



**MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)**

**MAIN CAMPUS**

**UNIVERSITY EXAMINATIONS**

**2023/2024 ACADEMIC YEAR**

**SECOND YEAR, FIRST TRIMESTER END OF  
TRIMISTER EXAMINATIONS**

**FOR THE DEGREE**

**OF**

- 1. BACHELOR OF SCIENCE IN HEALTH PROFESSIONS EDUCATION,**
- 2. BACHELOR OF SCIENCE IN PHYSIOTHERAPY AND**
- 3. BACHELOR OF SCIENCE IN CLINICAL MEDICINE AND SURGERY**

**(UPGRADING AND DIRECT ENTRY)**

**COURSE CODE: HPE 205, HCM 223**

**COURSE TITLE: MEDICAL BIOSTATISTICS**

**DATE: THURSDAY 7<sup>TH</sup> DECEMBER 2023      TIME: 8:00AM – 10:00AM**

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over

## **SECTION A-MULTIPLE CHOICE QUESTION (20 MARKS)**

1. In biostatistics, confounding is normally defined as:
  - A. One chosen from a carefully defined population with the aid of a formal method to avoid bias.
  - B. A formal method to assign subjects by chance to one or the other treatment.
  - C. The effect of two or more variables that do not allow a conclusion about either one separately.
  - D. The systematic tendency of any factors associated with the design, conduct, analysis, and evaluation of the results of a trial to make the estimate of a treatment effect deviate from its true value
2. Measures that are used to determine degree or extent of variation in a data set are called
  - A. Mean
  - B. Median
  - C. Measures of dispersion
  - D. Measures of central tendency
3. When the distribution of data is skewed, one should ideally use;
  - A. Mean
  - B. Median
  - C. Mode
  - D. None of these
4. Which of the following statements is TRUE ABOUT the standard deviation (SD)?
  - A. It is used to calculate confidence intervals.
  - B. It is used to determine variability of a sample around a sample mean.
  - C. It is used to display bimodal or skewed data.
  - D. A large SD shows that individual data points are clustered closer to the mean.
5. In a five number summary, which of the following is not used for data summarization?
  - A. The largest value
  - B. The median
  - C. The 25th percentile
  - D. The mean
6. Classifying continuing educational experience into categories including “strongly agree,” “agree,” and “disagree,” is an example of which type of variable or data?
  - A. Nominal
  - B. Ordinal
  - C. Interval
  - D. Ratio
7. The heights (in inches) of adult males in Kenya are believed to be Normally distributed with mean  $\mu$ . The average height of a random sample of 25 Kenyan adult males is found to be 69.72 inches, and the standard deviation of the 25 heights is found to be  $s = 4.15$ . A 90% confidence interval for  $\mu$  is
  - A.  $69.72 \pm 1.09$
  - B.  $69.72 \pm 1.37$
  - C.  $69.72 \pm 1.42$
  - D.  $69.72 \pm 1.32$
8. When we make a 95% confidence interval for the population mean using t or z test then probability or chance of error will be;

- A. 0.05
  - B. 0.1
  - C. 1
  - D. 5
  - E. ) The test statistic for a two-sided significance test for a population mean is  $z = -2.12$ . What is the
  - F. corresponding P-value?
  - G. a. 0.017
  - H. b. 0.034 |
  - I. c. 0.483
  - J. d. 0.983
9. The test statistic for a two-sided significance test for a population mean is  $z = -2.12$ . What is the corresponding P-value?
- A. 0.017
  - B. 0.034
  - C. 0.483
  - D. 0.983
10. Which one of the following is not a characteristics of normal distribution ?
- A. Symmetric
  - B. Bell-shaped
  - C. Mean = median = mode
  - D. Negative skewness
11. What is the value of the first quartile (Q1) in the following age data 21, 23, 24, 25, 25, 26, 27, 31.?
- A. 23.5
  - B. 23
  - C. 24
  - D. 25
12. Confidence intervals are useful when trying to estimate ?
- A. Unknown parameters
  - B. Known parameters
  - C. Unknown statistics
  - D. Known statistics
13. In a Poisson probability distribution
- A. The mean and variance of the distribution are same (equal)
  - B. The probability of success is always greater than 5
  - C. The number of trials is always less than 5
  - D. It always contains a contingency table
14. If the occurrence of one event means that another cannot happen, then the events are
- A. Independent
  - B. Mutually Exclusive
  - C. Bayesian
  - D. Empirical
15. When constructing a frequency polygon which is to be taken along X-axis?
- A. Class interval
  - B. Class frequency

- C. Class boundaries  
D. Class mark
16. The variance of binomial distribution is always  
A. Less than mean  
B. Equal to mean  
C. Greater than mean  
D. Equal to standard deviation
17. A coach of three football teams—the B team, junior varsity team, and varsity team—wants to study the average times in the 40-yard dash for his players. Which test would help him determine if the mean 40-yard dash times for the athletes on one team are different from those on the other teams?  
A. Independent 2-sample t test  
B. Analysis of variance (ANOVA)  
C. Chi-square test  
D. Fisher's exact test
18. An investigation studying whether physical therapy or subacromial injection can be successfully used to treat shoulder pain is conducted. Two groups are identified. One group is prescribed physical therapy, while the other receives a subacromial injection. The groups have similar baseline demographics and shoulder pathologies. Ten patients are randomized in each group and findings show that there is no significant difference in any patient-reported outcome measure. An increase in sample size would reduce the risk of what parameter?  
A. Type I error  
B. Type II error  
C. Selection bias  
D. Recall bias
19. A random sample of 300 diastolic blood pressure measurements are taken. Suppose a 99% confidence interval for the population mean diastolic blood pressure is 68 to 73 mm Hg. If a 95% confidence interval is also calculated, then  
A. The 95% confidence interval will be wider than the 99%.  
B. The 95% confidence interval will be narrower than the 99%.  
C. 95% and 99% confidence interval will be the same.  
D. One cannot make a general statement about whether the 95% confidence interval would be narrower, wider or the same as the 99%
20. A study of 100 patients is performed to determine if cholesterol levels are lowered after 3 months of taking a new drug. Cholesterol levels are measured on each individual at the beginning of the study and 3 months later. The cholesterol change is calculated which is the value at 3 months minus the value at the beginning of the study. On average the cholesterol levels among these 100 patients decreased by 15.0 and the standard deviation of the changes in cholesterol was 40. What can be said about the 2 sided p-value for testing the null hypothesis of no change in cholesterol levels?  
A. The p value is less than .05  
B. The p value is greater than .05  
C. The p value is equal to .05  
D. Cannot be determined from the information given

## SECTION B –SHORT ANSWER QUESTIONS (40 MARKS)

1. A researcher is interested in obtaining an estimate of the Blood sugar levels of diabetic patients attending the clinic, takes a sample of 20 patients, determines the Blood sugar level of each, and computes a sample BS mean of 12. Suppose it is further known that the variable is approximately normally distributed with a variance of 5. (8 Marks)
  - a) Calculate a 95% confidence interval for the true mean blood sugar level among the diabetic population (4 Marks)
  - b) Suppose the study above was based on 10 patients instead of 20 but the mean (12) and standard deviation (5) are the same. Recalculate the 95% confidence interval. Does the interval get wider or narrower? Why? (4 Marks)
2. In a local Dispensary a Researcher was interested to know the age of women who had given birth in that week. The following was the data: 17, 24, 23, 27, 39, 29, 34, 25, 21, 36 (8 marks)
  - a) Find the mean (2 Marks)
  - b) Find the median (1 Marks)
  - c) Calculate the variance (4 Marks)
  - d) Standard deviation (1 Marks)
3. The HB levels of 12 HPE female students are as follows: 12, 8, 9, 11, 14, 10, 13, 14, 10, 16, 18, 16. Calculate the following: (8 Marks)
  - a) The Median (2 Marks)
  - b) Q1 and Q3 (2 Marks)
  - c) IQR (1 Marks)
  - d) Construct a box plot (3 Marks)
4. The number of kidney transplant done in Kenya has greatly increased. But of concern is the success rate of the procedure. Suppose the average number of patients kidney donor rejection each year is 5. What is the probability that the patients rejecting the donor kidney will be? (8 Marks)
  - c) At least four patients on the next day 1- day clinic? (6 Marks)
  - d) At most two patients on the next day 1- day clinic? (2 marks)
5. The resting heart rate of Kenyans male marathon runners are normally distributed variable with mean  $\mu = 60$  HR per minute and standard deviation  $\sigma = 6$ . Calculate the following: (8 Marks)
  - a)  $P(x < 70)$  (2 Marks)
  - b)  $P(x > 51)$  (2 Marks)
  - c)  $P(55 < x < 75)$  (4 Marks)

### **SECTION C –LONG ANSWER QUESTIONS (40 MARKS)**

1. A study was done to determine the effectiveness of COVID-19 Vaccines. A sample of 300 individuals who had been vaccinated and later contracted covid-19 were picked using a probability sampling method. 170 (70 females and 100 males) had used Moderna COVID-19 vaccines which is an mRNA vaccine and 130 (60 females and 70 males) had Novavax COVID-19 vaccine which is a protein subunit vaccine.  
(20 Marks)
  - a) Construct a table of observed frequency (2 marks)
  - b) Computing the expected frequency (4 marks)
  - c) State its null and alternative hypothesis (4 marks)
  - d) Calculate the degree of freedom (2 Mark)
  - e) Calculate the chi square test at a significance level of  $\alpha = 0.05$  (6 marks)
  - f) Interpret the test statistic (2 marks)
2. The height in centimeters of 20 recently concluded Armed forces recruitment were as follows : 144, 171, 167, 149, 161, 180, 166, 176, 180, 162, 164, 163, 168, 154, 139, 170, 175, 183, 146, 164  
(20 Marks)
  - a) For the data above, group their Height in a class width of 10 and construct a frequency table (5Marks)
  - b) Calculate the relative frequency and cumulative frequency (6 Marks)
  - c) Compute the mean, median and mode (9 Marks)