PRACTICE EXAM THREE QUESTIONS

1. According to manufacturing standards, the average warp wise breaking strength of a type of cloth should not fall below 175 pounds per square inch. A shipment is received, and a random sample of 20 pieces is tested, resulting in the following x̄= 178 and ∑( xi-x̄)2 = 304
2. State the appropriate hypotheses to test if the true average warp wise strength satisfies the requirements. Explain your rationale by considering the Type I and Type II errors.
3. Test your hypotheses at the 0.05 significance level using a confidence interval.
4. What is the largest integer value of µo for which the data supports the hypothesis requirements are satisfied at the 0.05 significance level? Justify your answer.
5. Assume now that the standard deviation is σ = 4.1. Use a p-value to test your hypotheses in part (a)
6. Two students measured the outside diameter of 8 spanner bushings from a machine supply shop. The data in centimeters are.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bushing (i) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Student (x) | 10.2 | 9.8 | 6.5 | 7.6 | 8.2 | 9.9 | 8.6 | 9.1 |
| Student (y) | 10.0 | 10.1 | 6.9 | 7.5 | 8.2 | 9.7 | 8.3 | 8.8 |
| D | 0.2 |  |  |  |  |  |  |  |
| D2 | 0.04 |  |  |  |  |  |  |  |

1. Using a test statistic, is there a significant difference in the mean measurements of the two students at the 0.10 level of significance? State your hypotheses.
2. Construct a two-sided 95% confidence interval estimate for the difference in the mean.
3. A well-known sprinter ran 22 races in the years 1972-1974 and 20 races in the years 1975-1977; between the 1974 and 1975 track seasons, the sprinter contracted a rare tropical disease and lost his luxurious head of hair. The sprinter’s coach contends that due to decreased wind resistance, the sprinter ran significantly faster after the disease than before. The sample mean for his run times in the years 1972-1974 is 9.83 seconds. For the years 1975-1977, the sample mean is 9.67 seconds, and the pooled sample standard deviation for the run times from all years is 0.3 seconds.
4. State the appropriate hypotheses.
5. Use a 99% confidence interval to conduct your test. What do you conclude?
6. The Space Agency is testing the precision of two new types of rockets, A and B. Specifically, they are interested in the variation of the rockets in landing too long or too short (versus to the left or to the right). Let XA1,…… XA10 and XB1….. XB11 denotes the distance observations for rockets A and B, respectively. x̄ A= 30.1 s A 2 =0.17, x̄ B = 69.8, **s** B **2** = 0.19
7. Construct a 95% two-sided confidence interval estimate for the ratio of the variances.
8. They would like to determine if the two rockets have the same precision. Test this at the 0.5 level. State your hypotheses.

A: n1 = 10, x̄ 1=30.1, s12 =0.17

B: n2 = 11, x̄ 2 = 69.8, s22 =0.19

1. A producer claims that the lengths of manufactured parts have a variance of less than or equal to 0.05 inches. In a sample of 15 parts, you find a sample variance of 0.08 inches.
2. Using a confidence interval, can you reject the producers’ claim at the 0.01 level of significance? State your hypotheses.
3. What is the smallest value of σ o2

n=15, s2 = 0.08 that the producer can claim which would not be rejected by the data at the 0.01 level of significance? Justify your answer.

1. A chemical reagent (x) is used to obtain a precipitate of a particular substance (y) in a given solution. Fifteen observations yielded the following.

∑xiyi = 871.77

∑xi2= 589.1875

∑yi2 = 1312.4

∑xi = 92.25

∑yi = 135.0

1. Compute the fitted regression line, or find the equation of the regression line or trueline.
2. What proportion of the observed variation in the precipitate is explained by the regression model?
3. Test if the slope is statistically significant at the 0.05 level.
4. A public health survey will be conducted in an inner-city area to estimate the proportion of children ages 0 to 14 who have adequate polio immunization.
5. Out of a sample of 1500 inner-city children in Baltimore, 1125 had received adequate polio immunization.
6. Compute a two-sided 95% confidence interval estimate for the proportion of Baltimore’s inner-city children with adequate polio immunization.
7. How large a sample would be required for the total length of a two-sided 95% confidence interval to be 0.03 or less?
8. Answer the same question in part (ii) except for Cleveland instead of Baltimore (assuming you have no data for Cleveland).
9. Out of a sample of 1200 inner-city children in Cleveland, 960 had received a polio immunization.
10. Using a test statistic, test if the proportion of Baltimore’s inner-city children with adequate polio immunization is strictly less than the proportion of Cleveland 0.01 level of significance. State your hypotheses.
11. What is the p-value of your test?