

11.3 Test of Independence

Section 11.3 Test of Independence

Learning Objective:

In this section, you will:

- Conduct and interpret chi-square test of independence hypothesis tests

A **test of independence** is used to determine whether two factors are independent or not. We use the graphing calculator, **C: χ^2 - Test**, with test statistic $\chi^2 = \sum \frac{(O-E)^2}{E}$, with

E df = (# of rows - 1)(# of columns - 1), O = Observed values, E = expected values

Enter data in a matrix [A] using a graphing calculator, **Matrix (2nd x-1)**, Edit, input number of rows and columns. Note that the **χ^2 - Test** will create a matrix of the expected values and place it in matrix [B].

Example 1: In a volunteer group, adults 21 and older volunteer from one to nine hours each week to spend time with a disabled senior citizen. The program recruits among community college students, four-year college students, and nonstudents. In the table below is a sample of the adult volunteers and the number of hours they volunteer per week.

Type of Volunteer	1-3 Hours	4-6 Hours	7-9 Hours
Community College Student	111	96	48
Four-Year College Student	96	133	61
Nonstudents	91	150	53

Is the number of hours volunteered independent of the type of volunteer? Test at a 5% significance level.

1. Null and Alternative Hypothesis
2. Calculator Work
3. Test Statistic and P-Value
4. Conclusion about the null hypothesis
5. Final conclusion that addresses the original claim

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Example 2: De Anza College is interested in the relationship between anxiety level and the need to succeed in school. A random sample of 400 students took a test that measured anxiety level and need to succeed in school. The table below shows the results. De Anza College wants to know if anxiety level and need to succeed in school are independent events. Test at a 5% significance level.

Need to Succeed in School	High Anxiety	Med-high Anxiety	Medium Anxiety	Med-low Anxiety	Low Anxiety
High Need	35	42	53	15	10
Medium Need	18	48	63	33	31
Low Need	4	5	11	15	17

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For more information and examples see online textbook OpenStax Introductory Statistics pages 633-638.

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