CHI-SQUARED DISTRIBUTION HOMEWORK

TEXT: 11.1, 11.6

LAST NAME	FIRST NAME	DATE

1. Find the critical value(s) of the χ^2 distribution with 12 degrees of freedom if the area in the right tail is 0.15.

2. Find the critical value(s) of the χ^2 distribution with 79 degrees of freedom if the area of 0.005 is split equally among the two tails.

3. Find the critical values for a 95% standard deviation confidence interval using the χ^2 distribution with 15 degrees of freedom.

4. Find the critical values for a 99% standard deviation confidence interval using the χ^2 distribution and a sample of size 6.

5. Construct a 95% confidence interval for the population standard deviation if a sample of size 25 has standard deviation $s = 15$.

6. Construct a 99% confidence interval for the population standard deviation if a sample of size 8 has standard deviation $s = 7.5$.

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

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

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

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

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

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

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

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

15. 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 $\alpha = 0.02$?

16. 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.

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.

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.

23. State the null and the alternative hypotheses.

24. State the distribution of the test statistic.

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

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

27. Find the p-value of this test.

28. State the conclusion.

ANSWERS

1. 16.989

2. 48.265, 118.879

3. 6.262, 27.488

4. 0.412, 16.75

5. $(11.71, 20.87)$

6. $(4.41, 19.95)$

7. $(60.44704, 72.68518)$

9. $(1.135627, 1.439967)$

11. 0.054036

13. 4.254852

17. H_0: $\sigma = 0.1$, $\quad H_1$: $\sigma \neq 0.1$

18. χ^2_{499}

19. Critical values are 438.998 and 562.7895

20. 404.19

21. 0.001402702

22. 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.