COVENANT UNIVERSITY
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TUTORIAL KIT
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PROGRAMME:
DEMOGRAPHY AND SOCIAL STATISTICS

COURSE: DSS 322

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DSS 322
SOCIAL STATISTICS II

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QUESTIONS

Q1. Define the following terms Estimation.

Q2. Distinguish between the following pairs as used in statistical hypothesis.

Q3. Enumerate the general procedures for test of hypothesis.

Q4. A population consists of 5 members 3, 4, 6, 2, 1. Consider all possible sample size of 2 which can be drawn with replacement. From the population, find the population mean?

Q5. State the definitions of Point estimate and interval estimate.

Q6. What are the fundamental conditions for Bi-variate normal distribution to hold?

Q7. List the examples of population parameters you know.

Q8. State two applications of Poisson distribution in Natural sciences

Q9. 10% of flashlight batteries in shipment are burnt out. What is the probability that in a sample of 3 batteries exactly one is burnt out?

Q10. Mention the properties of both Binomial and Poisson distribution.

Q11. State the properties of Point estimate.

Q12. Outline the types of probability distribution you know and give examples on them.

Q13. What is an estimator?

Q14. Jusrite store in Ota, Ogun state employed 15 salesmen, 10 of whom are married and 5 of whom are single. Then 4 salesmen are to be selected at random from the group to develop a new sales' campaign. Find the probability that 2 of the first salesmen selected are single?

Q15. A population consists of 5 members 3, 4, 6, 2, 1. Consider all possible sample size of 2 which can be drawn with replacement. From this population find the standard deviation of the sampling distribution of means.

Q16. Suppose that P and Q are random variables whose joint density function is the bi-variate normal distribution, show that A and B are independent if and only if their correlation coefficient is zero.

Q17. State the probability function of poisson random variable K.

Q18. The mean lifetime of electric light bulbs produced by a company has in the past been 1,120hrs with a standard deviation of 125hrs. A sample of 8 electric bulbs recently chosen from a supply of newly produced bulbs showed a mean lifetime of 1070hrs. Test the hypothesis that the mean lifetime of the bulb has not changed using a level of significance of 0.05 and 0.01.

Q19. Define the term 'type I and type II errors'.

Q20. The probability that a gateman was arrested in Mushin Local Government Office is 0.02, taking a sample size of 200, find the probability that one or fewer gatemen have been arrested?

ANSWERS

Q1. Estimation is a statistical method employed to make inferences about likely values of the population parameters using sample statistic.

Q3. The formal procedures for testing hypothesis in any choice of study include:

- State the Null hypothesis Ho: $\bar{X} \neq \mu$
- State the alternative hypothesis H1: $\bar{X} = \mu$
- Choose the level of significance that is; estimate a criterion for rejection or acceptance of the null hypothesis. e.g $\propto = 0.05, 0.01$ etc.
- Select the appropriate test statistic. The test statistic which will be appropriate depends on the characteristics of the parent population from which the sample was drawn. The probable statistic includes: z, t, X^2 (chi-square).
- Estimate the critical region. Here we define the area under which we consider the difference between the sample and population parameters significant enough to reject the hypothesis Ho.
- Compute the value of the statistic from a random sample of size n.

- Conclusion: Compare the value of your calculated test statistic and the standard or tabulated statistic and accordingly reject or accept Ho.

Q5. Point Estimate

This is an estimate of a population parameter given by a single number. It has the following properties

(1) It is a single value.
(2) It assumes different values with different samples.
(3) It may not exactly equal to the population characteristic being estimated.
(4) No legitimate probability statement could be associated with it.

Interval Estimate

This is an estimate of the population parameter given by two numbers between which the parameter may be considered. It has the following properties

(1) It has a stated range.
(2) It allows for objective evaluation of the precision of an estimate.
(3) It makes allowance for the error margin.

A probability statement can be associated with it.

Q7. The typical examples of population parameters are: μ *and* σ, Kurtosis, Skewness, median, moment.

Q9. The Prob. that exactly one is burnt out

P = 10/100 = 1/10, q = 9/10, n = 3, x = 1

$$P(x = 1) = f(1) = 3_{C_1}\left(\frac{1}{10}\right)^1\left(\frac{9}{10}\right)^2$$

$$= 3 \times 0.1 \times 0.81$$

$$= 0.243$$

Q11. Point estimate has the following properties:

(1) It is a single value.
(2) It assumes different values with different samples.
(3) It may not exactly equal to the population characteristic being estimated.

No legitimate probability statement could be associated with it.

Q13. Thus when a sample statistic is used to estimate a population parameter, the statistic is referred to as an **estimator**.

Q15. The standard deviation of the sampling distribution of means

$$\bar{X} = \frac{3+4+6+2+1}{5} = \frac{16}{5} = 3.2$$

$$\sigma\bar{X} = \sqrt{\frac{\sum_{i=1}^{25}(X_i-\mu)^2}{N}}$$

$$\sqrt{\frac{(3-3.2)^2+(3.5-3.2)^2+(4.5-3.2)^2+(2.5-3.2)^2+(2-3.2)^2+(3.5-3.2)^2+(4.0-3.2)^2+(\quad (5.0-3.2)^2+(6-3.2)^2+(4-3.2)^2+(3.5-3.2)^2+(2.5-3.2)^2+(3-3.2)^2+(4-3.2)^2+(2-3 \quad (3.5-3.2)^2+(1.5-3.2)^2+(1.0-3.2)^2}{25}}$$

$\sqrt{1.48}$

$\sigma\bar{X}$ = 1.22

Q17. The probability function of Poisson random variable k which represents a number of occurrences of an event during a specified time interval is defined as

$$f(k; \lambda) = \frac{\lambda^k e^{-\lambda}}{k!}$$

Where λ is the mean average, e = constant = 2.71828

Q19. Type 1 error is the error of rejecting the null hypothesis when it is true. (e.g. the asserted mean is true but we say it is not). Summarily type 1 error is the error of rejecting a hypothesis when it is in fact true.

Type II error is the error of not rejecting the null hypothesis when it is false (e.g. the asserted mean is false but we say there are no grounds for disbelieving it). In short, a type II error is the error of not rejecting a hypothesis when it is in fact false.