



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF AGRICULTURAL AND FOOD SCIENCES**

**UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE IN
AGRIBUSINESS MANAGEMENT, BACHELOR OF SCIENCE IN SOIL SCIENCE
FIRST SEMESTER 2023/2024 ACADEMIC YEAR**

SIAYA

COURSE CODE: ALS 3215/AEB 1204

COURSE TITLE: Quantitative Methods in Agricultural Economics 1/ Quantitative Methods in Soil Science

STREAM: BSc. (Agribusiness Management), BSc. (Soil Science)

EXAM VENUE:

DATE: December 2022

EXAM SESSION:

TIME: 2.00 Hours

Instructions:

- 1. Answer ALL questions in Section A (compulsory) and ANY other TWO questions in Section B.**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

SECTION A [30 MARKS]

Answer ALL questions from this section.

1. Distinguish
 - a. A Predictor variable from an outcome variable. [2 Marks]
 - b. A population from a sample. [2 Marks]
 - c. A discrete random variable from a continuous random variable. [2 Marks]
2. State the assumptions of the simple linear regression model. [6 Marks]
3. You are organizing a tree-planting event for next week and believe attendance will depend on the weather. Do you consider the following possibilities are appropriate?

Weather	Probability = f (x)	Attendance = X
Terrible weather	0.2	500
Mediocre weather	0.6	1000
Great weather	0.2	2000

- a. Let X denote the attendance. Why is X a random variable? [2 Marks]
 - b. What is the expected attendance? [2 Marks]
 - c. Suppose that each tree seedling costs \$5 and that the total cost of giving the tree planting event is a fixed \$2,000. Let Y = profit = total sales revenue – total cost = 5X - 2000. What is the expected profit? [2 Marks]
4. Consider the following observations. You are to do all the parts of this question using only a calculator.

X	12	11	10	23	11	14	15
Y	20	40	50	70	10	40	20

- a. What are the sample means of x and y? [4 Marks]
 - b. Compute the least squares estimates of the slope and the intercept and state their interpretation. [6 Marks]
 - c. Compute the variance of the random error term, σ_2 . [2 Marks]

SECTION B [40 MARKS]

Answer any TWO questions from this section

5. Imagine we looked at the number of leaves that a selection of 11 bean plants had.

Number of leaves data: 108, 103, 252, 121, 93, 57, 40, 53, 22, 116, 98.

- a. Calculate the mean for the number of leaves data. [2 Marks]
 - b. Calculate the standard deviation [8 Marks]
 - c. Calculate a 95% confidence interval for this mean using a z table. [3 Marks]
 - d. Calculate a 95% confidence interval for this mean using the sample size. [4 Marks]
 - e. Recalculate the confidence interval assuming that the sample size was 56. [3 Marks]
6. A Mango juice vendor at JOOUST University football games observes that the more Mango juices are sold the warmer the temperature at game time is. Based on 32 home games covering five years, the vendor estimates the relationship between Mango juice

sales and temperature to be $y = -240 + 8x$, where y = the number of Mango juices she sells and x = temperature in degrees Fahrenheit,

- a. Interpret the estimated slope and intercept. [4 Marks]
 - b. Do the estimates of the slope and intercept make sense? Why, or why not? [6 Marks]
 - c. On a day when the temperature at game time is forecast to be 80°F , predict how many Mango juices the vendor will sell. [4 Marks]
 - d. Below what temperature are the predicted sales zero? [3 Marks]
 - e. Sketch a graph of the estimated regression line. [[3 Marks]
7. In an estimated simple regression model, based on 24 observations, the estimated slope parameter is 0.310 and the estimated standard error is 0.082.
- a. Test the hypothesis that the slope is zero against the alternative that it is not, at the 1% level of significance. [3 Marks]
 - b. Test the hypothesis that the slope is zero against the alternative that it is positive at the 1% level of significance. [3 Marks]
 - c. Test the hypothesis that the slope is zero against the alternative that it is negative at the 5% level of significance. Draw a sketch showing the rejection region. [3 Marks]
 - d. Test the hypothesis that the estimated slope is 0.5, against the alternative that it is not, at the 5% level of significance. [3 Marks]
 - e. Describe three ways in which statistical inferences and carried out. [5 Marks]