



Since the P -value of 0.0015 is less than $\alpha = 0.01$, we reach the same conclusion; reject the null hypothesis.

Step 6: State the conclusion in terms of the original question.

There is overwhelming evidence that the process variation exceeds the desired level. Therefore, the manager is willing to shut down the manufacturing process at a significance level of 0.01.

11.6 Exercises

Basic Concepts

- How does testing a hypothesis about a variance differ from testing a hypothesis about a mean?
- What is the sampling distribution for $\frac{(n-1)s^2}{\sigma^2}$?
- What assumption must hold to use the chi-square distribution to make inferences about the population variance?
- True or False: The chi-square distribution is skewed to the right.
- What is the symbol for a critical value for the chi-square distribution? Describe the meaning of this critical value.
- Give an example where we would want to calculate a confidence interval for σ^2 .

Exercises

- Determine the critical value(s) of the test statistic for each of the following tests for a population variance where the assumption of normality is satisfied.
 - Right-tailed test, $\alpha = 0.01$, $n = 20$
 - Right-tailed test, $\alpha = 0.05$, $n = 24$
 - Right-tailed test, $\alpha = 0.005$, $n = 5$
- Determine the critical value(s) of the test statistic for each of the following tests for a population variance where the assumption of normality is satisfied.
 - Right-tailed test, $\alpha = 0.025$, $n = 18$
 - Right-tailed test, $\alpha = 0.10$, $n = 24$
 - Right-tailed test, $\alpha = 0.05$, $n = 41$

9. A bolt manufacturer is very concerned about the consistency with which the machines produce bolts that are $\frac{3}{4}$ inches in diameter. When the manufacturing process is working normally the standard deviation of the bolt diameter is 0.05 inches. A random sample of 30 bolts has an average diameter of 0.25 inches with a standard deviation of 0.07 inches.
- Can the manufacturer conclude that the standard deviation of bolt diameters is greater than 0.05 inches at $\alpha = 0.05$?
 - What assumption did you make about the diameter of the bolts in performing the test in part **a.**?
10. A drug that is used for treating cancer has potentially dangerous side effects if it is taken in doses that are larger than the required dosage for the treatment. The pharmaceutical company that manufactures the drug must be certain that the standard deviation of the drug content in the tablet is not more than 0.1 mg. Twenty-five tablets are randomly selected and the amount of drug in each tablet is measured. The sample has a mean of 20 mg and a variance of 0.015 mg.
- Does the data suggest at $\alpha = 0.01$ that the standard deviation of drug content in the tablets is greater than 0.1 mg?
 - What assumption did you make about the amount of drug contained in the tablets in performing the test in part **a.**?
11. The refrigeration coolers in a local grocery store must stay at the same daily temperature with little variance to ensure the quality of the items placed in it. Daily temperatures are measured in degrees Fahrenheit ($^{\circ}\text{F}$), and the store manager assumes the standard deviation in daily temperatures is 3.8°F . The assistant manager claims that the standard deviation is more than 3.8°F and decides to test the claim using a hypothesis test. For a random sample of 30 days, the assistant manager finds that the standard deviation in the daily temperatures for one cooler is 4.4°F . At the 0.01 level of significance, does the evidence support the claim that the standard deviation in the daily temperatures for the cooler is more than 3.8°F ?