72$

(iii) $0.72 \times 150 = 108$ couples.

Q30

a(i) $\angle DOA = 40° + 40°$
$= 80°$



(ii) $A = \frac{1}{2}ab\sin C$
$= \frac{1}{2}(29)(36)\sin 80$
$= 514.06$
$= 514\ m^2$

(iii) $(DA)^2 = 29^2 + 36^2 - 2(29)(36)\cos 80$
$= 1774.42\ldots$
$\therefore DA = \sqrt{1774.42\ldots}$
$= 42.12\ldots\ m$
$= 42\ m$

b (i) $A = \pi(0.6^2 - 0.5^2)$
$= 0.3455\ldots$
$= 0.35\ m^2$

(ii) $V = Ah$
$= 0.35 \times 3.5$
$= 1.2\ m^3$ (to 1d.p.)

Q30 cont

b(iii) cylinder surface (not including faces)
$= 2\pi rh$
$= 2\pi(0.6) \times 3.5$
$= 13.19\ldots$
$= 13.2\ m^2$ (to 1d.p.)

Surface including both ends
$= 13.2 + 2 \times (0.35)$
$= 13.9\ m^2$ (to 1d.p.)

c(i) H intercept = 100

(ii) Using two coordinates on the line of best fit:
(0, 100) and (40, 130)
gradient $= \frac{170 - 100}{40 - 0} = \frac{30}{40} = 0.75$

(iii) $H = 0.75W + 100$

(iv) As the chimp grows in height, the weight increases.