

MARKER CODE



Student Personal Identification Number

South Pacific Form Seven Certificate

MATHEMATICS WITH STATISTICS 2015

QUESTION and ANSWER BOOKLET

Time allowed: Two and a half hours

INSTRUCTIONS

Write your **Student Personal Identification Number (SPIN)** in the space provided on the top right hand corner of this page.

Answer **ALL QUESTIONS**. Write your answers in the spaces provided in this booklet.

If you need more space for answers, ask the Supervisor for extra paper. Write your SPIN on all extra sheets used and clearly number the questions. Attach the extra sheets at the appropriate places in this booklet.

Major Learning Outcomes (Achievement Standards)	Skill Level			Weight /Time
	Band 1 <i>Basic</i>	Band 2 <i>Proficient</i>	Band 3 <i>Advanced</i>	
StaA: Develop knowledge and skills related to Probability in order to solve problems and to investigate situations involving elements of chance.	14 questions	4 questions	2 questions	28% 56 mins
StaB: Model situations using graphical methods in order to solve problems.	12 questions	2 questions	2 questions	22% 44 mins
StaC: Carry out statistical investigations and understand statistical processes.	4 questions	2 questions	1 question	11% 22 mins
StaD: Use numeric and algebraic methods to solve problems.	7 questions	2 questions	1 question	14% 28 mins
TOTAL	37 questions	10 questions	6 questions	150 mins

Check that this booklet contains pages 2-28 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

SECTION A: SHORT ANSWERS

Question 1: Major Learning Outcome A

Develop knowledge and skills related to Probability in order to solve problems and to investigate situations involving elements of chance.

Assessor's use only

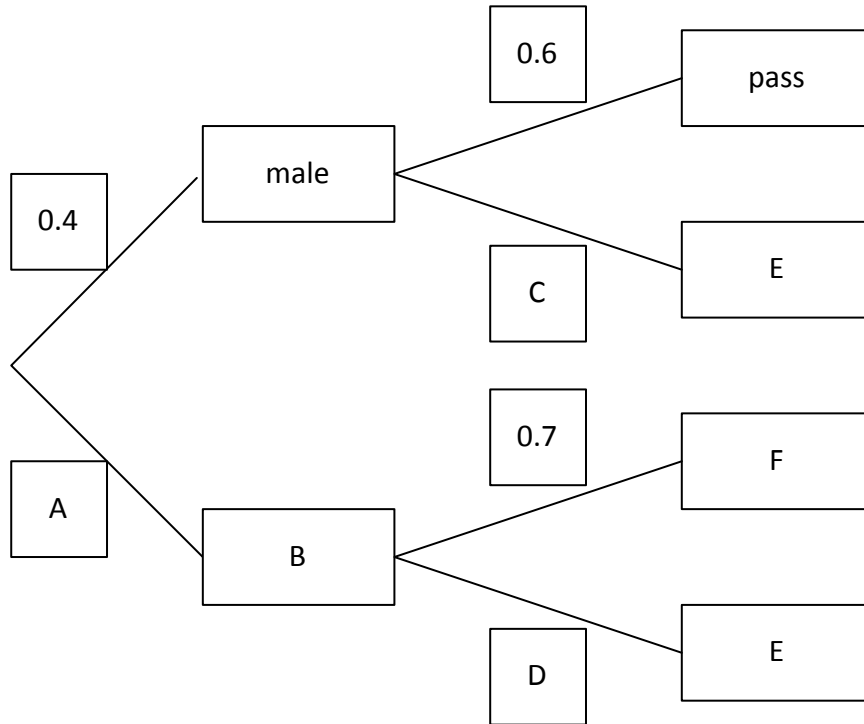
A1a	<p>Two cards are to be drawn from a deck of 52 cards without replacement. What is the probability that both are picture cards (i.e. a King, Queen, or Jack)?</p> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #cccccc;">Basic</th> <th style="background-color: #cccccc;">Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td style="width: 20px;"></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table>	Basic	Level	Excellent		Weak		NR							
Basic	Level															
Excellent																
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NR																
A1b	<p>On average the number of customers that enter the Tikong Yummy Takeaway restaurant is 5 customers per minute. Assuming customers arrive randomly within any given minute, what is the probability that exactly 6 customers enter the takeaway restaurant?</p> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #cccccc;">Basic</th> <th style="background-color: #cccccc;">Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td style="width: 20px;"></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table>	Basic	Level	Excellent		Weak		NR							
Basic	Level															
Excellent																
Weak																
NR																
A1c	<p>The weights of lavalava fish at Molimoli Lake are normally distributed with a mean of 6 kg and a standard deviation of 1.3 kg. Find the weight that 80% of fish weight less than.</p> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/> <hr style="border: 0.5px solid black;"/>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #cccccc;">Advanced</th> <th style="background-color: #cccccc;">Level</th> </tr> </thead> <tbody> <tr> <td>Exceed</td> <td style="width: 20px;"></td> </tr> <tr> <td>Excellent</td> <td></td> </tr> <tr> <td>Moderate</td> <td></td> </tr> <tr> <td>Low</td> <td></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table>	Advanced	Level	Exceed		Excellent		Moderate		Low		Weak		NR	
Advanced	Level															
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Moderate																
Low																
Weak																
NR																

Assessor's use only

A1d Consider the set $\{a, b, c, d, 1, 2, 3, 4, 5\}$ consisting of two types of objects where four are letters and five are numbers. If a subset of six objects is drawn at random, what is the probability that four objects would be of the same type?

Advanced	Level
Exceed	
Excellent	
Moderate	
Low	
Weak	
NR	

A1e The tree diagram below shows the results of a teacher's class in a history mid-term test.



(i) Complete the missing information in the probability tree by completing the following table.

A	
B	
C	
D	
E	
F	

(ii) What is the probability a randomly selected student didn't pass the test?

Basic	Level
Excellent	
Weak	
NR	

Basic	Level
Excellent	
Weak	
NR	

Question 2: Major Learning Outcome B

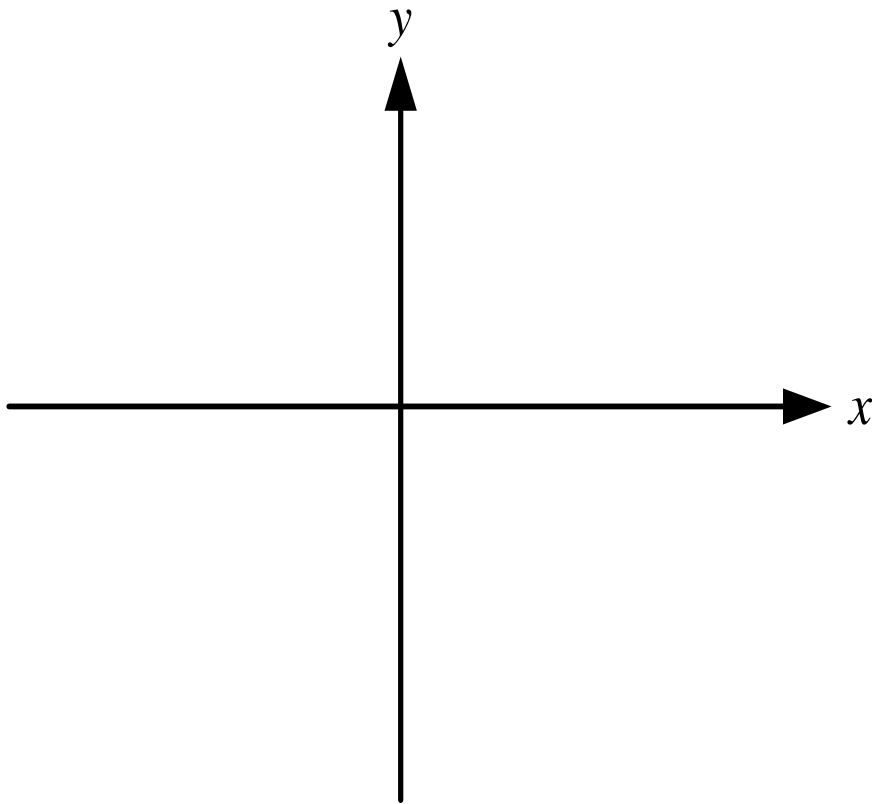
Model situations using graphical methods in order to solve problems

Assessor's use only

A2a

Consider the piecewise function $f(x) = \begin{cases} 2x + 1, & x < 0 \\ 0, & 0 \leq x \leq 1 \\ (x - 1)^2, & x > 1 \end{cases}$

(i) Sketch the graph of $f(x)$ clearly marking all relevant intercepts.

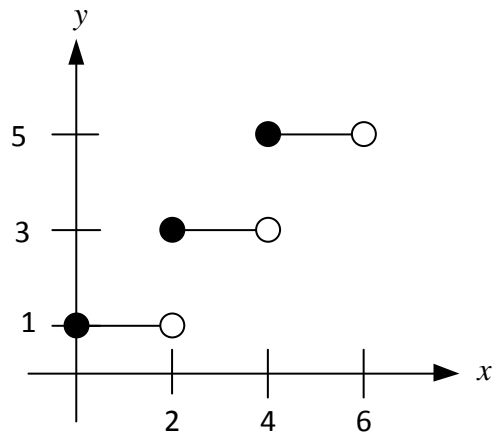


(ii) Find k if $f(k) = 9$.

Basic	Level
Excellent	
Weak	
NR	

Basic	Level
Excellent	
Weak	
NR	

A2b Consider the piecewise function whose graph is shown below.



Write the equation of the function.

Basic	Level
Excellent	
Weak	
NR	

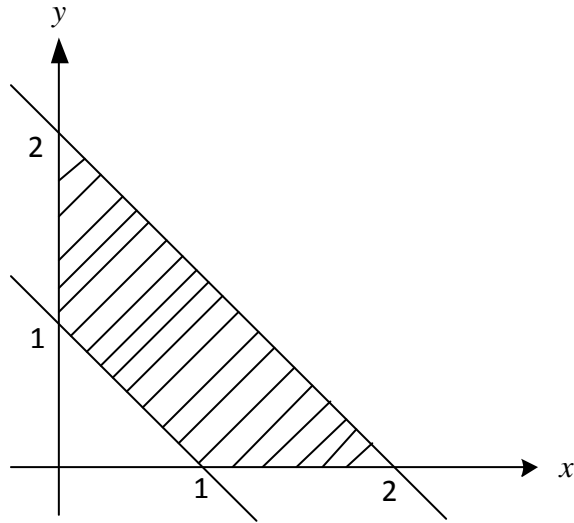
A2c Find k such that $\frac{e^{k^2}}{3} - 1.2 = 0$.

Basic	Level
Excellent	
Weak	
NR	

A2d The population of a specific group of creatures is given by the exponential function $P(t) = 568e^{0.4t}$, where t is in years. What is the population when records were first taken?

Basic	Level
Excellent	
Weak	
NR	

A2e Write a system of inequalities that describes the shade region.



Proficient	Level
Excellent	
Moderate	
Weak	
NR	

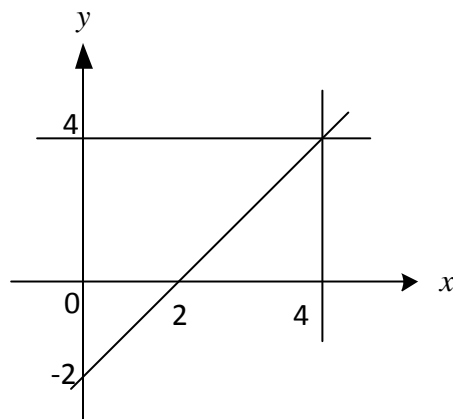
A2f The following data were collected during an experiment known to be governed by the law $V = Ap^n$, where A and n are constants.

$\ln V$	2.40	2.46	2.58	2.82
$\ln p$	0.63	0.97	1.83	3.42

Write down the linear law that is equivalent to the law given then find A and n .

Advanced	Level
Exceed	
Excellent	
Moderate	
Low	
Weak	
NR	

A2g Clearly shade the region whose boundaries are $x \geq 0$, $y \leq 4$, and $y \geq x - 2$.

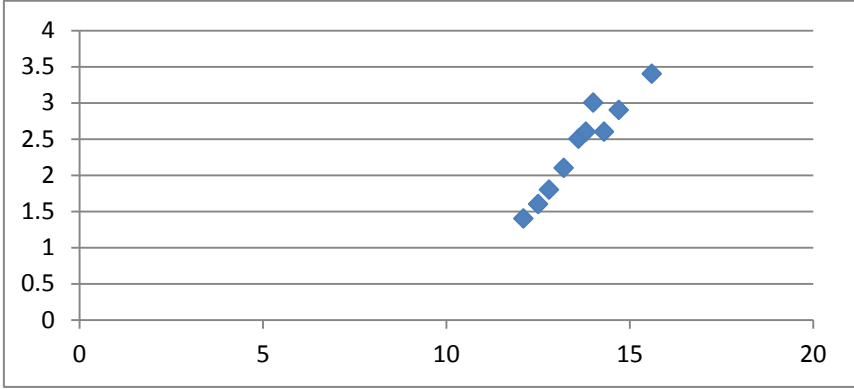


Basic	Level
Excellent	
Weak	
NR	

Question 3: Major Learning Outcome C

Carry out statistical investigations and understand statistical processes.

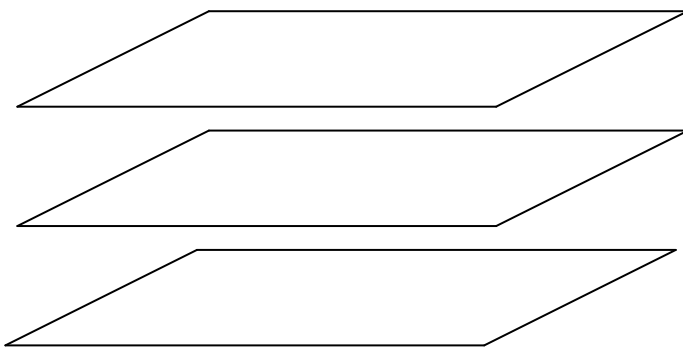
Assessor's use only

A3a	What does the Central Limit Theorem say? <hr/> <hr/> <hr/> <hr/>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;">Proficient</th> <th style="width: 20%;">Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td style="text-align: center;"> </td> </tr> <tr> <td>Moderate</td> <td style="text-align: center;"> </td> </tr> <tr> <td>Weak</td> <td style="text-align: center;"> </td> </tr> <tr> <td>NR</td> <td style="text-align: center;"> </td> </tr> </tbody> </table>	Proficient	Level	Excellent		Moderate		Weak		NR																							
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A3b	The following table gives widths (cm) and lengths (cm) of sweet potatoes from a sample taken by a researcher. <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 10%;">Length (cm)</th> <th>12.5</th> <th>13.2</th> <th>12.1</th> <th>14.3</th> <th>15.6</th> <th>14.7</th> <th>12.8</th> <th>13.6</th> <th>13.8</th> <th>14.0</th> </tr> </thead> <tbody> <tr> <th style="width: 10%;">Width (cm)</th> <td>1.6</td> <td>2.1</td> <td>1.4</td> <td>2.6</td> <td>3.4</td> <td>2.9</td> <td>1.8</td> <td>2.5</td> <td>2.6</td> <td>3.0</td> </tr> </tbody> </table>  Based on the above scatter plot, comment on the trend and the type of relationship between the width and length of the sweet potatoes. <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	Length (cm)	12.5	13.2	12.1	14.3	15.6	14.7	12.8	13.6	13.8	14.0	Width (cm)	1.6	2.1	1.4	2.6	3.4	2.9	1.8	2.5	2.6	3.0	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;">Proficient</th> <th style="width: 20%;">Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td style="text-align: center;"> </td> </tr> <tr> <td>Moderate</td> <td style="text-align: center;"> </td> </tr> <tr> <td>Weak</td> <td style="text-align: center;"> </td> </tr> <tr> <td>NR</td> <td style="text-align: center;"> </td> </tr> </tbody> </table>	Proficient	Level	Excellent		Moderate		Weak		NR	
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Question 4: Major Learning Outcome D

Use numeric and algebraic methods to solve problems.

Assessor's use only

A4a	<p>A system of linear equations is represented by the following planes.</p>  <p>What is the nature of the solution of the system?</p> <hr/> <hr/>	<table border="1"> <thead> <tr> <th>Basic</th> <th>Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table>	Basic	Level	Excellent		Weak		NR	
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Excellent										
Weak										
NR										
A4b	<p>Give a valid reason why the bisection method could not be used to solve $\frac{1}{x+1} = 0$ on the closed interval $[-2, -0.8]$?</p> <hr/> <hr/> <hr/>	<table border="1"> <thead> <tr> <th>Basic</th> <th>Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table>	Basic	Level	Excellent		Weak		NR	
Basic	Level									
Excellent										
Weak										
NR										
A4c	<p>The following is the augmented matrix represents of a system of linear equations.</p> $\begin{bmatrix} 2 & 0 & 1 & 2 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 2 & 4 \end{bmatrix}$ <p>By inspection, how many solutions are there?</p> <p>DO NOT ATTEMPT TO SOLVE THE SYSTEM.</p> <hr/> <hr/> <hr/>	<table border="1"> <thead> <tr> <th>Basic</th> <th>Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table>	Basic	Level	Excellent		Weak		NR	
Basic	Level									
Excellent										
Weak										
NR										

Assessor's use only

A4d	Give at least one disadvantage of the Newton-Raphson method. <hr/> <hr/> <hr/> <hr/>	<table border="1"><thead><tr><th>Basic</th><th>Level</th></tr></thead><tbody><tr><td>Excellent</td><td></td></tr><tr><td>Weak</td><td></td></tr><tr><td>NR</td><td></td></tr></tbody></table>	Basic	Level	Excellent		Weak		NR	
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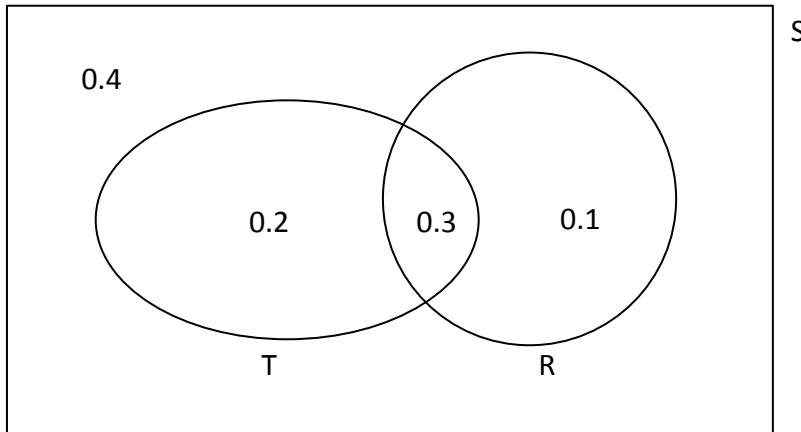
SECTION B: LONG ANSWERS

Question 1: Major Learning Outcome A

Develop knowledge and skills related to Probability in order to solve problems and to investigate situations involving elements of chance.

Assessor's use only

B1a The following Venn diagram represents a population of people who play either tennis, T, or rugby, R, or both or neither; S is the sample space.



(i) What is the probability a person plays neither tennis nor rugby?

(ii) What is the probability of a person playing rugby?

(iii) What is the probability that a person playing tennis and not playing rugby?

Basic	Level
Excellent	
Weak	
NR	

Basic	Level
Excellent	
Weak	
NR	

Basic	Level
Excellent	
Weak	
NR	

B1b A survey was conducted and 80 people were asked about their preference for yoghurt, ice-cream, and chocolate the results were: 35 liked yoghurt, 40 liked ice-cream, 31 liked chocolate, 4 likes yoghurt and chocolate only, 6 liked yoghurt and ice-cream only, 5 liked yoghurt only, and 3 liked chocolate and ice-cream only.

- (i) Explain why the events "liking yoghurt" and "liking ice-cream" are not mutually exclusive.

- (ii) A person is chosen at random. Find the probability s/he likes all three foods.

[Hint: You may find the use of an appropriate Venn diagram helpful.]

Basic	Level
Excellent	
Weak	
NR	

Proficient	Level
Excellent	
Moderate	
Weak	
NR	

B1c Three standard fair dice are shaken together and rolled on a table. The random variable X represents the number of sixes that appear on a single throw of the three dice.

(i) Explain why X has a binomial distribution.

(ii) What is $P(X = 2)$?

Proficient	Level
Excellent	
Moderate	
Weak	
NR	

Basic	Level
Excellent	
Weak	
NR	

B1d

In a game of Blotto, two marbles are drawn without replacement from a bag containing 2 red marbles and 3 blue marbles. The player receives \$5 for each red marble drawn and \$2 for each blue marble drawn. Let the random variable X denotes the amount won in a game. The probability distribution of X is given below.

x	10	7	4
$P(X = x)$	0.1	0.6	0.3

(i) Find the variance of X .

(ii) If Blotto was a fair game, how much would a player pay to play each game?

[A 'fair game' is one in which the expected winnings are zero.]

Proficient	Level
Excellent	
Moderate	
Weak	
NR	

Basic	Level
Excellent	
Weak	
NR	

B1e The mean number of phone calls which arrive every six minutes at Delixious Café is eleven. Let X be the random variable "Number of phone calls per six minutes".

(i) Explain why the Poisson distribution best models X .

(ii) Find the probability of nine calls arrive in any twelve minutes interval.

(iii) Find the probability of receiving fewer than two calls in six minutes.

Proficient	Level
Excellent	
Moderate	
Weak	
NR	

Basic	Level
Excellent	
Weak	
NR	

Basic	Level
Excellent	
Weak	
NR	

B1f	<p>A machine produces brake pads for vehicles has 1% chance of being faulty. Considering the number of faulty brake pads per batch of 1,000, find the:</p> <p>(i) mean number of faulty brake pads;</p> <hr/> <hr/> <hr/> <hr/>	<table border="1"> <thead> <tr> <th>Basic</th> <th>Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table>	Basic	Level	Excellent		Weak		NR	
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<p>(ii) standard deviation of the number of faulty brake pads.</p> <hr/> <hr/> <hr/> <hr/>	<table border="1"> <thead> <tr> <th>Basic</th> <th>Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table>	Basic	Level	Excellent		Weak		NR		
Basic	Level									
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Question 2: Major Learning Outcome B

Model situations using graphical methods in order to solve problems

Assessor's use only

<p>B2a</p>	<p>Signal Company is a medium size manufacturer of computers which are either sold locally or exported. The company has contracts to provide at least 4 computers per month locally and at least 6 computers per month for export, and it has the capacity to produce no more than 20 computers per month. The costs involved in producing a computer locally are \$3,000 and for each exported computer are \$4,000; a maximum of \$72,000 is available per month for production costs.</p> <p>Let the number of computers produced per month for local sale be x, and the number produced per month for export be y.</p> <p>Write a set of inequations for the information given. Clearly identify the constraints.</p> <p>DO NOT SOLVE PROBLEM.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<table border="1"> <thead> <tr> <th>Advanced</th> <th>Level</th> </tr> </thead> <tbody> <tr> <td>Exceed</td> <td></td> </tr> <tr> <td>Excellent</td> <td></td> </tr> <tr> <td>Moderate</td> <td></td> </tr> <tr> <td>Low</td> <td></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table>	Advanced	Level	Exceed		Excellent		Moderate		Low		Weak		NR	
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B2b Senolita has a cheque account with her bank and is concerned about her bank fees. Her bank has one fee for paper transactions (telephone, EFTPOS, and ATM transactions).

Let x represents the number of paper transactions Senolita makes in a month and y represents the number of electronic transactions she makes in a month.

Senolita looks at her bank statements for the previous year and identifies three constraints on the number of transactions. The table below shows each constraint in words as an inequation. The table is not complete.

Number	Constraints	
	In words	Inequation
1	There are at least four paper transactions in a month.	$x \geq 4$
2		$y \geq 4$
3	There are, at the most, twelve electronic transactions per month.	

Express constraint 2 in words and write an inequation for constraint 3.

Basic	Level
Excellent	
Weak	
NR	

B2c The variable x and y are related by the rule $y^4x^3 = 2$.

- (i) Use log-log technique to linearize the given rule, i.e. write it in the form $Y = a + mX$. Clearly give the values of a and m , respectively.

- (ii) What is y when $x = 3$?

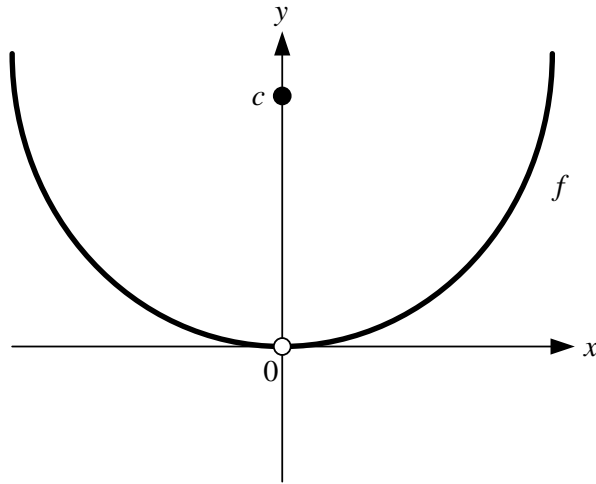
Basic	Level
Excellent	
Weak	
NR	

Basic	Level
Excellent	
Weak	
NR	

B2d	<p>Amini conducted an experiment in his Physics class and the following table gives the rate of heat loss (R) of an object at a given temperature difference (T) above the surrounding temperature.</p> <table border="1"> <thead> <tr> <th>Excess Temperature T ($^{\circ}\text{C}$)</th> <th>2</th> <th>4</th> <th>6</th> <th>11</th> <th>20</th> <th>36</th> </tr> </thead> <tbody> <tr> <td>Rate of head loss R (J/s)</td> <td>0.03</td> <td>0.05</td> <td>0.11</td> <td>0.2</td> <td>0.45</td> <td>1.22</td> </tr> </tbody> </table> <p>Amini believes that the rate of heat loss should follow the power law $R = kT^n$, where k and n are constants.</p> <p>(i) Amini plotted $\ln R$ versus $\ln T$ to find that the graph supports his claim. What would you expect the graph to look like?</p> <hr/> <hr/> <p>(ii) Amini was curious and calculated the rate of heat loss at a temperature 100°C above the surrounding temperature and found it to be 3.88. Why is this answer questionable?</p> <hr/> <hr/> <hr/> <hr/>	Excess Temperature T ($^{\circ}\text{C}$)	2	4	6	11	20	36	Rate of head loss R (J/s)	0.03	0.05	0.11	0.2	0.45	1.22	<table border="1"> <thead> <tr> <th>Basic</th> <th>Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Basic</th> <th>Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table>	Basic	Level	Excellent		Weak		NR		Basic	Level	Excellent		Weak		NR	
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B2e	<p>Without graphing, determine which of the points $P_1(4, -3)$, $P(2, -6)$, and $P_3(8, -3)$ are parts of the graph of the following system of linear inequations.</p> $\begin{aligned} x + 2y &\leq 8 \\ 2x - y &\geq 4 \end{aligned}$ <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<table border="1"> <thead> <tr> <th>Proficient</th> <th>Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td></td> </tr> <tr> <td>Moderate</td> <td></td> </tr> <tr> <td>weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> <tr> <td>Exceed</td> <td></td> </tr> </tbody> </table>	Proficient	Level	Excellent		Moderate		weak		NR		Exceed																			
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B2f

Consider the function $f(x)$ whose graph is given below, where $c > 0$.



What is the specific value of k if $k \times f(0) + 1 = 5$?

Basic	Level
Excellent	
Weak	
NR	

Question 3: Major Learning Outcome C

Carry out statistical investigations and understand statistical processes.

Assessor's use only

<p>B3a</p>	<p>Consider the confidence interval for the difference between two population means given by</p>	<table border="1"> <thead> <tr> <th>Basic</th> <th>Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table>	Basic	Level	Excellent		Weak		NR	
	Basic		Level							
	Excellent									
	Weak									
NR										
$0.2 - 1.645 \sqrt{\frac{0.75^2}{60} + \frac{x^2}{75}} < \mu_1 - \mu_2 < 0.2 + 1.645 \sqrt{\frac{y^2}{60} + \frac{0.8^2}{75}}$ <p>(i) If the mean of the first sample is 4.8, what is the mean of the second sample?</p> <hr/> <hr/> <hr/>	<table border="1"> <thead> <tr> <th>Basic</th> <th>Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table>	Basic	Level	Excellent		Weak		NR		
Basic		Level								
Excellent										
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NR										
<p>(ii) If the first sample had a standard deviation of 0.75, find x and give its meaning.</p> <hr/> <hr/> <hr/>	<table border="1"> <thead> <tr> <th>Basic</th> <th>Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table>	Basic	Level	Excellent		Weak		NR		
Basic		Level								
Excellent										
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NR										
<p>(iii) What is the level of confidence for the interval?</p> <hr/> <hr/> <hr/>	<table border="1"> <thead> <tr> <th>Basic</th> <th>Level</th> </tr> </thead> <tbody> <tr> <td>Excellent</td> <td></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table>	Basic	Level	Excellent		Weak		NR		
Basic	Level									
Excellent										
Weak										
NR										
<p>(iv) What is the margin of error for the confidence interval?</p> <hr/> <hr/> <hr/>										

<p>B3b</p>	<p>In 2000, a survey was conducted at Nukurawa University and it was found that among the 400 students interviewed 60% used public transport to travel to university. The 99% confidence interval for the population of students who use public transport to travel to university was found to be (0.5369, 0.6631).</p> <p>In 2002, a similar survey found that 51% used public transport to travel to university. Comment on this new finding.</p> <p>DO NOT ATTEMPT TO CONSTRUCT ANY CONFIDENCE INTERVAL.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<table border="1"> <thead> <tr> <th>Advanced</th> <th>Level</th> </tr> </thead> <tbody> <tr> <td>Exceed</td> <td></td> </tr> <tr> <td>Excellent</td> <td></td> </tr> <tr> <td>Moderate</td> <td></td> </tr> <tr> <td>Low</td> <td></td> </tr> <tr> <td>Weak</td> <td></td> </tr> <tr> <td>NR</td> <td></td> </tr> </tbody> </table>	Advanced	Level	Exceed		Excellent		Moderate		Low		Weak		NR	
Advanced	Level															
Exceed																
Excellent																
Moderate																
Low																
Weak																
NR																

Question 4: Major Learning Outcome D

Use numeric and algebraic methods to solve problems.

Assessor's use onlyB4a The following system of linear equations has the solution $(x, y, z) = (2, -1, 3)$.

$$\begin{aligned}x + y + 2z &= 7 \\2x - y + 3z &= 14 \\3x + 2y - 4z &= -8\end{aligned}$$

Give a geometric interpretation of this scenario.

DO NOT SOLVE THE SYSTEM.

Proficient	Level
Excellent	
Moderate	
Weak	
NR	

B4b A fisherman catches a total of 120 fishes. The fish are of three types: A, B, and C. A has average weight 3 kg, B has average weight 5 kg, and C has average weight 6.5 kg. When sold, A sells on average for \$3 per fish, B for \$8 per fish, and C for \$10.50 per fish. The total weight of fish caught is 513 kg; the total value of fish caught is \$715. Find the number of each type of fish caught.

Advanced	Level
Exceed	
Excellent	
Moderate	
Low	
Weak	
NR	

B4c

Let $f(x) = 0.2x^2 - \frac{2x+2}{12-2x}$.

(i) Show that there is a root of $f(x)$ in the interval $[4, 5]$.

(ii) Find the new interval of the root that is formed after two iterations using the bisection method.

Basic	Level
Excellent	
Weak	
NR	

Proficient	Level
Excellent	
Moderate	
Weak	
NR	

B4d

Jione invests some of the profits from his business. In order to understand one particular investment, he needs to find a solution greater than one to the equation $x^8 - 11x + 10 = 0$.

Calculate the first iterate x_1 of the Newton-Raphson method to solve this equation starting with the value $x_0 = 1.1$.

Basic	Level
Excellent	
Weak	
NR	

B4e A quadratic function has the form $f(x) = ax^2 + bx + c$, where a, b, c are constants. Suppose $f(1) = 2$, $f(2) = 5$, and $f(3) = 10$. Without solving any system of equations, explain how you would go about finding the constants a, b, c .

Basic	Level
Excellent	
Weak	
NR	