## Multiple-Choice Questions:

1. What is the primary reason we use sampling instead of studying an entire population in A/B testing?
   A) It increases the variability of data
   B) It is more cost-efficient and practical
   C) It ensures biased results
   D) It guarantees 100% accuracy
2. In A/B testing, which sampling method ensures that different subgroups within a population are proportionally represented?
   A) Simple Random Sampling
   B) Convenience Sampling
   C) Stratified Sampling
   D) Cluster Sampling
3. In systematic sampling, how are individuals selected?
   A) Randomly from the entire population
   B) Every nth individual from an ordered list
   C) Based on the researcher's convenience
   D) From pre-defined strata
4. What does the mean represent in A/B testing?
   A) The lowest value in a dataset
   B) The central tendency or average of a metric
   C) The total sum of all data points
   D) The variability of the dataset
5. When is it appropriate to use the t-distribution instead of the z-distribution?
   A) When the population standard deviation is known
   B) When the sample size is large ($n \geq 30$)
   C) When the sample size is small ($n < 30$) and population variance is unknown
   D) When working with non-numeric data
6. What does a low standard deviation indicate in A/B testing?
   A) Data points are spread out far from the mean
   B) The sample is biased
   C) Data points are close to the mean, indicating consistency
   D) The mean value is incorrect
7. What does the **p-value** tell us in hypothesis testing?
   A) The probability that the null hypothesis is true
   B) The probability of observing the data if the null hypothesis were true
   C) The absolute difference between the control and treatment groups
   D) The number of participants needed in an A/B test
8. What does the **Empirical Rule** state about a normal distribution?
   A) 95% of data falls within ±3 standard deviations
   B) 68% of data falls within ±1 standard deviation

C) 99.7% of data falls within ±1 standard deviation
D) 50% of data falls within ±3 standard deviations

9. Which of the following is NOT a key component of hypothesis testing?
   A) Null Hypothesis ($H_0$)
   B) Alternative Hypothesis ($H_1$)
   C) Random Selection
   D) Statistical Power
10. A Type I error occurs when:
   A) The null hypothesis is falsely rejected
   B) The null hypothesis is correctly rejected
   C) A real effect is missed
   D) The sample size is too large

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## True/False Questions:

1. A sample is always a perfect representation of the entire population.
2. In A/B testing, we aim to use random sampling or random assignment to reduce bias.
3. Cluster sampling selects a few groups (clusters) and surveys all individuals within those clusters.
4. The population mean (μ) is always equal to the sample mean ($\bar{X}$).
5. A z-score tells us how many standard deviations a data point is from the mean.
6. A significance level (α) of 0.05 means there is a 95% probability that the null hypothesis is true.
7. The Central Limit Theorem states that as sample size increases, the distribution of sample means approaches a normal distribution, regardless of the population distribution.
8. In a normal distribution, 99.7% of data falls within ±2 standard deviations of the mean.
9. If a p-value is greater than 0.05, we reject the null hypothesis.
10. Statistical power (1-β) represents the probability of detecting a true effect when it exists.