



ZIMBABWE EZEKIEL GUTI UNIVERSITY

**FACULTY OF SCIENCE, TECHNOLOGY, AGRICULTURE AND
FOOD SYSTEMES DEVELOPMENT**

DEPARTMENT OF DATA SCIENCE AND COMPUTER TECHNOLOGY

EXAMINATION PAPER

COURSE CODE : **BIS112**
COURSE TITLE : **APPLIED STATISTICS**
SPECIAL REQUIREMENTS : **None**
DURATION : **3 Hours**
LEVEL : **1.1**
DATE : **2026 10 JUN 2026**

INSTRUCTIONS TO CANDIDATES:

1. Answer all questions.
2. Show all the working
3. Calculators and slide rules are allowed
4. Graph paper is provided
5. Formula sheet is attached at the end of the question paper
6. Each question carries 20 marks

Question 1

- a. Define the following terms:
- i. Mean [1]
 - ii. Mode [1]
 - iii. Variance [1]
- b. Given the data below:
5, 7, 1, 9, 11, 22, 15
- i. Draw a box and whisker plot in a graph paper provided [5]
 - ii. find the Inter quartile range for the sample [2]
- c. A test was given to 90 students. The maximum mark was 70 and the list is 8. The raw data are shown below.

10, 8, 68, 67 25, 62, 49, 12, 18, 46, 53, 57, 30, 63, 34,
21, 68, 31, 20, 16, 29, 13, 31, 9, 34, 45, 55, 35, 45, 54,
50, 34, 32, 47, 70, 52, 21, 25, 53, 41, 29, 63, 43, 50, 40,
48, 45, 38, 51, 25, 52, 55, 47, 46, 46, 50, 8, 25, 56, 18,
36, 36, 9, 38, 39, 45, 42, 42, 61, 55, 30, 38, 62, 47, 58,
54, 59, 25, 24, 53, 42, 61, 18, 30, 32, 45, 49, 28, 31, 27.

- i. Present the data in a grouped frequency table. [3]
- ii. Find the mean of the data [2]
- iii. Calculate the variance [3]
- iv. Find the standard deviation [2]

Question 2

- a. Given that two events A and B are mutually exclusive
If $P(A)=0.4$, and $P(B)=0.3$
Find $P(A \cup B)$ [2]
- b. One card is drawn from a standard 52-card deck.
Let:
- Event A = drawing a Heart
 - Event B = drawing a Queen
- Find $P(A \cup B)$. [3]

- c. A fair six-sided die and a fair coin are tossed at the same time.
- What is the probability of getting a Head and a number greater than 4 on the die? [3]
 - What is the probability of getting a Tail and an even number on the die? [2]
 - What is the probability of getting a Head given that the die shows a number less than 3? [2]
- d. Nozi took two tests. The probability of her passing both tests is **0.3**. The probability of her passing the first test is **0.4**. What is the probability of her passing the second test given that she has passed the first test? [3]
- e. A box contains 4 red balls, 3 blue balls and 5 green balls. If Toby draws
- One ball at random, what is the probability that it is either red or green? [3]
 - Two balls at random, what is the probability that the first is blue and the second red? [2]

Question 3

- b. A discrete random variable X has the following probability distribution:

X	0	1	2	3
$P(X=x)$	0.2	0.3	0.4	0.1

- Verify that this is a valid PMF [2]
- Find $P(X \geq 2)$ [2]

- c. A discrete random variable X has the following probability distribution

$$P(X=x) = \begin{cases} 0.1 & x=1, 2 \\ 0.2 & x=3, 4 \\ a & x=5 \end{cases}$$

- Make a discrete probability table for the above [3]
- Find the value of a [2]
- Find $P(2 < X \leq 4)$ [2]
- Find the expected mean of the distribution [3]
- Calculate the variance [4]
- Find the standard deviation [2]

Question 4

- a. What is the purpose of sampling when collecting data in research? [4]
- b. Tom and Thando are investigating about the behaviour of students while at home.
Tom wants to know how many hours on average students watch television on Sundays, he intends to gather this information from students.
Thando wants to know how much time students study each evening during the week, she intends to accomplish this by asking parents and guardians.
- i. What is the population for Tom's investigation? [2]
- ii. What is the population for Thando's research? [2]
- Tom decides to use opportunity sampling and Thando uses quota sampling.
- iii. For each of these methods give reasons why they are not probability sampling. [4]
- c. Describe any 2 probability sampling techniques, giving an example in each. [2*4]

Question 5

- a. Define Correlation. [2]
- b. What is meant by the correlation coefficient? [2]
- c. Give one example of positive correlation. [2]
- d. A researcher wants to relate the final test for Mathematics and Physics for O-level students. He takes a sample of 8 students from Harare district. The table below summarizes the above information.

Mathematics results(x)2025	63	67	70	72	77	80	84	87
Physics results(y) 2025	74	75	72	78	74	82	79	82

- i. From the regression equation $y=b+ax$ find the values of a and b. [5]
- ii. What is the coefficient of correlation between the marks for physics and the marks for mathematics? [3]
- iii. Present the data in a scatter diagram using a graph paper. [3]
- iv. Determine an average physics marks of a student who scores 86% in Mathematics. [2]
- v. Why is it not advisable to use the given information to estimate the mathematics marks of students who failed Physics? [1]

THE END

BIS 112 APPLIED STATISTICS FORMULA SHEET

Probability distribution

$$0 \leq P(A) \leq 1$$

$$\sum P(x)=1$$

$$\text{Mean} = \mu = x' = \sum x * P(x)$$

$$E(X) = \sum x_i * P_i$$

$$\begin{aligned} \text{Variance} = \sigma^2 &= \text{Var}(X) = \sum x^2 * P(x) - \mu \\ &= \sum [(x^2 - \mu)^2 P(x)] \end{aligned}$$

$$\text{Var}(X) = E(X^2) - (E(X))^2$$

$$\text{Var}(aX+b) = a^2 \text{Var}(X)$$

$$E(X^2) = \sum x^2 * P(x)$$

$$E(aX-b) = aE(X) - b$$

$$\text{Standard deviation} = \sigma = \text{Sqrt}(\sigma^2)$$

Grouped Data

$$\text{Mean} = \sum f(x) / \sum f$$

$$\text{Mean deviation} = \sum f(|x - \mu|) / \sum f$$

$$\text{Variance} = \sum f(|x - \mu|)^2 / \sum f$$

$$\text{Standard deviation} = \text{Sqrt}(\text{variance})$$

Linear Regression and co-relation

$$y = ax + b$$

$$a = \frac{n \sum xy - (\sum x)(\sum y)}{n \sum x^2 - (\sum x)^2}$$

$$b = \frac{\sum y \sum x^2 - \sum x \sum xy}{n(\sum x^2) - (\sum x)^2}$$

$$S_x = \text{Sqrt}[(\sum x^2 - (\sum x)^2/n)/n-1]$$

$$S_y = \text{Sqrt}[(\sum y^2 - (\sum y)^2/n)/n-1]$$

$$r = S_x * a / S_y$$

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}}$$

10/18 AM