MARKER CODE

Pacific Community
Communauté du Pacifique

EQAP

Student Personal Identification Number						

South Pacific Form Seven Certificate

MATHEMATICS WITH STATISTICS
2022

QUESTION and ANSWER BOOKLET

Time allowed: Three hours

(An extra 10 minutes is allowed for reading this paper.)

INSTRUCTIONS

1. Write your **Student Personal Identification Number (SPIN)** in the space provided on the top right-hand corner of this page.
2. Answer **ALL QUESTIONS**. Write your answers in the spaces provided in this booklet. For **Multiple Choice Questions**, circle the letter that represents the **BEST** answer.
3. Show all your working. Unless otherwise stated, numerical answers correct to **three significant figures** will be adequate.
4. 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 & Number of Questions				Weight/ Time
	Level 1 *Uni-structural*	Level 2 *Multi-structural*	Level 3 *Relational*	Level 4 *Extended Abstract*	
Strand 1: Probability Develop knowledge and skills related to probability in order to solve problems and to investigate situations involving elements of chance.	6	2	2	1	20% 60 min
Strand 2: Modelling Using Graphical Methods Model situations using graphical methods in order to solve problems.	6	4	1	0	17% 51 min
Strand 3: Statistical Investigations Carry out statistical investigations and understand statistical processes.	3	2	1	0	10% 30 min
Strand 4: Numerical and Algebraic Methods Use numeric and algebraic methods to solve problems.	2	2	1	1	13% 39 min
TOTAL	**17**	**10**	**5**	**2**	**60% 180 min**

Check that this booklet contains pages 2–17 in the correct order and that none of these pages are blank.

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

STRAND 1: PROBABILITY

Assessor's use only

1.1 A fair die is rolled in a game of snakes and ladders.

Which of the following represents the outcome of the event: 'the result is an **even** number'?

A. {1, 3, 5}

B. {2, 4, 6}

C. {1, 2, 4, 6}

D. {1, 2, 3, 4, 5, 6}

Unistructural	
1	
0	
NR	

1.2 Define the term **complementary events**.

Unistructural	
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0	
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1.3 A committee of five is to be formed from seven men and five women.

What is the probability that a randomly selected committee has **at least two** of each gender in the committee?

Relational	
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Assessor's use only

1.4	A table with all possible values of a random variable and its corresponding probabilities is called _____. A. variance B. expected value C. standard deviation D. probability distribution	**Unistructural** 1 0 NR
1.5	The binomial distribution, normal distribution and Poisson distribution have parameters. Define the term **parameters**.	**Unistructural** 1 0 NR
1.6	The number of visitors to a webserver per minute follows a Poisson distribution. If the average number of visitors per minute is 6, what is the probability that there are **less than three** visitors in one minute?	**Relational** 3 2 1 0 NR

Assessor's use only

1.7 State **one** feature of normal distribution.

Unistructural	
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1.8a **Use the information below to answer questions 1.8a and 1.8b.**

An experiment that produces the discrete random variable X has a probability distribution as shown in the table.

X	6	7	8	9	10
P(X)	0.2	0.2	0.3	0.2	k

Find the value of k.

Multistructural	
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1.8b Calculate the **variance** of X.

Multistructural	
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Assessor's use only

1.9 A and B are independent events with $P(A) = 0.3$ and $P(B) = 0.2$.

Find $P(A \cup B)$.

Multistructural	
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1.10 The amount of weight lost by people on a special diet is normally distributed with a mean of 8 kg and a standard deviation of 3.5 kg.

If 1500 people were on this diet, how many are expected to lose weights between 6.95 kg and 10.8 kg?

Extended Abstract	
4	
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STRAND 2: MODELLING USING GRAPHICAL METHODS

Assessor's use only

2.1 State **one** feature of a linear function.

Unistructural	
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NR	

2.2 A function can be either continuous or discontinuous.

State **one** property of discontinuous functions.

Unistructural	
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NR	

2.3 An exponential function is given as $g(x) = 2(3)^x$.

Identify the y-intercept (initial value) of the function.

Unistructural	
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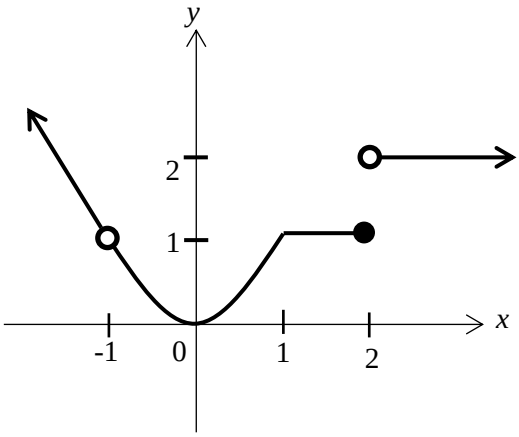
NR	

2.4 The graph of a piece-wise function, $f(x)$ is shown below.



For what values of x is the function discontinuous?

Multistructural	
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Assessor's use only

2.5 The data in the table given below has x related to y by the exponential function of the type $y = a\,m^x$.

x	0	10	20	30
y	2.30	5.97	15.47	40.13
$Y = \log(y)$	0.36	0.78	1.19	1.60

Use semi-log technique to transform $y = a\,m^x$ into the form $Y = A + Bx$ where; $Y = \log(y)$, $A = \log(a)$, $B = \log(m)$ then find the values of a and m.

Relational	
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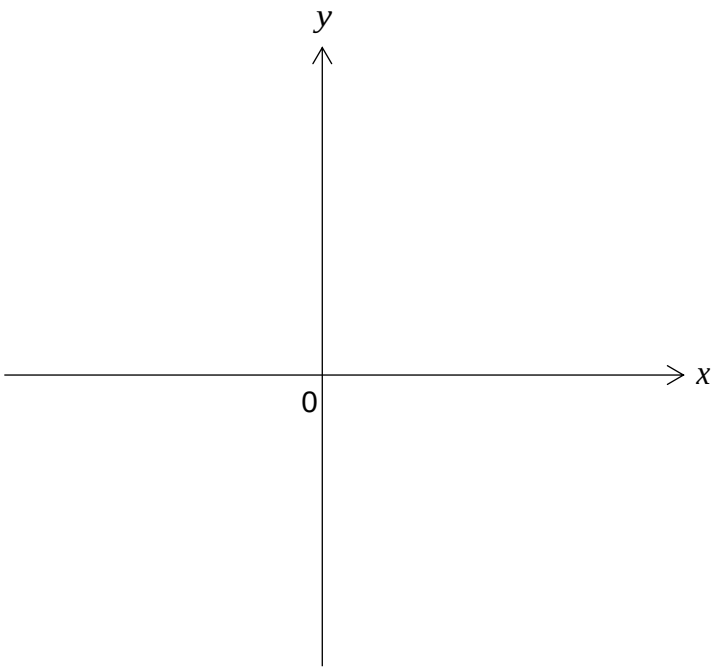
NR	

Assessor's use only

2.6 Sketch the graph of $y = x^{\frac{1}{2}}$ clearly showing the intercept(s).



Unistructural	
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2.7 Solve the equation $x^{\frac{3}{2}} - 4 = 23$

Multistructural	
2	
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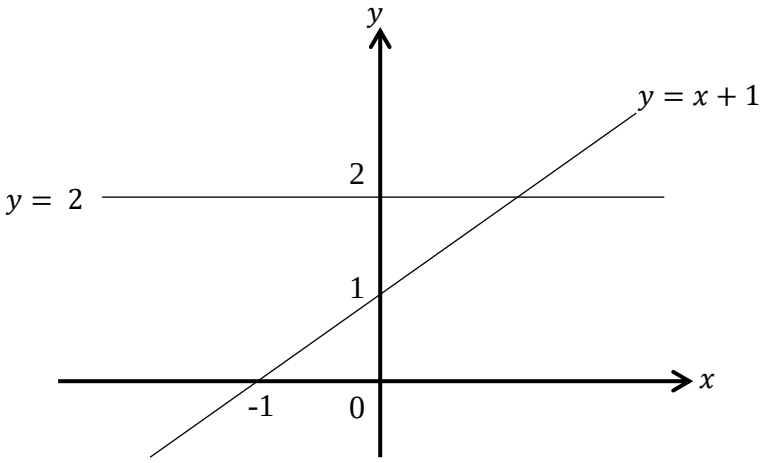
Assessor's use only

2.8	Solve $e^{x-2} = 12$ using the laws of natural logarithm.	**Multistructural** 2 | 1 | 0 | NR |
2.9	State **one** general feature of inequations.	**Unistructural** 1 | 0 | NR |

Assessor's use only

2.10 Shade the region whose boundaries are $x \geq 0$, $y \leq 2$ and $y \geq x + 1$.



Unistructural	
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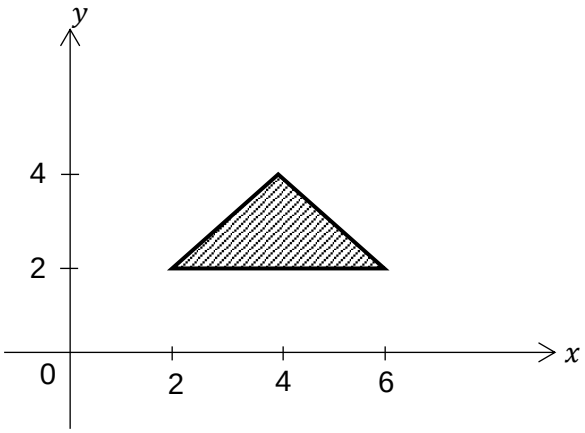
2.11 Find the minimum value of $P = 3x - 2y$ over the shaded region shown below.



Multistructural	
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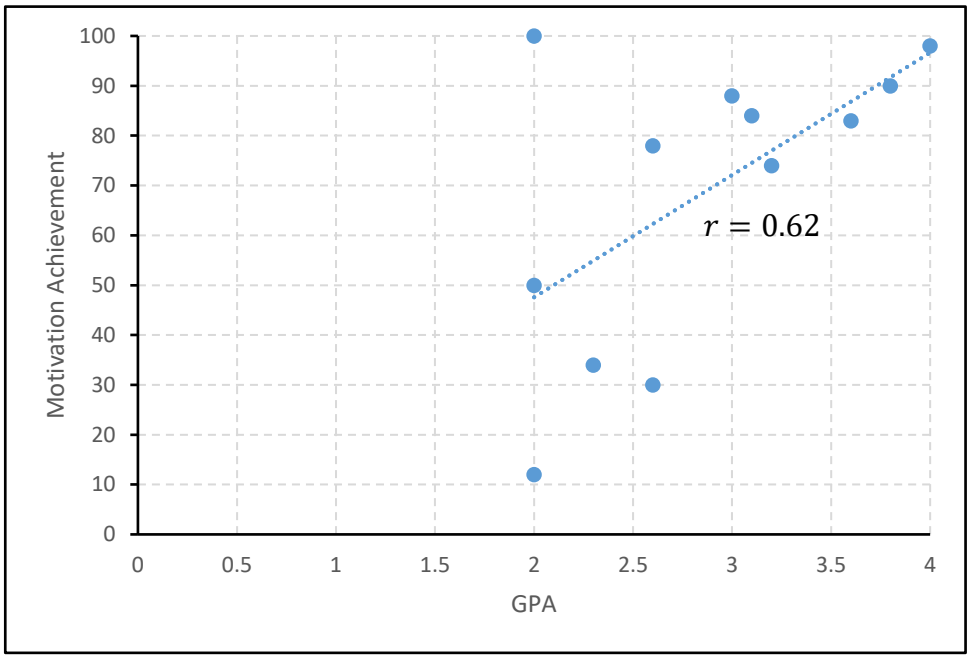
STRAND 3: STATISTICAL INVESTIGATIONS

Assessor's use only

3.1	State **one** general feature of scatter plots. _____ _____ _____ _____ _____	**Unistructural** 1 0 NR
3.2	Sampling is one of the important factors that determines the accuracy of a survey result. State **one** method of sampling. _____ _____ _____ _____ _____ _____	**Unistructural** 1 0 NR
3.3	Define **sample size** as used in statistics. _____ _____ _____ _____ _____	**Unistructural** 1 0 NR

Assessor's use only

3.4 The relationship between Grade Point Average (GPA) and motivation achievement is shown below.



Based on the above representation, describe the strength of the relationship between GPA and motivation achievement.

Multistructural	
2	
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Assessor's use only

3.5	A survey of 400 airline passengers found that 238 were satisfied with the service provided by flight attendants. Compute the point estimate of the proportion of passengers who are satisfied with the service from flight attendants.	**Multistructural** 2 1 0 NR
3.6	A random sample of 36 trees of a certain species from population **A** has a mean height of 175 cm with a sample standard deviation of 15 cm. A sample of 48 trees of the same species from population **B** has a mean height of 169 cm with a sample standard deviation of 12 cm. Calculate the 95% confidence interval for the difference in means between populations **A** and **B**.	**Relational** 3 2 1 0 NR

STRAND 4: NUMERICAL AND ALGEBRAIC METHODS

Assessor's use only

4.1 Solving a system of linear equations yields three types of solutions. One type of solution is infinitely many solutions.

State **another** type of solution.

Unistructural	
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4.2 State **one** disadvantage of using the Newton-Raphson method to approximate the root of a function.

Unistructural	
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4.3 A system of linear equations is given below.

$$12x + ay = k$$

$$3x + y = 4$$

Determine the condition such that the above system of equations is consistent with infinitely many solutions.

Multistructural	
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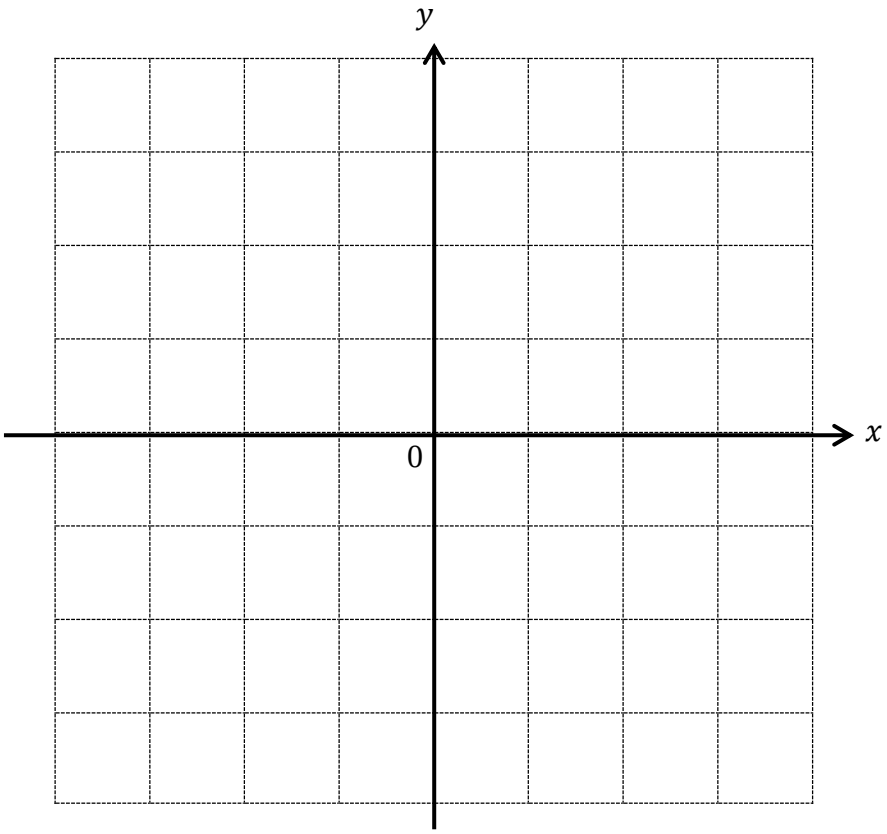
Assessor's use only

4.4 Use the graphing method to solve the following system of linear equations.

$x - y = 1$

$x + y = 3$



Multistructural	
2	
1	
0	
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Assessor's use only

4.5 A fishing company catches a total of 120 fish on a particular night. The fish are of three types: **A**, **B** and **C**. Type **A** has an average weight of 3 kg, type **B** has an average weight of 5 kg and type **C** has an average weight of 6.5 kg.

Type **A** sells on average for \$3 per fish, type **B** for \$8 and type **C** for \$10.50. The total weight of fish caught is 513 kg and the total value of fish caught is \$715.

Let: x = the number of type **A** caught;

y = the number of type **B** caught; and

z = the number of type **C** caught.

Write down a system of linear simultaneous equations that represent this information.

DO NOT ATTEMPT TO SOLVE THE SYSTEM.

Relational	
3	
2	
1	
0	
NR	

Assessor's use only

4.6 A function is given as $f(x)=x^3 + 3x - 3$.

Using [0.5, 1] as the starting interval, calculate seven iterations of the bisection method to solve the equation $f(x) = 0$.

Fill in the table to find the value of the root to **2 decimal places**.

Iterations	a	b	$c = \frac{a+b}{2}$	$f(c)$
1	0.5	1		
2				
3				
4				
5				
6				
7				

Extended Abstract	
4	
3	
2	
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THE END