$$\text{Test statistic is } \chi^2 = \sum \frac{(O - E)^2}{E}.$$

In Section 11-3 we described methods for testing claims involving contingency tables (or two-way frequency tables), which have at least two rows and two columns. Contingency tables have two variables: One variable is used for determining the row that describes a sample value, and the second variable is used for determining the column that describes a sample value. We conduct a test of independence between the row and column variables by using the test statistic given below. This test statistic is used in a right-tailed test in which the $\chi^2$ distribution has the number of degrees of freedom given by $(r - 1)(c - 1)$, where $r$ is the number of rows and $c$ is the number of columns. This test requires that each of the expected frequencies must be at least 5.

$$\text{Test statistic is } \chi^2 = \sum \frac{(O - E)^2}{E}.$$

## Chapter Quick Quiz

***Questions 1–5 refer to the sample data in the following table (based on data from the Bureau of Labor Statistics). The table lists frequencies for randomly selected nonfatal occupation injuries arranged according to day of the week. Assume that we want to use a 0.05 significance level to test the claim that such injuries occur with equal frequency on different days of the week.***

| Day | Mon | Tues | Wed | Thurs | Fri |
|---|---|---|---|---|---|
| Number | 23 | 23 | 21 | 21 | 19 |

**1.** What are the null and alternative hypotheses corresponding to the stated claim?

**2.** When testing the claim in Question 1, what are the observed and expected frequencies for Monday?

**3.** Is the hypothesis test left-tailed, right-tailed, or two-tailed?

**4.** If using a 0.05 significance level to test the stated claim, find the number of degrees of freedom and the critical value.

**5.** Given that the *P*-value for the hypothesis test is 0.971, what do you conclude?

***Questions 6–10 refer to the sample data in the following table (based on data from the Pew Research Center). Randomly selected subjects were asked about the use of marijuana for medical purposes. Assume that we want to use a 0.05 significance level to test the claim that response to the question is independent of gender.***

| | In Favor | Oppose | Don't Know |
|---|---|---|---|
| Men | 538 | 167 | 29 |
| Women | 557 | 186 | 31 |

**6.** Identify the null and alternative hypotheses corresponding to the stated claim.

**7.** What distribution is used to test the stated claim (normal, *t*, *F*, chi-square, uniform)?

**8.** Is the hypothesis test left-tailed, right-tailed, or two-tailed?

**9.** Find the number of degrees of freedom and the critical value.

**10.** Given that the *P*-value for the hypothesis test is 0.836, what do you conclude?