

***Scoring
Rubric
2019***

**South Pacific
Form
Seven
Certificate**

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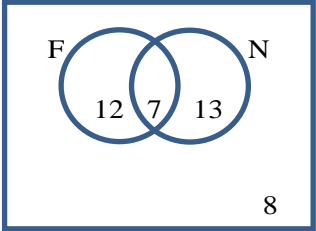
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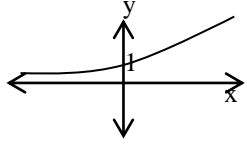
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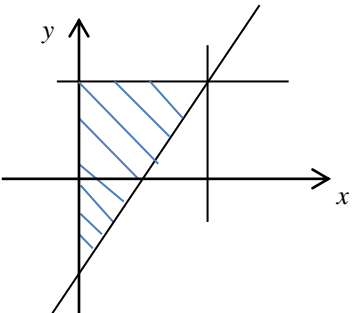
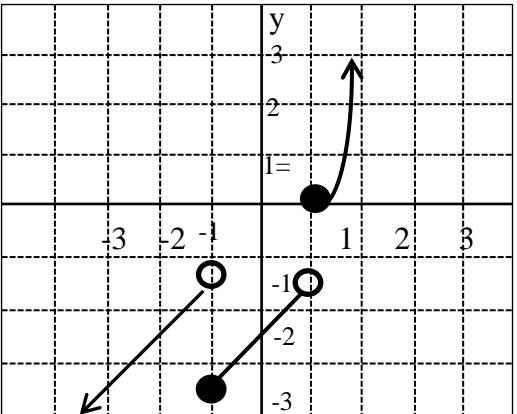
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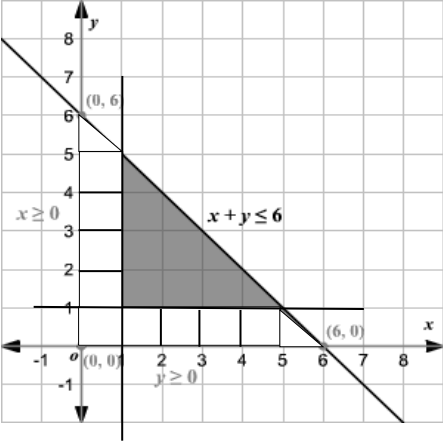
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Item	Solution	4	3	2	1	0
1.1a	All possible outcomes of a probability experiment				<i>Correct ans. Allow for 'slips'</i>	<i>No merit at all in answer</i>
1.1 b	H1,H2,H3,H4,H5,H6,T1,T2,T3,T4,T5,T6 $P(H5) = \frac{1}{12}$			<i>Correct ans.</i>	<i>Correct sample space or sample point</i>	<i>No merit at all in answer</i>
1.2a	Events in which the two outcomes are the only possibilities . $p(A) + p(A^1) = 1$				<i>Any one definition</i>	<i>No merit at all in answer</i>
1.2b	$P(A \text{ and } B) = 0.53 \times 0.35 = 0.1855$ Therefore not independent.				<i>Correct ans. or incorrect final</i>	<i>No merit at all in answer</i>
1.3	Conditional probability				<i>Correct ans.</i>	<i>No merit at all in answer</i>
1.4a	Mean (μ) Standard Deviation((σ))				<i>one correct parameter</i>	<i>No merit at all in answer</i>
1.4b	Symmetric; Unimodal; asymptotic; ,and mean, mode & median is same, bell shape				<i>One correct property</i>	<i>No merit at all in answer</i>
1.4c	$E(x) = np = 0.25 \times 40 = 10$ $\sigma = \sqrt{npq} = \sqrt{7.5}$ $\mu \quad \sigma$ Approx. with $N(10, \sqrt{7.5})$ $P(8 \leq y \leq 13) = (7.5 \leq y \leq 13.5)$ $P(-0.913 \leq z \leq 1.278)$ $= 0.3186 + 0.3980$ $= 0.7189$	<i>Correct ans. Allow for 'slips'</i>	<i>Correct interval</i>	<i>Correct approximation</i>	<i>At least mean or variance correct</i>	<i>No merit at all in answer</i>

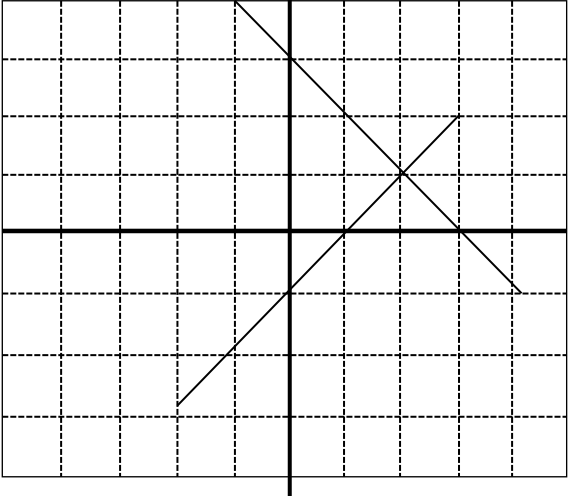
Item	Solution	4	3	2	1	0
1.5a	The numerical description of the outcome of a statistical experiment				Correct expression	No merit in response
1.5b	Quantity expressing how much members differ from a group or square root of variance.				Correct expression	no merit in response
1.5c	$\frac{2}{5} \times 5 + \frac{2}{5} \times 10 + \frac{1}{5} \times 25 = 11$			Correct ans. allow for 'slip' in working	Probabilities multiplied by numbers	Attempts, no meaningful result
1.5d	$X - [E(x)]^2 = (5-11)^2 = 36, (10-11)^2 = 1, (25-11)^2 = 196$ $SD = \sqrt{36 \times \frac{2}{5} + 1 \times \frac{2}{5} + 196 \times \frac{1}{5}} = \sqrt{54} = 7.35$			Correct ans. allow for 'slip' in working	Correct working minor slips	no merit in response
1.6a	N repeated trials, Probability same for each trial , Two outcomes, Each trial is independent of the other.				One correct property	no merit in response
1.6b	$Z = \frac{42 - 40}{2} = 1$ FT $0.3413 \times 2 = 0.6826$ $0.6826 \times 10000 = 6826$			Correct ans. allow for 'slip' in working	Correct z value	no merit in response
1.6c	$Z = \frac{44 - 40}{2} = 2$; $0.5 - 0.4772 = 0.0228$ $0.0228 \times 2 = 0.0456$ $0.0456 \times 10000 = 456$		Correct ans. allow for 'slip' in working	Correct probability or x 2	Correct z value	no merit in response
1.7a	A variable which can take only countable number of values.				Correct expression	no merit in response
1.7b	 $12 + 13 = 25$ $\frac{25}{40} = 0.625$		Correct ans. allow for 'slip' in working	Correct numbers filled in the venn diagram	venn diagram	no merit in response

Item	Solution	4	3	2	1	0
2.1	It is a function that is not a continuous curve, meaning that it has points that are isolated from each other on a graph. There is hole ,jump etc				<i>Correct expression</i>	<i>Meaningless response</i>
2.2	Creates a graph of a parabola Vertex is max/min Domain is all real numbers				<i>Correct expression</i>	<i>Meaningless response</i>
2.3a					<i>Correct shape with Y- intercept</i>	<i>No merit in response</i>
2.3b	$3^{x+2} = 3^4$ $x + 2 = 4$ $x = 2$			<i>Correct ans. allow for 'slip' in working</i>	<i>Equating the powers</i>	<i>Meaningless response</i>

Item	Solution	4	3	2	1	0
2.4a	It has inequality signs.				<i>Correct expression</i>	<i>No merit in response</i>
2.4b				<i>Correct shading</i>	<i>Correct graphs</i>	<i>Meaningless response</i>
2.5	<p> $(x,y) = (0,0)$ $x(2,0)$ $y(0,-2)$ $x(1,0)$ </p> 	Correct direction of arrows and open, closed circles.	3 graphs correct	2 graphs correct	x and y intercepts of the equations or 1 graph correct	<i>Meaningless result</i>

Item	Solution	4	3	2	1	0
2.6a	$0 = 4e^{0.055t} - 0.2e^{0.086t}$ $0.2e^{0.086t} = 4e^{0.055t}$ $0.05 = e^{-0.031t}$ $\ln 0.05 = -0.031t$ 96.64 years		Correct ans. allow for 'slip' in working	Use ln or log to solve	Equate to 0	No meaningful response
2.6b	$2^x = 12$ $\ln 2^x = \ln 12$ $x \ln 2 = \ln 12$ $x = \frac{\ln 12}{\ln 2}$ $x = 3.59$		Correct ans. allow for 'slip' in working	Writing $x \ln x$	Taking ln both sides	No meaningful response
2.7a	<p>(x,y) (0,0) (x,y) (0,0) x(6,0) y (0,6)</p> 		Correct shading	Correct drawing of graphs	x and y intercepts correct	No meaningful response
2.7b	(0,0) ,(0,6) , (6,0)			At least two points correct	At least one point correct	No meaningful response

Item no	Solution	4	3	2	1	0
3.1	Weak/ positive relationship				Correct strength or nature	No merit in response
3.2	With stratified sampling , the researcher divides the population into separate groups, called strata. Then, a probability sample (often a simple random sample) is drawn from each group			Provide two or more correct ideas	Indicates dividing the population into groups	No merit in response
3.3	$\bar{x} \pm z \times \frac{\sigma}{\sqrt{n}}$ $25 \pm 1.96 \times \frac{8}{\sqrt{10}}$ 25 ± 4.958 $20.042 \quad - \quad 29.958 \quad (20 - 30)$		Correct ans. allow for 'slip' in working	Correct z value	Correct CI formula	No merit in response
4.1	unique solution, infinitely many solutions, and no solution				One Correct answer	No merit in response
4.2	It brackets the root much more quickly				Correct expression	No merit in response
4.3	It can identify repeated roots It can find complex roots of polynomials Newton-Raphson converges quicker				Any one correct advantage	No merit in response

Item	Solution	4	3	2	1	0
4.4	<p>$x(3,0)$ $y(0,3)$ $x(1,0)$ $y(0,-1)$</p>  <p>$(2, 1)$</p> <p>The solution is unique as there is only one possible value of x and y $(2,1)$.</p>			<p><i>Correct POI</i></p> <p><i>The solution is unique as there is only one possible value of x and y $(2,1)$</i></p>	<p><i>Correct intercept and intersection of graphs drawn or correct POI</i></p>	<p><i>No merit or meaningful response</i></p>
4.5	<p>$1.5x + 0.5y = 78.5$</p> <p>$x + y = 87$</p>				<p>At least one correct equation</p>	<p><i>No merit or meaningful response</i></p>

Item	Solution	4	3	2	1	0
4.6	$\begin{pmatrix} 1 & 1 & 1 \\ 0 & 2 & 2 \\ 2 & 5 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 6 \\ -4 \\ 27 \end{pmatrix}$ $AX = B$ $X = A^{-1}B$ $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \frac{1}{-21} \begin{pmatrix} -27 & 6 & 3 \\ 10 & -3 & 5 \\ -4 & -3 & 2 \end{pmatrix} \begin{pmatrix} 6 \\ -4 \\ 27 \end{pmatrix}$ $= \frac{1}{-21} \begin{pmatrix} -105 \\ -63 \\ 42 \end{pmatrix} = \begin{pmatrix} 5 \\ 3 \\ -2 \end{pmatrix}$ $x = 5, y = 3, z = -2$		<i>Correct ans. allow for 'slip' in working</i>	<i>Correct inverse matrix</i>	<i>Correct matrix equation</i>	<i>No merit or meaningful response</i>

Item	Solution	4	3	2	1	0
4.6	<p>Solution (Alternative)</p> $x + y + z = 6 \text{equation 1}$ $2x + 5y - z = 27 \text{equation 2}$ $2y + 5z = -4 \text{equation 3}$ <p>Multiply equation 1 by 2 and then subtract equation 2 from it to eliminate variable x</p> $(x + y + z = 6) \times 2$ $2x + 2y + 2z = 12$ $-(2x + 5y - z = 27)$ $-3y + 3z = -15$ $(-3y + 3z = -15) \times 2 \rightarrow -6y + 6z = -30$ $(2y + 5z = -4) \times 3 \rightarrow + (6y + 15z = -12)$ $21z = -42$ $z = -2$ <p>Substitute $z = -2$ in equation 2 to find the value of y.</p> $2y + 5z = -4$ $2y + 5(-2) = -4$ $2y - 10 = -4$ $2y = 6$ $y = 3$ <p>Substitute $y = 3$ and $z = -2$ in equation 1 to find the value of x</p> $x + y + z = 6$ $x + 3 - 2 = 6$ $x = 5$ $\therefore (x, y, z) = (5, 3, -2)$		Correct ans. allow for 'slip' in working	Correct substitution	Correct making y the subject	No merit or meaningful response

Item	Solution	4	3	2	1	0
4.6	<p>(Alternative)</p> <p>Using Reduced Row Echelon form (Method 2)</p> $\left(\begin{array}{ccc c} 1 & 1 & 1 & 6 \\ 0 & 2 & 5 & -4 \\ 2 & 5 & -1 & 27 \end{array}\right) \xrightarrow{2R_1 - R_3 \rightarrow R_3} \left(\begin{array}{ccc c} 1 & 1 & 1 & 6 \\ 0 & 2 & 5 & -4 \\ 0 & -3 & 3 & -15 \end{array}\right) \xrightarrow{3R_2 + 2R_3 \rightarrow R_3}$ $\left(\begin{array}{ccc c} 1 & 1 & 1 & 6 \\ 0 & 2 & 5 & -4 \\ 0 & 0 & 21 & -42 \end{array}\right) \xrightarrow{R_3 \div 21 \rightarrow R_3} \left(\begin{array}{ccc c} 1 & 1 & 1 & 6 \\ 0 & 2 & 5 & -4 \\ 0 & 0 & 1 & -2 \end{array}\right) \xrightarrow{5R_3 - R_2 \rightarrow R_2}$ $\left(\begin{array}{ccc c} 1 & 1 & 1 & 6 \\ 0 & -2 & 0 & -6 \\ 0 & 0 & 1 & -2 \end{array}\right) \xrightarrow{R_2 \div -2 \rightarrow R_2} \left(\begin{array}{ccc c} 1 & 1 & 1 & 6 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & -2 \end{array}\right) \xrightarrow{-R_3 + R_1 \rightarrow R_1}$ $\left(\begin{array}{ccc c} 1 & 1 & 0 & 8 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & -2 \end{array}\right) \xrightarrow{-R_2 + R_1 \rightarrow R_1} \left(\begin{array}{ccc c} 1 & 0 & 0 & 5 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & -2 \end{array}\right)$ <p>$\therefore x = 5 \quad y = 3 \quad z = -2$</p>		Correct ans. allow for 'slip' in working	Correct reduction of row	Correct matrix	No merit or meaningful response

4.7	$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ $f' = 3x^2 + 14x + 8$ $x_1 = x_0 = 5 - \frac{f(0)}{f'(0)} = 5 - \frac{-13}{13} = 6$ $x_2 = 6 - \frac{f(6)}{f'(6)} = 6 - \frac{9}{32} = 5.71875$	<i>Correct ans. allow for 'slip' in working</i>	Correct value of x_1	<i>Correct f'</i>	Correct formula	<i>No merit or meaningful response</i>
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