CHAPTER 10

Appendix

Inference for Proportions with Excel, JMP, Minitab, SPSS, CrunchIt!, R, and TI-83-84 Calculators

Inference for One Proportion

EXCEL

Excel has no built-in functions for inference for one proportion. If this is your technology, you can compute a z test statistic for a hypothesis test and then use **Formulas → More Functions → Statistical → NORM.S. DIST** to compute the *P*-value.

For a video that shows how to use Excel and the formulas with an example, see the Excel Video Technology Manuals on One Proportion Inference: CI - Summarized Data and One Proportion Inference: Sample Size Computation.

Confidence Interval for One Proportion

JMP

1. Click **Help → Calculators → Confidence Interval for One Proportion**.
2. Select the input method (Raw Data or Summary Statistics). For almost all exercises and examples in this text, you will select "Summary Statistics."
3. Click **OK**.
4. Input the number of successes and trials (sample size) in their boxes. For a plus four interval, simply add 2 to the number of successes and 4 to the number of trials/samples. Change the confidence level if needed.
5. Press **Enter.**

Note: Confidence intervals and hypothesis testing for a proportion with raw data can also be found in the **Analyze → Distribution** platform, but this would not happen with textbook data.

For a video that shows how to use JMP here with an example, see the JMP Video Technology Manuals on One Proportion Inference: CI - Summarized Data and One Proportion Inference: Sample Size Computation.

z Test for One Proportion

1. Click **Help → Calculators → Hypothesis Test for One Proportion**.
2. Select the input method ("Raw Data" or "Summary Statistics"). For almost all exercises and examples in this text, you will select "Summary Statistics."
3. Click **OK**.

4. Select the form of the alternate hypothesis (not equal, greater than, or less than) and enter the hypothesized value of the proportion, the number of "successes," the sample size, and the significance level of the test. Press **Enter**.
5. If you desire, check the box labeled "Reveal Decision." A Reject/Fail to Reject message will appear below the *P*-value of the test at the lower right.

Power for a Test for One Proportion

1. Click **DOE ➔ Sample Size and Power ➔ One Sample Proportion**.
2. Input alpha, the alternative proportion, and one of the three options: the hypothesized proportion p_0, the sample size, or the power.
3. Click **Continue**. The results show a power curve that shows how the two unknown quantities relate. From this curve, you can see how the three quantities relate to each other.

For an example, see the JMP Video Technology manual One Proportion Inference: CI and test - raw data.

Confidence Interval and Tests for One Proportion

Confidence intervals and tests are done from the same dialog box regardless of whether you have raw data (in a column) or only summary statistics.

1. Click **Stat ➔ Basic Statistics ➔ 1 Proportion**.
2. Change the drop-down at the top to reflect whether you have summary statistics (typical for this text) or raw data in a column.
3. For raw data, highlight and select the column name into the box.
4. For summary statistics, enter the number of successes (x) and the sample size (n). If you want a plus four interval, simply add 2 to the number of successes and 4 to the number of trials.
5. The defaults are 95% confidence and a "not equal" alternate (two-sided confidence interval). To change either of these, click **Options**, change the value, then click **OK** to return to the main dialog.
6. For the confidence interval, click **OK**.
7. For a hypothesis test, check the box and enter the value of p_0, then click **OK**.

Sample size calculations and power

Minitab will calculate the sample size needed for a particular margin of error, but it uses a different method from the one in your text. Therefore, we recommend using the provided formula $n \geq \left(\frac{z^*}{m}\right)^2 (p^*)(1-p^*)$.

To calculate the power of a test:

1. Click **Stat ➔ Power and Sample Size ➔ 1 Proportion**.
2. Specify values for any two of sample size, the alternative proportion, and power (Minitab will calculate the third) along with the hypothesized proportion.
3. Click **Options** to specify the form of the alternative hypothesis and alpha. Click **OK** to return to the main dialog.
4. Click **OK**. Minitab first gives a calculated result followed by a graphic that represents the power curve for different comparison values.

For more information and an example, see the Minitab Video Technology Manual: One Proportion Inference: CI and Test: summarized data.

SPSS does not compute confidence intervals, hypothesis tests, or power for one proportion.

Note: See the SPSS technology manual for this chapter for instructions on using SPSS as a calculator to perform the tests and procedures above.

CRUNCHIT!

Both confidence intervals and hypothesis tests are done through the **Statistics → Proportion → One-Sample** dialog.

1. For "raw data" in a column, click the **Columns** tab; otherwise (typically), click **Summarized**.
2. For raw data, select the column of interest.
3. For summarized data, enter the sample size (n) and number of successes (x). If you want a plus four interval, simply add 2 to the number of successes and 4 to the number of trials.
4. Select the "Confidence Interval" tab and enter the desired confidence level or select the "Hypothesis Test" tab. Enter the hypothesized proportion value and type of alternate hypothesis.
5. Click **Calculate**.

CrunchIt! does not calculate the sample size needed for a particular margin of error or power for proportions.

For more information (and an example), see the CrunchIt! Help Video, Inference for One Proportion.

TI-83/-84

Confidence Interval for One Proportion

1. Press STAT ▸ ▸ to select "TESTS."
2. Select A:1-PropZInt.
3. Enter the number of successes (x), the sample size (n), and the confidence level.
4. Arrow down to "Calculate" and press ENTER.

Test for One Proportion

1. Press STAT ▸ ▸ to select "TESTS."
2. Select 5:1-PropZTest.
3. Enter the value of the population proportion (p_0) under the null hypothesis, the number of successes (x), and the sample size (n).
4. Select the desired type of alternative hypothesis.
5. Arrow down to "Calculate" and press ENTER.

TI calculators do not calculate the sample size needed for a particular margin of error or power for proportions.

For more help and an example, see the TI-83/-84 Video Technology Manuals, One Proportion Inference: CI - summarized data and One Proportion Inference: Sample Size Computation.

R does not have a built-in function to perform a z test for one proportion. There is a prop.test command, but it uses the chi-square distribution; its p-values and confidence intervals will be different than those found using a z distribution.

For an example using R (as a calculator here), see the R Video Technology Manual: One Proportion Inference: Confidence Intervals. (The part you are interested in is at the end.)

Inference for Two Proportions

EXCEL

Excel has no built-in functions for inference for two proportions. If this is your technology, you can compute a z test statistic for a hypothesis test and then use **Formulas ➔ More Functions ➔ Statistical ➔ NORM.S. DIST** to compute the P-value.

For a video that shows how to use Excel and the formulas with an example, see the Excel Video Technology Manual on Two Proportions Inference: CI and Test - summarized data.

JMP

Confidence Interval and Test for Two Proportions

Both of these can be done at once using the following steps:

1. Enter the data into the spreadsheet with one column for the "factor" variable (the category that distinguished the two proportions of interest), one column for the success/failure category names, and one for the counts. An example is below.

Sex	Live with parents	count
Female	Yes	923
Female	No	1703
Male	Yes	986
Male	No	1287

2. Click **Analyze ➔ Fit Y by X**.
3. Select and enter the Response variable (the Yes/No variable), the Factor (the explanatory variable), and the counts as Weights.
4. Click **OK**.
5. Click on the red triangle at the top of the output. Select **Two-Sample Test for Proportions**. If necessary, change the response category of interest in that output.
6. The default is 95% confidence. To change that, click the red triangle at the top of the output and select **Set α Level**.
7. To calculate relative risk, click the red arrow at the top of the output and select **Relative Risk**. Select which category is of interest and which group should be used in the numerator. Click **OK**. Those results are added at the bottom of the output window.

If you want a plus four interval, simply add 1 to each number of successes and 2 to each number of trials.

Power Calculations

1. Click **DOE ➔ Sample Size and Power ➔ Two Sample Proportions**.
2. Input alpha, the alternative proportions, and one of the three options: the hypothesized proportion p_0, the sample sizes, or the power.
3. Click **Continue**. The results show a power curve that shows how the two unknown quantities relate. If solving for sample sizes, the two will be the same size. From this curve, you can see how the three quantities relate to each other.

For a video that shows how to use Excel and the formulas with an example, see the JMP Video Technology Manual on Two Proportions Inference: CI and Test - summarized data.

Confidence Interval and Tests for Two Proportions

Confidence intervals and tests are done from the same dialog box regardless of whether you have raw data (in columns) or only summary statistics.

1. Click **Stat ➔ Basic Statistics ➔ 2 Proportions**.
2. Change the drop-down at the top to reflect whether you have summary statistics (typical for this text) or raw data in columns (and the data layout, if in columns—but this would be extremely rare for this text).
3. For raw data, highlight and select the column names into the boxes.
4. For summary statistics, enter the number of successes (x) and the sample size (n) for each sample.

   If you want a plus four interval, simply add 1 to the number of successes and 2 to the number of trials for each sample
5. Click **Options**. For a confidence interval, enter the level of confidence and select **Estimate the proportions separately** in the "Test Method" drop-down. For a hypothesis test, enter the type of alternate hypothesis and select **Use the pooled estimate of the proportion** in the Test Method drop-down.
6. Click **OK** to return to the main dialog.
7. Click **OK** for the results.

Power Calculations (Assumes Equal Sample Sizes)

1. Click **DOE ➔ Sample Size and Power ➔ Two Sample Proportions**.
2. Input any two of sample size, the comparison proportion (p_1) and the power value. Input a baseline (hypothesized) proportion for p_2.
3. Click **Options**.
4. Select the form of the alternate hypothesis and change the alpha level if needed.
5. Click **OK** to return to the main dialog.
6. Click **OK** for the results. You will first see a calculated result, and then the power curve.

For a video that shows how to use Excel and the formulas with an example, see the Minitab Video Technology Manual on Two Proportion Inference: CI and Test - summarized data

SPSS does not compute confidence intervals, hypothesis tests, or power for two proportions.

Note: See the SPSS technology manual for this chapter for instructions on using SPSS as a calculator to perform these.

Both confidence intervals and hypothesis tests are done through the **Statistics ➔ Proportion ➔ Two-Sample** dialog.

1. Typically, you will click **Summarized**. For "raw data" in two columns, click the **Columns** tab. If you have raw data with one column indicating success/failure and a separate column for the explanatory variable, click **Grouped**.
2. For summarized data, enter the sample sizes (n_i) and number of successes (x_i). If you want a plus four interval, simply add 1 to each number of successes and 2 to each number of trials.

3. For raw data, select the columns of interest and indicate the data value that represents a success.
4. Select either the **Confidence Interval** or **Hypothesis Test** tab. For the interval, enter the desired confidence level. For the test, enter the hypothesized proportion value and type of alternate hypothesis.
5. Click **Calculate**.

CrunchIt! will not calculate sample sizes or power for two proportions.

For more information (and an example), see the CrunchIt! Help Video, Inference for Two Proportions.

TI-83/-84

Confidence Interval for Two Proportions

1. Press STAT ▶ ▶ to select "TEST."
2. Select B:2-PropZInt.
3. Enter the number of successes (x), the sample size (n) for each sample, and the confidence level.

   If you want a plus four interval, simply add 1 to each number of successes and 2 to each number of trials.
4. Arrow down to "Calculate" and press ENTER.

Test for Two Proportions

1. Press STAT ▶ ▶ to select "TEST."
2. Select 6:2-PropZTest.
3. Enter the number of successes (x) and the sample size (n) for each sample.
4. Select the desired type of alternative hypothesis.
5. Arrow down to "Calculate" and press ENTER.

For a video that shows how to use Excel and the formulas with an example, see TI-83/-84 Video Technology Manual: Two Proportion Inference: CI and Test-summarized data.

R does not have a built-in function to perform a z test for two proportions. There is a prop.test command, but it uses the chi-square distribution; its p-values and confidence intervals will be different than those found using a z distribution.