CHI-SQUARED DISTRIBUTION HOMEWORK

TEXT: 11.1, 11.6

LAST NAME	FIRST NAME	DATE

1. Construct a 95% confidence interval for the population standard deviation based on a sample of size $n = 228$ with sample standard deviation $s = 66$.

2. Construct a 99% confidence interval for the population standard deviation based on a sample of size $n = 140$ with sample standard deviation $s = 8$.

3. Construct a 80% confidence interval for the population standard deviation based on the `nhtemp` dataset.

4. Construct a 95% confidence interval for the population standard deviation based on the `rivers` dataset.

5. Find the area under the pdf of χ^2 with 70 degrees of freedom to the right of $x = 90$.

6. Find the area under the pdf of χ^2 with 4 degrees of freedom between $x_1 = 2$ and $x_2 = 6$.

7. Find the first quartile of the χ^2 distribution with 7 degrees of freedom.

8. Find the median of the χ^2 distribution with 50 degrees of freedom.

9. A two-tailed test for population standard deviation with sample size 23 yields a test statistic of 30.

(a) State the distribution of the test statistic:

(b) Sketch the pdf of the test statistic and shade the p-value.

(c) Compute the p-value of the test.

(d) Can H_0 be rejected with $\alpha = 0.02$?

10. A two-tailed test for population standard deviation with sample of size 80 yields a test statistic of 53.

(a) State the distribution of the test statistic:

(b) Sketch the pdf of the test statistic and shade the p-value.

(c) Compute the p-value of the test.

(d) Can H_0 be rejected with $\alpha = 0.1$?

A sample of 500 sand particles from a San Francisco beach yields the following statistics: the sample mean for the diameter of a sand particle is 0.39 mm and the corresponding sample standard deviation is 0.09 mm. Using 0.05 significance level test whether the population standard deviation is different from 0.1 mm.

11. State the null and the alternative hypotheses.

12. State the distribution of the test statistic.

13. Sketch the pdf of the test statistic, label the citical value(s), and shade the rejection region.

14. Find the test statistic and sketch it on the graph above.

15. Find the p-value of this test.

16. State the conclusion.

According to a 2023 study with a sample of size 1347, the mean duration of a romantic relationship among young adults is 17.16 months, with standard deviation of 16.44 months. At 98% confidence test the claim that the standard deviation for this population is less than the mean.

17. State the null and the alternative hypotheses.

18. State the distribution of the test statistic.

19. Sketch the pdf of the test statistic, label the citical value(s), and shade the rejection region.

20. Find the test statistic and sketch it on the graph above.

21. Find the p-value of this test.

22. State the conclusion.

ANSWERS

1. (60.44704, 72.68518)

3. (1.135627, 1.439967)

5. 0.054036

7. 4.254852

11. H_0: $\sigma = 0.1$, H_1: $\sigma \neq 0.1$

12. χ^2_{499}

13. Critical values are 438.998 and 562.7895

14. 404.19

15. 0.001402702

16. The data provides sufficient evidence for the claim that the standard deviation of the diameter of a sand particle is different from 0.1 mm.