

## 16.1 Exercises

### Basic Concepts

- Describe the shape of the chi-square distribution.
- What is the sampling distribution of the sample variance?
- What are the degrees of freedom associated with the chi-square distribution?
- Can a chi-square statistic ever be negative? Explain why or why not.
- Describe how the chi-square distribution changes in shape as  $n$  becomes large.
- Explain the meaning of  $\chi_{\alpha, df}^2$ .
- Explain the procedure for determining chi-square critical values.

### Exercises

- Find the chi-square critical value for each of the following.
  - $\alpha = 0.01, df = 14$
  - $\alpha = 0.01, df = 26$
  - $\alpha = 0.05, df = 4$
  - $\alpha = 0.05, df = 9$
  - $\alpha = 0.005, df = 12$
- Find the chi-square critical value for each of the following.
  - $\alpha = 0.005, df = 40$
  - $\alpha = 0.025, df = 15$
  - $\alpha = 0.025, df = 2$
  - $\alpha = 0.10, df = 24$
  - $\alpha = 0.10, df = 50$
- Suppose that a marketing manager is studying sales data for products that are not available in stores and only sold online. She collects the following weekly sales data for 10 products not sold in stores. Assume the population standard deviation for this data is \$5000.

Weekly Online Sales										
Product	1	2	3	4	5	6	7	8	9	10
Sales (\$)	26,259	18,514	21,579	18,739	27,821	22,511	29,753	20,235	16,258	15,990

- Compute the sample standard deviation for this data. Round your answer to the nearest dollar.
  - Compute the value of  $\chi^2$ . Round your answer to three decimal places.
  - How many degrees of freedom are associated with this chi-square distribution?
  - What is the value of  $\chi_{0.05, df}^2$  for this data?
- Michael is interested in obtaining 30-year fixed mortgage rates in Myrtle Beach, SC. He obtained rate quotes from 8 lenders, and the APR rates that were quoted to him are given in the following table.

30-Year Fixed Mortgage Rates	
Lender	APR (%)
EverBank	5.375
AimLoan	5.875
Great Western	6.125
Greenlight	6.375
Flagstar	5.375
AuroraBank	5.750
Quicken	5.875
Roundpoint	5.375

- Calculate the variance of the sample. Round your answer to six decimal places.
  - Assuming the population standard deviation for the rates is 0.1%, calculate the value of  $\chi^2$ .
  - Determine the value of  $\chi_{0.025, df}^2$  for this data.
12. A fitness club manager suspects that the pool heater is faulty as the temperature of the heated pool does not seem to stay consistent throughout the day. The manager decides to collect data to determine if a new pool heater is needed. The temperature of the pool is supposed to stay within a variance of 2 if the heater is operating properly. The temperature data collected over a 14-day period is given in the following table.

Daily Pool Temperature														
Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Temperature	76.2	75.4	77.9	78.0	79.2	77.8	75.1	78.3	77.9	79.6	78.2	76.2	75.9	74.9

- Calculate the variance of the sample. Round your answer to three decimal places.
  - Assuming the population variance for the pool temperature is 2, calculate the value of  $\chi^2$ .
  - How many degrees of freedom are associated with this chi-square distribution?
13. The manufacturer of a high blood pressure medication must ensure that each tablet contains 37.5 mg of the active ingredient. It is also crucial that the standard deviation of the active ingredient per dose be less than 0.2 mg. A sample of ten tablets is taken and the data are shown in the following table.

Amount of Active Ingredient in a High Blood Pressure Tablet										
Sample	1	2	3	4	5	6	7	8	9	10
Active Ingredient Amount (mg)	37.3	36.9	37.0	37.1	37.4	37.0	36.8	37.2	37.5	37.4

- Calculate the standard deviation of the sample. Round your answer to six decimal places.
- Assuming the population standard deviation for the active ingredient amount is 0.2 mg, calculate the value of  $\chi^2$ .
- How many degrees of freedom are associated with this chi-square distribution?