How Far Am I Off: Estimating σ

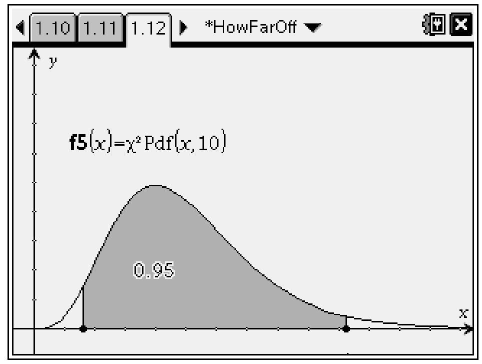
HowFarOff.tns

Name ____________________

Class ____________________

Problem 1 – Assumptions

When constructing a confidence interval for the variance, it is necessary to find two critical values due to the lack of symmetry in the chi-square (χ^2) distribution.



A 95% confidence interval has a low percentage of 2.5% and a high percentage (area) of 97.5%. The values on the *x*-axis (the critical values) that correspond with these percentages can be found using the **Inverse χ^2** command.

To use the **Inverse χ^2** command:

- Press **MENU > Statistics > Distributions > Inverse χ^2**.
- In the pop up box, enter the area and the degrees of freedom.

The critical value on the left is χ_L^2. It uses the low percentage of area.

The critical value of the right is χ_R^2. It uses the high percentage of area.

1. On page 1.10, calculate the χ_L^2 and χ_R^2 values for a 95% confidence interval with 10 degrees of freedom. Store χ_L^2 as **L** and χ_R^2 as **R**.

2. Verify that the area between these two values is 95% of the area under the entire curve. On page 1.12 graph ***f*(*x*) = χ^2pdf(x,10)**.

Problem 2 – Estimating the Interval

Goal: Estimate the true variance (σ) of the population from a sample.

Confidence Interval
$\sqrt{\dfrac{(n-1)s^2}{\chi_R^2}} < \sigma < \sqrt{\dfrac{(n-1)s^2}{\chi_L^2}}$

3. Why is the right χ^2 value used in the left bound of the interval and vice versa?

Read the problem on page 2.3.

4. Find χ_R^2 and χ_L^2 and store as **R** and **L**.

5. Calculate the endpoints of the interval.

6. Interpret the interval in as it applies to the problem.

Homework

1. A random sample of the population of 17 U.S. state capitals has a mean of 330,731 and a standard deviation of 371,691. Assume that the population is normally distributed.

a. Find 90% confidence intervals for the mean and standard deviation of all U.S. state capitals. Interpret the intervals.

b. The complete set of US capital data for this problem is given in Problem 3. Calculate the actual mean and standard deviation. Do the actual values fall within the calculated confidence intervals? Why do you think this happens? What does this information tell you about the 50 US State capitals?

2. There are 343 teams in Division I College Men's Basketball. A random sample of 50 teams has a mean of 68.1 and a standard deviation of 6.1 for the average number of points scored per game. Assume that the population is normally distributed.

a. Find a 95% confidence interval for the mean and standard deviation of the population. Interpret the intervals.

b. The complete set of team data for this problem is given in Problem 3 in the TI-Nspire document file. Calculate the actual mean and standard deviation. Do the actual values fall within the calculated confidence intervals? Why do you think this happens?