COEP Technogical University

Department of Mathematics
(MA- 21001) Probability and Statistics for Engineers
T.Y. B. Tech. Semester V
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1 Tutorial: Week 8

1. What is meant by the word 'Statistic'?.

2. What is meant by an unbiased estimator of a population parameter θ? What is biased estimator of a population parameter?

3. Let $X_1, X_2, \ldots, X_n$ be n random variables with $E(X_i) = \mu$ and $Var(X_i) = \sigma^2,\ i = 1, 2, \ldots, n$. What is an unbiased estimator of mean μ and that of σ^2?

4. Define suitable populations from which the following samples are selected:
(a) Persons in 200 homes are called by telephone in the city of Richmond and asked to name the candidate that they favor for election to the school board
(b) A coin is tossed 100 times and 34 tails are recorded.

5. The numbers of incorrect answers on a true-false compentency test for a random sample of 15 students were recorded as follows:
2, 1, 3, 0, 1, 3, 6, 0, 3, 3, 5, 2, 1, 4, 2. Find the mean, the median, the mode.

6. Find the probability that a random sample of 25 observations, from a normal population with variance $\sigma^2 = 6$, will have a variance (a) S^2 greater than 9.1. (b) S^2 lying in between 3.462 and 10.745.
Ans: (a) 0.05 (b) 0.94

7. Prove that the sample mean $\overline{X} = \frac{1}{n}\sum_{1}^{n} X_i$ is an unbiased estimator for the population mean μ.

8. Find an unbiased estimator for the population variance σ^2.

9. Explain the use of z- test, t- test, Chi-square test and F-test in testing of hypothesis.

10. Using statistical tables find the following:
    (i) $\chi^2_{0.025}$ when degree of freedom is 15 ANS: 27.488
    (ii) $\chi^2_{0.01}$ when degree of freedom is 18 ANS:34.805
    (iii) $\chi^2_{0.05}$ when degree of freedom is 25 ANS:37.652
    (iv) $t_{0.025}$ when degree of freedom is 15 ANS:2.131
    (v) $t_{0.995}$ when degree of freedom is 17 ANS: 2.898

(vi) $f_{0.05}$ when degree of freedom are 7 and 15

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(vii) $f_{0.99}$ when degree of freedom are 28 and 12

(viii) $f_{0.01}$ when degree of freedom are 24 and 19

(ix) χ^2_α if $P(X^2 < \chi^2_\alpha) = 0.95$ when degree of freedom is 6

(x) χ^2_α if $P(X^2 > \chi^2_\alpha) = 0.05$ when degree of freedom is 16

(xi) χ^2_α if $P(\chi^2_\alpha < X^2 < 23.209) = 0.015$ when degree of freedom is 10

(xii) $P(T < 2.365)$ when degree of freedom is 7 ANS: 0.975

(xii) $P(T > -2.567)$ when degree of freedom is 17 ANS:0.99

(xiii) $P(-t_{0.005} < T < t_{0.01})$ when degree of freedom is 20 ANS:0.985

(xiv) k such that $P(k < T < 2.807) = 0.095$ for a random sample of size 24 from a normal population.

11. If S_1^2 and S_2^2 represent the variances of independent random samples of size 8 and 12 respectively, taken from a normal populations with equal varinces, find $P(\frac{S_1^2}{S_2^2} < 4.89)$.

12. Find the probability that a random sample of size 28 from a normal population with variance 4 will have a variance

    (i) greater than 6.1

    (ii) between 2.168 and 5.749. Assume that measurements are continuous.