



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF BIOLOGICAL, PHYSICAL, MATHEMATICS AND ACTUARIAL
SCIENCES
UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE
ACTUARIAL
2ND YEAR 2ND SEMESTER 2024/2025 ACADEMIC YEAR
REGULAR (MAIN)

COURSE CODE: WAB 2214

COURSE TITLE: PRINCIPLES OF STATISTICAL INFERENCE

EXAM VENUE: STREAM: (Bsc. ACTUARIAL SCIENCE)

DATE: EXAM SESSION:

TIME: 2.00 HOURS

Instructions:

- 1. Answer question 1 (Compulsory) and ANY other 2 questions**
- 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.**

QUESTION ONE (30 MARKS)

- a) Using the standard normal tables and drawing sketches to illustrate your answer find
- i) $P(Z > 2.21)$ (2Marks)
 - ii) $P(-0.87 < Z < 1.89)$ (3 Marks)
 - iii) The value of a such that $P(|Z| < a) = 0.9886$ (3 Marks)

- b) Use the sequence of random digits 3642945883309239184000300 to generate five simulated observations from the following frequency distribution;

X	10	14	16	22	Total
f	10	13	9	8	40

(4 Marks)

- c) A sample of n independent observations is taken from a normal population with mean 74 and standard deviation 6. The sample mean is denoted by \bar{X} . Find n if $P(\bar{X} > 75) = 0.282$ (4 Marks)
- d) The lengths of certain items follow a normal distribution with mean μ cm and standard deviation 8 cm. It is known that 6.68% of the items have length greater than 69 cm. Find the value of the mean μ . (4 Marks)
- e) It is given that 30% of the population supports a given political party. One hundred members of the population are selected at random, use a suitable approximation to find the probability that exactly 35 out of the 100 support the party. (4 Marks)
- f) The mean of 50 observations of X , where $X \sim B(15, 0.4)$, is \bar{X}
- i. State the approximate distribution of \bar{X} (2 Marks)
 - ii. Obtain $P(\bar{X} > 8)$ (4 Marks)

QUESTION TWO (20 MARKS)

- a) You are given the following data relating to aptitude scores and productivity index;

Aptitude score (X)	9	18	18	20	20	23
Productivity index (Y)	33	23	33	42	29	32

Find the coefficient of correlation between aptitude score and productivity index. (8 Marks)

- b) The heights of students taking actuarial science were measured and found to be normally distributed with mean μ cm and standard deviation σ cm. On the basis of the results obtained from a random sample of 100 men from the actuarial science cohort, the ranges of height for the middle 90% was calculated and it was found that the mean heights lie between 177.22 cm to 179.18 cm. Calculate

- i. The value of the sample mean μ
- ii. The value of σ
- iii. A symmetric 95% confidence interval for μ (12 Marks)

c) Find the regression equation Y on X for the following data.

X	2	4	6	8
Y	5	15	20	25

g) A sample of n independent observations is taken from a normal population with mean 74 and standard deviation 6. The sample mean is denoted by \bar{X} . Find n if $P(\bar{X} > 75) = 0.282$ (5 Marks)

QUESTION THREE (20 MARKS)

- a) The marks of 500 candidates in an examination are normally distributed with mean of 45 marks and a standard deviation of 20 marks.
 - i) Given that the pass mark is 41, estimate the number of candidates who passed the examination. (4 Marks)
 - ii) If 5 % of the candidates obtain a distinction by scoring x marks or more, estimate the value of x . (4 Marks)
 - iii) Estimate the range of marks scored by the middle 50%. (5 Marks)
- b) Four runners, Andy, Bob, Chris and Dai train to take part in a 1,600m relay in which Andy is to run 100m, Bob 200m, Chris 500m and Dai 800m. During training their individual times, recorded in seconds follow normal distributions with notation as; $A \sim N(10.8, 0.2^2)$, $B \sim N(23.7, 0.3^2)$, $C \sim N(62.8, 0.9^2)$ and $D \sim N(121.2, 2.1^2)$. Find the probability that they run the relay race in less than 3 minutes 35 seconds. (7 Marks)

QUESTION FOUR (20 MARKS)

a) Six graduates with Bsc. Actuarial Science appeared for an interview were subjected to two tests. Each had to take an aptitude test out of 25 and a productivity test whose index was measured within 2 weeks of internship out of 50 before the company would finally make a decision for permanent employment. The results were tabulated as follows:

Aptitude score (X)	9	18	18	20	20	23
Productivity Index (Y)	33	23	33	42	29	32

- i. Find the Coefficient of Correlation between aptitude scores and productivity. (8 Marks)
 - ii. Obtain the probable error and state its significance. (4 Marks)
- b) Prints from two types of film C and D have developing times which can be modelled by normal variables, C with mean 16.18s and standard deviation 0.11 s and D with mean 15.88 s and standard deviation 0.10 s.
 - i. A type C print is developed and immediately afterwards a type D print is developed. What is the probability that the total time taken is greater than 32.5 s? (4 Marks)
 - ii. What is the probability that a type C print will take longer to develop than a type D print? (4 Marks)

QUESTION FIVE (20 MARKS)

- a) The masses of boxes of oranges are normally distributed such that 30% of them are greater than 4.00 kg and 20% are greater than 4.53 kg. Estimate the mean and standard deviation of the masses. (10 Marks)
- b) Find the probability of obtaining 4, 5, 6, or 7 heads when a fair coin is tossed 10 times;
 - i) Using binomial distribution (5 Marks)
 - ii) Using a normal approximation to the binomial distribution. (5 Marks)