



THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY  
DEPARTMENT OF MATHEMATICS & COMPUTER SCIENCE

**SECOND SEMESTER EXAMINATIONS – 2022**

**SECOND YEAR BACHELOR PROPERTY PROFESSIONAL STUDIES**

**MA226 – QUANTITATIVE METHODS FOR PROPERTY PROFESSIONAL STUDIES**

**TIME ALLOWED: 3 HOURS**

**INFORMATION FOR CANDIDATES:**

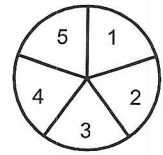
1. Write your name and student number clearly on the front of the examination answer booklet/s.
2. You have 10 minutes to read this paper. You must not begin writing during this time.
3. This paper contains seven (7) questions. You should attempt all the questions.
4. Make sure you have 4 pages, including cover page and formula sheet.
5. All answers must be written in examination answer booklets provided. No other written materials will be accepted.
6. Start the answer for each question on a new page.
7. Do not use red ink or pencil.
8. Notes, textbooks, mobile phones and other recording devices are not allowed in the examination room.
9. Scientific and business calculators are allowed in the examination room.

**MARKING SCHEME**

Marks are indicated at the beginning of each question. Total mark is 100.

**Question 1****[2 marks each = 14 marks]**

Consider the “wheel of fortune” illustrated on the right. The wheel is spun about an axis at the center of the wheel, and one of the numbered sectors lands under the arrowhead. We are interested in the number under the arrowhead. Let event **A** be prime numbers and event **B** be even numbers.



- (a) List the sample space.
- (b) Find the probability of:
  - i. each outcome.
  - ii. event A.
  - iii. event B.
  - iv. event  $A \cap B$ .
  - v. the number under the arrowhead is greater than or equal to 2.
- (c) Are events A and B mutually exclusive? Why?

**Question 2****[3 + 2 + 2 + 2 + 2 + 3 = 14 marks]**

A bag contains 4 red, 3 blue, and 2 white marbles. A marble is selected at random from the bag and not replaced before the second marble is selected.

- (a) Draw a probability tree diagram representing the experiment above.
- (b) Using the answer in (a) find the probability of:
  - i. both marbles drawn being red.
  - ii. both marbles drawn being blue.
  - iii. both marbles drawn being white.
  - iv. at least one marble drawn is white.
  - v. both marbles drawn are of same colour.

**Question 3****[2 marks each = 14 marks]**

Below are results of 9 students who sat for a test out of 30 marks.

**28    20    25    23    27    21    24    19    29**

Use the data above to answer the questions below. Give your answers to 2 decimal places where applicable.

- (a) Find the mean of the data set above.
- (b) Find the median of the data set above.
- (c) Find the variance of the data set above.
- (d) Find the standard deviation of the above data set.
- (e) Find the skewness of the above data set.
- (f) Find the z-score of the student who scored a 28 in this test.
- (g) Find the t-score of the student who scored a 28 in this test.

**Question 4****[4 + 2 + 2 + 2 + 2 + 2 = 14 marks]**

The table given below shows the size of the household in a survey done in Lae recently.

<b>Size of household (x)</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Probability (%)</b>	30%	40%	26%	3%	1%

- Copy and complete the table with rows for  $xP(x)$ ,  $(x - \mu)$ ,  $(x - \mu)^2$  and  $(x - \mu)^2 P(x)$ .
- Calculate the expected value of the size of household.
- Calculate the variance of the size of household. Give answer to 4 decimal places.
- Calculate the standard deviation of the size of household. Give answer to 3 decimal places.
- What is the probability of having more than 4 people in the household? Is that usual?
- What is the probability of having at the most 2 people in the household? Is that usual?

**Question 5****[4 + 2 + 4 + 2 + 2 = 14 marks]**

Approximately 10% of all people are left-handed. Five people were involved in this experiment.

- Argue that it is a binomial experiment.
- State the random variable in this experiment.
- Calculate  $P(x \leq 2)$  to 5 decimal places.
- Calculate the mean for this experiment.
- Calculate the standard deviation for this experiment to 5 decimal places.

**Question 6****[3 marks each = 15 marks]**

The average number of accidents at a level-crossing every year is 5 and has a Poisson distribution. Calculate the probability, to 5 decimal places, that there are:

- no accidents.
- exactly 2 accidents.
- exactly 3 accidents.
- less than 3 accidents.
- more than 3 accidents

**Question 7****(5 marks each = 15 marks)**

Suppose a random variable (x) is continuous over the interval  $[0, 0.5]$  and has probability distribution function  $f(x) = 2x$ . Find the probability, to 2 decimal places, of:

- $P(0.1 \leq x \leq 0.3)$ .
- $P\left(\frac{1}{5} \leq x \leq \frac{4}{5}\right)$ .
- $P\left(\frac{1}{10} \leq x \leq \frac{4}{5}\right)$ .

.....**End of Semester 2 Examination** .....

**MA226 SEMESTER 2, 2022 FORMULA SHEET**

**Probability**

P(E) = P(x)		$P(E) = P(x) = \frac{n(E)}{n(S)}$
Exclusive Events (A or B)		$P(E) = P(A) + P(B)$
Independent Events (A and B)		$P(E) = P(A) \times P(B)$
Complementary Events		$1 - P(E)$

**Descriptive Statistics & Normal Distribution**

	Formula		Meaning
Average	$\mu = \frac{\sum fx}{\sum f}$	z-score	$z - score = \frac{x - \mu}{\sigma}$
Variance	$\sigma^2 = \frac{\sum(x - \mu)^2}{\sum f}$	t-score	$t - score = 10z + 50$
Standard deviation	$\sigma = \sqrt{\frac{\sum(x - \mu)^2}{\sum f}}$	skewness	$Sk = \frac{3(\mu - median)}{\sigma}$

**Binomial Theorem:**  $(a + b)^n = \sum_0^n \binom{n}{r} a^{n-r} b^r$  where  $0 \leq r \leq n$

**Binomial Distribution:**  $P(x = r) = \binom{n}{r} p^r q^{n-r}$  where  $0 \leq r \leq n$

**Poisson Distribution:**  $P(x = r) = \frac{e^{-\lambda} \cdot \lambda^x}{x!}$  for  $r = 0, 1, 2, 3, \dots$

	Discrete Random Variable	Binomial Experiment
<b>Mean (<math>\mu</math>)</b>	$\sum xP(x)$	$np$
<b>Variance (<math>\sigma^2</math>)</b>	$\sum (x - \mu)^2 P(x)$	$npq$
<b>Standard Deviation (<math>\sigma</math>)</b>	$\sqrt{\sum (x - \mu)^2 P(x)}$	$\sqrt{npq}$