



EDUCATIONAL QUALITY AND ASSESSMENT PROGRAMME

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Scoring Schedule 2018

**South Pacific
Form
Seven
Certificate**

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2018 SPFSC Mathematics with Statistics - Marking Schedule

Item Number	Skill Level	Evidence	Skill Level			
			1	2	3	4
STRAND 1: Probability						
1.1a	1	Events that cannot both occur, i.e. they have nothing in common.	Correct answer.			
1.1b	2	$P(TT \text{ or } HH) = 1/4 + 1/4 = 1/2 \text{ or } 0.5$	Correct choices but incorrect final answer due to numerical errors. Allow the possibility of giving just a correct answer without any proper justification.	Correct answer based on correct calculations.		
1.2a	1	The occurrence of A has no effect on the likelihood of B occurring.	Correct answer.			
1.2b	1	A and B are not independent because $P(A)P(B) = (0.2)(0.16) = 0.032 \neq 0.04 = P(A \cap B)$.	Correct answer.			
1.3	1	$E = \{(1,6), (6,1), (2,5), (5,2), (3,4), (4,3)\}$	Correct answer.			
1.4a	1	There are two parameters: the number of trials n , and the probability of success p .	Correct answer.			
1.4b	1	Acceptable properties: consists of fixed number of n trials; only two possible outcomes for each trial; probability of success p at each individual trial is constant; each trial is independent.	Any correct three properties.			

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			1	2	3	4
1.4c	4	$n=5, p=1/6, q=1-p=5/6$ $P(X = 3) = \binom{5}{3} \left(\frac{1}{6}\right)^3 \left(\frac{5}{6}\right)^2$ $= 10 \times \frac{1}{216} \times \frac{25}{36} = \frac{250}{7776}$ $= \frac{125}{3888} \text{ or } 0.0322$	Clear indication of poor understanding.	Substitute at least 2 correct values into the correct formula.	Partially correct but due to numerical errors the final answer is incorrect.	Correct answer.
1.5a	1	The "expected value" of a random variable is a kind of a theoretical average that it should take.	Correct answer.			
1.5b	1	The "variance" is the square of the standard deviation, i.e. a measure of the spread of data about the mean.	Correct answer.			
1.5c	2	$E(X)$ $= 3(0.2) + 4(0.4) + 5(0.3) + 6(0.1)$ $= 0.6+1.6+1.5+0.6 = 4.3$	Partially correct but due to numerical errors the final answer is incorrect.	Correct answer.		
1.5d	2	$Var(X) = E[(X - \mu)^2]$ $= (3 - 4.3)^2(0.2) + (4 - 4.3)^2(0.4)$ $+ (5 - 4.3)^2(0.3) + (6 - 4.3)^2(0.1)$ $= (-1.3)^2(0.2) + (-0.3)^2(0.4)$ $+ (0.7)^2(0.3) + (1.7)^2(0.1)$ $= 0.81$	Partially correct but due to numerical errors the final answer is incorrect.	Correct answer.		
1.6a	1	Normal distribution depends on two parameters: the mean and the standard deviation.	Correct answer.			
1.6b	2	$P(X < 595) = P\left(Z < \frac{595 - 600}{4}\right)$ $= P(Z < -1.25) = 0.5 - P(0 < Z < 1.25)$ $= 0.5 - 0.3944 = 0.1056 \text{ or } 10.56\%$	Partially correct but due to numerical errors the final answer is incorrect.	Correct answer.		

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			1	2	3	4
1.6c	3	$P(X > 597) = P\left(Z > \frac{597 - 600}{4}\right)$ $= P(Z > -0.75) = 0.5 + P(0 < Z < 0.75)$ $= 0.5 + 0.2734 = 0.7734$ Number over 602 is $(0.7734)(750)=580$	Clear indication of poor understanding.	Partially correct but due to numerical errors the final answer is incorrect.	Correct answer.	
1.7a	1	A variable whose values cannot be predicted in advance, i.e. the values are determined by outcome of an experiment.	Correct answer.			
1.7b	3	$P=2T+5C$ $\text{Var}(P) = \text{Var}(2T + 5C)$ $= \text{Var}(2T) + \text{Var}(5C) = 2^2\text{Var}(T) + 5^2\text{Var}(C)$ $= 4 \cdot 3^2 + 25 \cdot 8^2 = 36 + 1600 = 1636$ $\text{SD}(P) = \sqrt{1636} = 40.4475 \text{ (4 dp)}$	Clear indication of poor understanding.	Partially correct but due to numerical errors the final answer is incorrect.	Correct answer.	
STRAND 2: Modelling Using Graphical Methods						
2.1	1	The graph is continuous, unbroken line or curve, i.e. there is no hole, gap, skip, or jump in the graph of a continuous function.	Mention at least any two acceptable properties.			
2.2	1	Linear functions have the general form $y=mx+b$, where m is the slope and b is the y -intercept. The graph is always a straight line and continuous everywhere.	Mention at least one of the acceptable properties.			
2.3a	1	$y = ax^b$, where a and b are constants.	Correct answer.			
2.3b	2	$120 = 10t^{1.6}$ when $t = 12^{-1.6} = 4.7$ years	Partially correct but due to numerical errors the final answer is incorrect.	Correct answer.		
2.4a	1	It is a linear expression in terms of x and y , say, that needs to be optimised subject to a set of constraints.	Correct answer.			

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2.4b	2	$f(x, y) = 0.6x + 0.7y$	Partially correct answer, for instance mistakenly swapping the coefficients.	Correct answer.		
2.4c	4	$400x + 500y \geq 8000,$ $300x + 600y \geq 9000,$ $x \geq 0,$ $y \geq 0$	Clear indication of poor understanding.	Giving two correct.	At least three correct.	Correct answer.
2.5	3	As t increases (without bound) $e^{-5t} = \frac{1}{e^{5t}}$ tends to 0. Hence, the current reaches a steady state of 0.7 amps as t increases.	Clear indication of poor understanding.	Giving partially sound, acceptable answer.	Correct answer.	
2.6	2	$5^x = 17$ $\ln 5^x = \ln 17$ $x \ln 5 = \ln 17$ $x = (\ln 17)/(\ln 5) = \frac{2.83321}{1.60944} = 1.76037$	Partially correct answer due to numerical errors in computation	Correct answer.		

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2.7a	2		Partially correct without all the relevant details shown. There should be some clear indication that the candidate have some 'vague' idea of how to start answering in the right direction.	Correct answer.		
2.7b	3	Solve $x+y=5$ and $4x+y=8$ simultaneously to get (1,4). Solve $x+y=5$ and $x+3y=9$ simultaneously to get (3,2). The other two relevant points are (0,8) and (9,0).	Clear indication of poor understanding.	Partial correct answer: giving two or three correct points.	Giving all four correct points.	
STRAND 3: Statistical Investigations						
3.1	1	Strong and negative.	Correct answer.			
3.2	2	$y = 55.299(2010) - 109626$ $= 111150.99 - 109626$ $= 1524.99$ million dollars	Partially correct answer but incorrect final answer due to numerical errors.	Correct answer.		

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3.3	3	The probability that the interval encloses the mean voltage is 90%, i.e. 90% of such intervals, in the long-run, would contain μ .	Clear indication of poor understanding.	A slight indication of some vague understanding of the concept.	Correct answer.	
STRAND 4: Numerical and Algebraic Methods						
4.1	1	These are parallel lines and therefore they is no solution.	Correct answer.			
4.2	1	It has not root there because it has a point of dicontinuity at $x=1$ which is in $[0,2]$.	Correct answer.			
4.3	1	$f'(x)$ may be difficult to obtain; $f'(x)=0$ at some point during the interative process.	Giving an acceptable answer.			
4.4	2	$x - y = 5 \Rightarrow x = y + 5$ $2(y + 5) + 3y = 65 \Rightarrow 5y = 55 \Rightarrow y = 11$ $x - 11 = 5 \Rightarrow x = 16$ $\therefore (x, y) = (16,11)$	Correct method but incorrect final answer due to numerical errors. Also, expect that candidate may use other method to give the correct answer.	Correct method giving correct answer.		
4.5	2	By completing the table, it should be clear that the the solution lies between 0.8 and 0.9 because this is where the sign changes from positive to negative.	Incorrect interval but reasoning may be sound and based on what calculated.	Correct answer.		
4.6	3	$4x + 9y + 12z = 101$ $2x + 5y + 8z = 63$ $x + y + z = 12$	Clear indication of poor understanding.	Giving at two equations correctly; marker's discretion is sought.	Giving all three equations correctly.	

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4.7	4	$x_{n+1} = x_n - \frac{e^{x_n} - x_n - 2}{e^{x_n} - 1} = \frac{(x_n - 1)e^{x_n} + 2}{e^{x_n} - 1}$ $x_0 = 1$ $x_1 = 1.163953414$ $x_2 = 1.146421185$ $x_3 = 1.146193259$ $x_4 = 1.146193221 = x_5$	Clear indication of poor understanding.	Giving incorrect answers but method is correct. Mistakes due to numerical errors.	At least two of the iterates are correct	Giving all correct iterates.