Enrolment No.: ……

School of Pharmaceutical Management
MBA Pharmaceutical Management
Batch-15th (2023-2025)
First Year, Term 1 End Term Examinations, November 2023
CC – 631 Statistics for Managers

Time - 3 Hour **Maximum Marks: 50 (Minimum Marks: 20)**

Instructions to students:

- **This question paper contains 7 printed pages.**
- **Don't write anything on the Question Paper except writing your Enrolment No.**

Part A

(Maximum Marks: 5)

Q1. Choose the most appropriate option for each of the following: (each question carries 1 mark

(a). A study is conducted to determine the efficacy of two drugs in preventing seasickness. Measurements are taken to assess the following: no seasickness, mild seasickness, or severe seasickness. Which of the following data types best describes these measurements?

(i) Nominal
(ii) Ordinal
(iii) Interval
(iv) Ratio
(v) Integer

(b). An analgesic medication was compared to an identical appearing placebo by random assignment to separate treatment groups. Pain was measured on a scale where 0 = none, 1 = mild, 2 = moderate and 3 = severe. Pain was measured at baseline to determine if the two groups were similar. Before the data were collected, the investigators stated that the level of pain 8 hours after a single dose of analgesic was the primary end point. Nevertheless, they measured pain every hour after the dose for 8 hours. Now that you know the level of measurement, which descriptive statistics would be most appropriate to summarize the pain in each group at each time point?

(i) 95% confidence interval for the median
(ii) Mean and standard error of the mean
(iii) Mean and standard deviation
(iv) Median and interquartile range

(c). Confidence intervals are preferred to p-values because

(i) They are more precise
(ii) p-values are not easily interpretable
(iii) Along with the significance, the variability and the limits of the estimate is known in the confidence intervals
(iv) Confidence intervals can be computed more readily, whereas p-values involve complex calculation
(v) They are more accurate in large studies

(d). A study is conducted prospectively to determine the effects of Drug A versus Drug B in preventing myocardial infarctions (MIs). One hundred patients in each group were treated with either Drug A or Drug B, and the following results were obtained over a 10 year period:
Drug A = 7% of patients had an MI; Drug B = 10% of patients had an MI
What would be the appropriate inferential statistical test that would be used to compare the percentage of patients experiencing a myocardial infarction associated with Drug A versus Drug B?

(i) Chi-square analysis
(ii) One-way ANOVA
(iii) Independent student t-test
(iv) None of the given options

(e). The association between two categorical (qualitative) variables is best shown in a

(i) One way frequency distribution
(ii) Cross-tabulation of two factors
(iii) Scatter plot
(iv) Bar chart
(v) Dot plot

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Part B

(Maximum Marks: 15)

Answer the following questions. Q2 is compulsory. There is a choice between Q3 & Q4 and Q5 & Q6.

Q2. Why concepts of biostatistics are important in answering questions which concern us in the field of pharmaceuticals? Support your response with a relevant example. (5)

Q3. Write a short note on measurement of scale and give examples. (5)

OR

Q4. Give a brief description of any three graphical methods of data presentation. (5)

Q5. Define standard error and elucidate its significance in establishing a connection between random samples and populations. (5)

OR

Q6. What is confidence interval? What information is obtained through a 95% confidence interval? (5)

Part C

(Maximum Marks: 30)

Answer the following questions. Q7 is compulsory. There is a choice between Q8 & Q9 and Q10 & Q11.

Q7. Outline the various steps involved in statistically testing the comparison of a sample mean with a population mean. Illustrate your explanation with a relevant example. (10)

Q8. A pharmaceutical company makes tranquilizers. It is assumed that the distribution for the length of time they last is approximately normal. Researchers in a hospital used the drug on a random sample of nine patients. The effective period of the tranquilizer for each patient (in hours) was as follows: 2.7; 2.8; 3.0; 2.3; 2.3; 2.2; 2.8; 2.1, 2.4 yielded a sample mean ($\bar{x}$) of 2.51 and a sample standard deviation (s) of 0.318. Construct 95% and 99% confidence intervals for the population mean length of time. Additionally, provide the interpretation of these confidence intervals. (10)

OR

Q9. A surgeon in a large hospital is investigating acute appendicitis in people aged 65 and over. As a preliminary study he examines the hospital case notes over the previous 10 years and finds that of 120 patients in this age group with a diagnosis confirmed at operation 73 were women and 47 were men. Construct 95% and 99% confidence intervals for the proportion of females with acute appendicitis. Additionally, provide the interpretation of these confidence intervals. (10)

Q10. Quality control records show the average tablet weight to be 502 mg with a standard deviation of 5.3. There are sufficient data so that these values may be considered known parameter values. A new batch shows the following weights from a random sample of six tablets: 500, 499, 504, 493, 497, and 495 mg yielded a sample mean ($\bar{x}$) of 498 and a sample standard deviation (s) of 3.899. Test whether there is difference between new batch mean and process average at significance level 0.05. (10)

OR

Q11. In a random sample of 500 mothers who had singleton births from 2011 to 2015 in a large tertiary hospital, one of our aims is to examine whether maternal hypertension is a risk factor for preterm delivery. The summary of the data is presented as follows:

Maternal Hypertension	Gestational Age		Total
	Preterm	Term	
Yes	7	20	27
No	41	432	473
Total	48	452	500

Test whether there is an increased risk of preterm birth among pregnant mothers with hypertension at significance level 0.01. (10)