

Section 11.2

Labor Union Example Last year, the labor union bargaining agents listed five categories and asked each employee to mark the one most important to her or him. The bargaining agents need to determine if the current distribution of responses fits last years distribution or if it is different.

Category	Percentage of Favorable Responses
Vacation time	4%
Salary	65%
Safety regulations	13%
Health and retirement benefits	12%
Overtime policy and pay	6%

Category	O	$E = n * \text{Last year}\%$	$(O - E)^2/E$
Vacation time	30		
Salary	290		
Safety regulations	70		
Health and retirement benefits	70		
Overtime policy and pay	40		

Example

The age distribution of the Canadian population and the age distribution of a random sample of 455 residents in the Indian community of Red Lake Village (Northwest Territories) are shown below (based on U.S. Bureau of the Census, International Data Base).

Age (years)	Percent of Canadian Population	Observed Number in Red Lake Village
Under 5	7.2%	47
5 to 14	13.6%	75
15 to 64	67.1%	288
65 and older	12.1%	45

Use a 5% level of significance to test the claim that the age distribution of the general Canadian population fits the age distribution of the residents of Red Lake Village.

Stone Tools Example

The types of raw materials used to construct stone tools found at the archaeological site Casa del Rito are shown below (Bandelier Archaeological Excavation Project, edited by Kohler and Root). A random sample of 1486 stone tools was obtained from a current excavation site.

Raw Material	Regional Percent of Stone Tools	Observed Number of Tools at Current Excavation Site
Basalt	61.3%	906
Obsidian	10.6%	162
Welded tuff	11.4%	168
Pedernal chert	13.1%	197
Other	3.6%	53

Use a 1% level of significance to test the claim that the regional distribution of raw materials fits the distribution at the current excavation site.

Section 11.3

Example

Are pet preferences related to gender? To test this, people were randomly selected and asked to identify their favorite pet. The possible responses are "cat," "dog" and "other." The results are given in the following table. Test at a 5% level of significance.

	Cat	Dog	Other	Total
Male	10	50	30	90
Female	40	45	35	120
Total	50	95	65	210

Example

Random samples of people ages 15-24 and of people ages 25 - 34 were asked about their preferred method of (remote) communication with friends. The respondents were asked to select one of the methods from the following list: cell phone, instant message, e-mail, other. At a 5% level of significance, is the sample evidence sufficient to show that proportions of preferences for each type of communication method differ for the two age groups?

	Cell	Instant	Email	Other	Total
15-24	48	40	5	7	100
25-35	41	30	15	14	100
Total	89	70	20	21	200

Example

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. The following table 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	Row Total
Community College Students	111	96	48	255
Four-Year College Students	96	133	61	290
Nonstudents	91	150	53	294
Column Total	298	379	162	839

Are the number of hours volunteered independent of the type of volunteer?

Example

Professor Fair believes that extra time does not improve grades on exams. He randomly divided 300 students into two groups and gave them all the same test. One group had exactly one hour to finish the test and the other group could stay as long as desired. At a 5% level of significance, is the sample evidence sufficient to show that test results and time to complete the test are related?

	A	B	C	F	Total
1 Hour	23	42	65	12	142
Unlimited	17	48	85	8	158
Total	40	90	150	20	300