"Investing in Africa's future"

COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

DEPARTMENT OF PUBLIC HEALTH AND NURSING

NSPH544 APPLIED BIOSTATISTICS
EXAMINATIONS
NOVEMBER/DECEMBER 2022
3 hours

INSTRUCTIONS

Answer **ONLY FIVE** Questions

The mark allocation for each question is indicated at the end of the question

Credit will be given for logical, systematic and neat presentations.

Question 1-20 marks

a) Give **one example** of the following data measurement scale [4]

i. Nominal

ii. Ordinal

iii. Interval

iv. Ratio

b) State **3 charts** which can be used to describe continuous data and **3 charts** which can be used to describe categorical data [6]

c) A study conducted to assess how many hours students spent doing assignments found that out of a sample of 15 students, the following number of hours were reported

Data: 16; 20; 13; 18; 20; 22; 18; 18; 15; 20; 21; 21; 18; 20; 18

Calculate the following measured from the data

i. Mean [2]

ii. Median [2]

iii. Mode [1]

iv. Interquartile range (percentiles) [2]

v. Coefficient of variation [3]

Question 2-20 marks

A researcher was set to determine the association between smoking and lung cancer. The aggregated data for this study is shown in the table below:

	Lung cancer	**No lung cancer**
Smokers	75	35
Non-smokers	15	85

a) State H0 and H1 statements for this study [4]

b) Calculate the Chi-square statistic for this analysis. [6]

c) What is the Chi-square critical value for this analysis? Show all the necessary information used to get this value. [4]

d) Test the proposed hypothesis based on (a) and make clear conclusions for this study using information obtained from (b) and (c) [6]

Question 3-20 marks

a) Define the following terms

i. Marginal probability [2] ii.

Joint probability [2]

iii. Conditional probability [2]

b) The distribution of blood types in a certain country is as follows:

A: 31% B: 13% AB: 10% O: 46%

An individual was brought into the emergency room after a bus accident. What is the probability that the person will be of type A or B or AB? [3]

c) The following data

Services	Hospital A	**Hospital B**	**Hospital C**
Screening	12	13	25
Surgery	7	15	42
Therapy	6	5	8

1. Calculate the marginal probability of screening [1]
2. Calculate P(Hospital B and Surgery) [2]
3. Calculate P(Therapy or Hospital C) [2]
4. Calculate P(Screening/Hospital A) [2]
5. Determine if the hospital type and services provided are independent [4]

Question 4-20 marks

a) Given the following probability distribution for an infinite population with the discrete random variables, *X*

X	1	2	3	4	5
P(x)	0.1	0.4	0.2	0.15	0.15

i. Determine the expectation of X [2]

ii. Determine the variance of X [3]

iii. Calculate P(X>2) [5]

b) Given a Poisson random variable X, where the average number of successes occurring in a specified interval is 2.5, find P(X=5). [5]

c) For a normal curve, if the mean is 45 minutes and the standard deviation is 5 minutes,

what is the area between 40 and 45 minutes? [5]

Question 5-20 marks

a) Suppose a random sample of 100 patients from a population and a sample proportion was estimated to be *p*. The true proportion π was estimated at 0.9.

i. Calculate the $P(p \leq 0.915)$ [2]

ii. Calculate the $P(0.855 \leq p \leq 0.945)$ [4]

b) Given a normal distribution with $\mu=100$ and $\sigma=12$ from a sample of 36 students. What is the probability that the mean sample X_bar is

i. P(X_bar<95) [3]

ii. P(95< X_bar <97.2) [3]

iii. P(X_bar >102.2) [3]

iv. P(X_bar>a)=0.65. Find the value of a [5]

Question 6-20 marks

In a study to investigate betaxolol drug's potential in lowering blood pressure between hypertensive men and women, 100 women and 150 men were given the drug. At the end of the study, the results below were reported:

	Women	**Men**
Total sample	100	150
Number with reduced blood pressure	35	45

a) Does the data provide sufficient evidence to indicate that drug Y was more effective in women than in men? Test using alpha = 0.05 [7]

b) What is the 95% confidence interval of the two proportion differences [5]

c) What is the 90% confidence interval of the two proportion differences [5]

d) Comment on the results from a-c fully [3]