The lesson documents provide information about using the calculator provided with the lessons. The purpose of this supplement is to supply information about another possible technology, namely the StatCrunch computer software product.

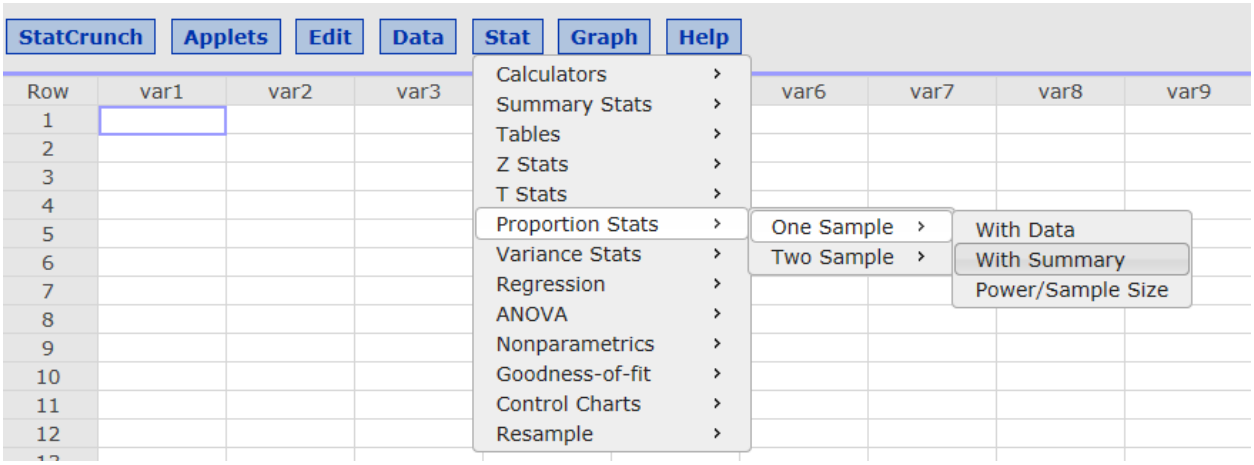
CAUTION: You should note that the interface for StatCrunch has changed in the past and may well change in the future – accordingly, some of the information given here may prove to be out of date.

Starting StatCrunch – see Lesson 2 document

Lesson 9

Hypothesis tests

For both confidence interals and hypothesis tests, the starting point is the same. We use menu option **Stat > Proportion Stats > One Sample > With Summary**. See the screen shot here:



On the resulting screen you will indicate the number of successes, the sample size, the null hypothesis proportion, and the nature of the test (one-tail or two-tail). We will illustrate this with an example.

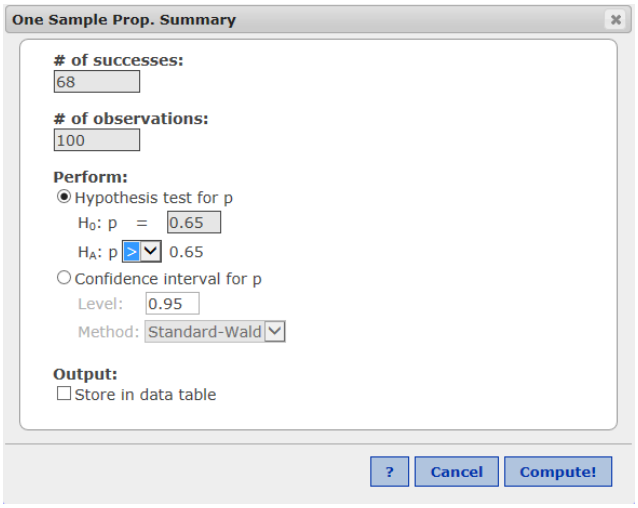
Example: Test the following claim:

$H_0 : p = 0.65$

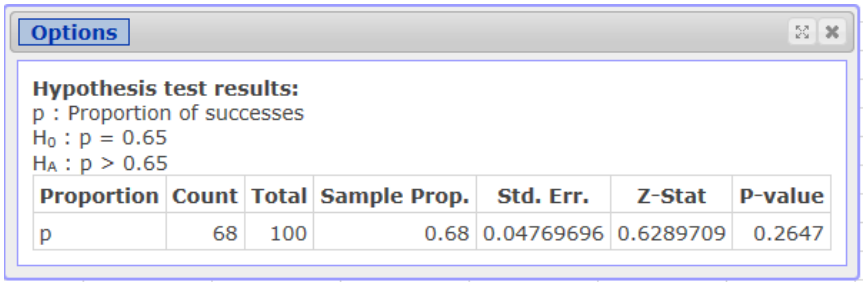
$H_a : p > 0.65$

Suppose that based on a random sample of 100 people, 68 say "yes" when asked the question. Is this enough evidence to refute the null hypothesis?

In this problem $x = 68$, $n = 100$, $p_0 = 0.65$, and the alternative hypothesis is of the form $p > p_0$. On the data input screen we enter x (the **# of successes**) and n (the **# of observations**, that is the sample size). We select the **Hypothesis test for p** option, and enter the proportion from the null hypothesis and show the direction of the alternative hypothesis, as shown here.



When we select **Compute!** we obtain the following results:



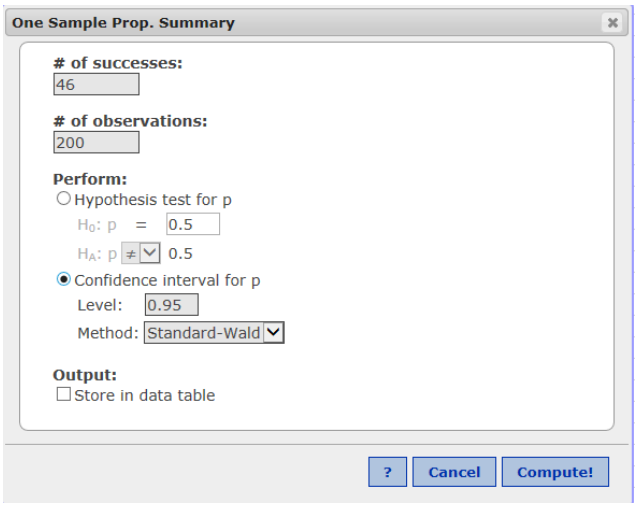
Therefore the *z*-test statistic value (rounded to four places) is 0.6290 and the *p*-value is 0.2647. Since the *p*-value is not small we do not reject the null hypothesis.

Confidence intervals

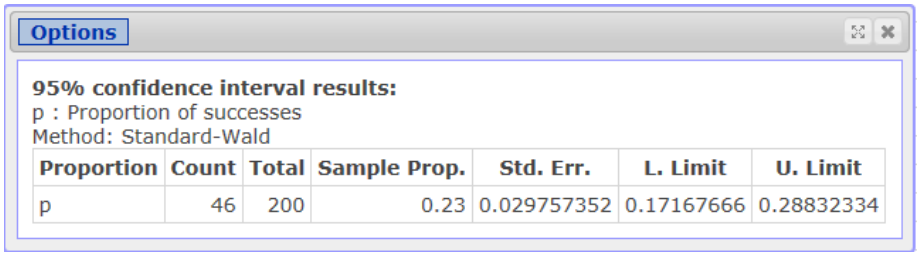
Just as for, hypothesis tests for confidence intervals the starting point is menu option **Stat > Proportion Stats > One sample > with summary.** On the next screen you will enter the number of successes, the sample size, and the confidence level. We will illustrate this with an example.

Example: Suppose that in a random sample of 200 people in a certain district, 46 said that they would vote for a particular candidate in an upcoming election. Find a 95% confidence interval to estimate the population proportion of all people in this district that would vote for this candidate.

In this problem x=46, n=200, and the confidence level is 0.95. On the data input screen we enter x (the **# of successes:**) and n (the **# of observations:**, that is the sample size). We select the **Confidence interval for p** option and set the **Level:** to 0.95, as shown here:



When we choose **Compute!** we obtain these results:



Proportion	Count	Total	Sample Prop.	Std. Err.	L. Limit	U. Limit
p	46	200	0.23	0.029757352	0.17167666	0.28832334

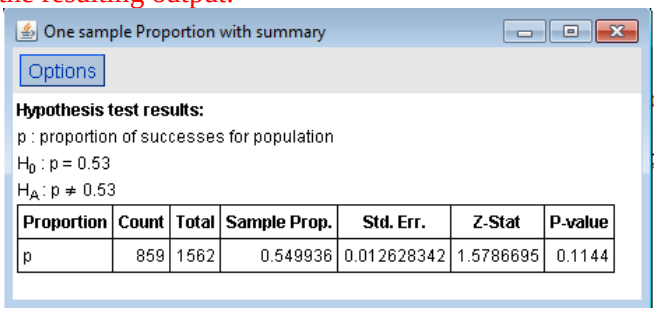
The **L.Limit** and **U.Limit** give the lower and upper "limits" of the confidence interval. So the 95% confidence interval is (0.1717, 0.2883). This means that we are 95% confident that between 17.17% and 28.83% of all the people in this district would vote for this candidate. The output also shows the $\hat{p}$ value – the sample proportion – which is 23%.

Solutions to exercises that use the calculator.

Exercise 1:

a. Use technology to test the claim that a population proportion is 53%. Use a two-tail test. Report the test statistic and the *p*-value, and state your conclusion. In the random sample, 859 of the 1562 surveyed answered "yes."

Here is the resulting output:



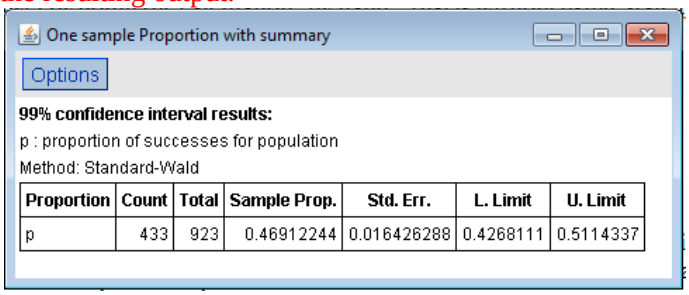
Proportion	Count	Total	Sample Prop.	Std. Err.	Z-Stat	P-value
p	859	1562	0.549936	0.012628342	1.5786695	0.1144

Test statistic $z = 1.5787$, p-value = 0.1144, do not reject null hypothesis.

Exercise 2:

a. Use technology to calculate a 99% confidence interval if 433 persons in a random sample of size 923 answered "yes" to the question posed.

Here is the resulting output:



Proportion	Count	Total	Sample Prop.	Std. Err.	L. Limit	U. Limit
p	433	923	0.46912244	0.016426288	0.4268111	0.5114337

- Report the answer as an interval, in a form similar to (42.31%, 48.75%)
  (42.68%, 51.14%)
- Report the answer in a form similar to 45.53% ± 3.22%
  46.91% ± 4.23% (the margin of error can be found by subtracting the sample proportion from the upper end of the interval: 51.14% – 46.91%)