

## Lab Activity: Chi-Square Goodness-of-Fit

In this lab activity, you will conduct a chi-square goodness-of-fit test to determine if an observed frequency distribution fits some claimed distribution.

### Student Learning Outcomes

By the end of this chapter, you should be able to do the following:

- Perform a chi-square goodness-of-fit test using Statcato

### Preliminary

**Read** Chapter 11 The Chi-Square Distribution in:

Illowsky, Barbara, and Susan Dean. Collaborative Statistics. Connexions. 2 Mar. 2010  
<<http://cnx.org/content/col110522/1.37/>>.

### Sampling Data

Suppose you wish to investigate if monthly birth frequencies fit a uniform distribution. Survey 50 people using a random sampling method of your choice. Ask each subject the month in which he or she is born. Tally the sample birth frequency of each month. Discuss the details and results of the data collection process in **LR: Data**.



Here you will input the samples into Statcato for further processing later in the lab.

- Go to **File > Save Project** in order to save the project.
- Enter the 12 frequencies (for the 12 months) in column **C1**.

### Formulating the Hypothesis Test

Answer the following questions in **LR: Hypotheses**.

- State the claim that you are testing (formulate one according to your intuition about whether birth frequencies are the same for all twelve months).
- State the null and alternative hypotheses.
  - $H_0$ :
  - $H_a$ :
- Is this a right-tailed, left-tailed, or two-tailed test?

### Performing the Goodness-of-Fit Test

Using Statcato, you will perform calculations for the chi-square goodness-of-fit test using a significance level of 0.05 ( $\alpha = 0.05$ ).



### Performing Chi-Square Goodness-of-Fit Test

Go to `Statistics > Multinomial Experiments > Chi-Square Goodness-of-Fit`.

- For **Observed Frequencies**, select **Frequencies in Column** radio button. Then in the drop-down menu, select **C1**.
- For **Expected Frequencies**, select **Equal Frequencies**.
- For **Significance Level**, enter **0.05**.
- Click **OK**.

Copy the computation results to **LR: Goodness-of-Fit Test**.

### ***Making Conclusions***

Based on the computer-generated results, draw conclusions for the goodness-of-fit test. Record your answers in **LR: Interpretation**.

### **Decision on Null Hypothesis**

Based on the significance level  $\alpha$  and the computed p-value, decide whether to reject  $H_0$  and explain why.

### **Conclusion**

Based on your decision on the null hypothesis, make a conclusion about your claim.

### ***Discussion***

Answer the following questions in **LR: Discussion**.

1. Do birth frequencies across the twelve months appear to be random? If not, what are some possible reasons behind unequal monthly birth frequencies?
2. The test statistic for goodness-of-fit tests is  $\chi^2 = \sum \frac{(O - E)^2}{E}$ . Using one sentence, explain what the test statistic measures. Fill in the following blanks (small or large):
  - a. When observed and expected values are close,  $\chi^2$  is \_\_\_\_\_ and p-value is \_\_\_\_\_.
  - b. When observed and expected values are far apart,  $\chi^2$  is \_\_\_\_\_ and p-value is \_\_\_\_\_.