COEP Technogical University
Department of Mathematics
(MA- 21001) Probability and Statistics for Engineers
T.Y. B. Tech. Semester V
Academic Year 2024-25
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1   Tutorial: Week 9

1. Define type-I error and type-II error in testing of hypothesis one can do.

2. What is meant by significance level and p-value?

3. Find the $100(1-\alpha)\%$ confidence interval for the population mean μ, if variance σ^2 is (i) known (ii) unknown. Also interpret the result in terms of error. Explain what will be different if we want a one sided confidence interval.

4. Increase in sample size n will ....(increase/reduce) α and β simultaneously.

5. To test the hypothesis that a coin is fair, the following decision rule is adopted. (i) Accept the hypothesis if the number of heads in a single sample of 100 tosses is between 40 and 60. (ii) Reject the hypothesis otherwise.
   (a) Find the probability of rejecting hypothesis when it is actually correct.
   (b) Interpret geometrically the decision rule.
   (c) What conclusions would you draw if a sample of 100 tosses yielded 53 heads? 60 heads?
   (d) Could you be wrong in your conclusions to (c)?

6. Design decision rule to test the hypothesis that a coin is fair if a sample of 64 tosses of the coin is taken and if the level of significance is (a) 0.05 (b) 0.01.

7. A manufacturer of car batteries claims that the life of the company's batteries is approximately normally distributed with a standard deviation equal to 0.9 year. If a random sample of 10 of these batteries has standard deviation of 1.2 years, do you think that $\sigma > 0.9$ years? Use a 0.05 level of significance.

8. A study is conducted to compare the lengths of time required by men and women to assemble a certain product. Past experience indicates that the distribution of times for both men and women is approximately normal but the variance of the times for women is less than that for the men. A random sample of times for 11 men and 14 women gives respective standard deviations 6.1 and 5.3. Test the hypothesis that $\sigma_1^2 = \sigma_2^2$ against the alternative that $\sigma_1^2 > \sigma_2^2$.

9. A manufacturer of a certain brand of energy bar claims that the average saturated fat content in the bar is 0.5 gms. Will you support his claim if the 8 bars that you examined for fat content were found to contain 0.6, 0.7, 0.7, 0.3, 0.4, 0.5, 0.4 and 0.2 gms of saturated fat? Assume normality. Take $\alpha = 0.05$.

10. A sample of 100 tires is taken from a lot. The mean life of tires in the sample was found to be 39350 kms. with the population standard deviation of 3260 kms. Test the hypothesis, at 1 percent level of significance, that the mean life of tire is 40000 kms.

11. Weight in kg of 10 lambs are 38, 40, 45, 53, 47, 43, 55, 48, 52, 49. Can we say that the variance of the population from which the above sample is drawn has a variance of 20 sq.kg? Assume $\alpha = 0.05$

12. Two random samples were drawn from two normal populations and their values are:

$$A: \quad 66 \quad 67 \quad 75 \quad 76 \quad 82 \quad 84 \quad 88 \quad 90 \quad 92$$
$$B: \quad 64 \quad 66 \quad 74 \quad 78 \quad 82 \quad 85 \quad 87 \quad 92 \quad 93 \quad 95 \quad 97$$

Test whether the two populations have the same variance at 10% level of significance.

13. The following data represents the number of Statistics lectures attended by 18 students : 9, 12, 18, 14, 12, 14, 12, 10, 16, 14, 13, 15, 13, 11, 13, 11, 9, 11. Perform a sign test to test the instructor's claim that the median of number of lectures attended is 12. Use a 2% level of significance.