Using Your TI-NSpire Calculator for Hypothesis Testing:
## The One-Sample *t* Test
Dr. Laura Schultz
Statistics I

The one-sample *t* test is used to test hypotheses regarding population means. This handout will take you through one of the examples we will be considering during class. Consult your lecture notes for more details regarding the non-calculator-related aspects of this specific hypothesis test.

Researchers at the University of Maryland recorded body temperatures from a random sample of 93 healthy adults. They obtained a sample mean of $\bar{x} = 98.12°F$, with a standard deviation of $s = 0.65°F$. Test the hypothesis that the mean (μ) body temperature of all healthy adults is actually less than 98.6°F.

Working from Summary Statistics

1. Before you can proceed with entering the data into your calculator, you will need to symbolize the null and alternative hypotheses. For this example, let's define μ as the mean body temperature of all healthy adults. Then, we can symbolize our null hypothesis (H_0) as $\mu = 98.6°F$ and our alternative hypothesis (H_1) as $\mu < 98.6°F$.
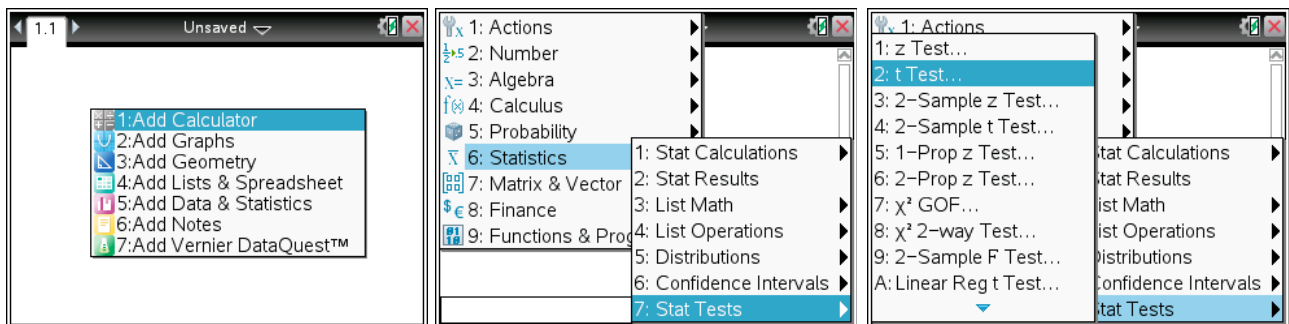
2. Start a new calculator document on your TI-Nspire. Then, press menu and select 6: Statistics followed by 7: Stat Tests. Select 2: t Test, and indicate that you will be using Stats as the data input method.
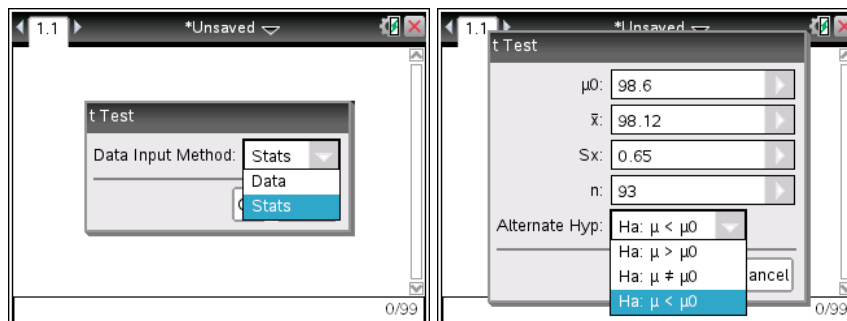
3. Your calculator will prompt you for the following information:

   • µ0: Enter the numerical value that appears in your null hypothesis. For this example, type 98.6 at the prompt and press tab.

- $\bar{x}$: Enter the sample mean. For this example, type 98.12 at the prompt and press tab.

- s_x: Enter the sample standard deviation. For this example, type 0.65 at the prompt and press tab.

- n: Enter the sample size. For this example, type 93 and press tab.

- Alternate Hyp: Highlight the option that contains the symbol used in your alternative hypothesis. For this example, highlight Ha: μ < μ0 and press tab. This entry tells your calculator that you are testing the alternative hypothesis $\mu < 98.6$. The other two choices represent right-tailed and tailed-tailed hypothesis tests, respectively. (We are conducting a left-tailed test for this example.) Press enter to run the test.

4. You will obtain the output screen shown to the right. <u>For one-sample t tests, we will round the t-test statistic to 4 decimal places and the P-value to 3 significant figures.</u> You should report these t-test results as $t_{92} = -7.1215$, $P = .000000000116$ (left-tailed). <u>Note that I included the degrees of freedom as a subscript; this is necessary because there is a different t distribution for each number of degrees of freedom.</u>

"Title"	"t Test"
"Alternate Hyp"	"μ < μ0"
"t"	-7.12147
"PVal"	1.15633E-10
"df"	92.
"x̄"	98.12
"sx := Sn-1x"	0.65
"n"	93.

5. We will be using the P-value approach to hypothesis testing in this course, so we now have all the information we need to formally conduct our hypothesis test. Compare the P-value to your alpha level. If the P-value is less than or equal to alpha, you will **reject the null hypothesis (H_0)** and conclude that the sample data support the alternative hypothesis. If the P-value is greater than alpha, you must **fail to reject H_0** and conclude that the sample data are not consistent with the alternative hypothesis. I indicated during class that you should test at a significance level of $\alpha = .01$ for the purposes of this example. Our P-value (.000000000116) is less than .01, so we reject our null hypothesis.

Working with Raw Sample Data

In situations where you are given raw sample data (instead of the calculated sample mean and standard deviation), you would start by entering the data into a list. Then, follow the same steps as described above, except choose Data instead of Stats as the data input method and indicate the name of the list where you stored the sample data.

The formal hypothesis test for this example is shown on the next page. I expect you to report the results of your hypothesis tests using these same seven steps. Pay special attention to the wording I use for the conclusion, especially how I report the numerical results of the t test.

1. <u>Claim</u>: The mean body temperature of healthy adults is actually less than 98.6°F.

2. Let μ = The mean body temperature of all healthy adults

   H_0: μ = 98.6 (Healthy adults have a mean body temperature of 98.6°F.)

   H_1: μ < 98.6 (Healthy adults have a mean body temperature that is less than 98.6°F.)

3. Conduct a left-tailed, one-sample t test with a significance level of **α** = .01

4. We are told that a random sample was used. We don't have access to the raw data, so we cannot check for normality. Given that the sample size of 93 is well above 30, we will assume that the Central Limit Theorem applies and that the sampling distribution of the sample mean is normal.

5. Results: t_{92} = -7.1215, P = .000000000116, left-tailed

6. Reject H_0 because .000000000116 < .01

7. <u>Conclusion</u>: The sample data support the claim that the mean body temperature of all healthy adults is actually less than 98.6°F (t_{92} = -7.1215, P = .000000000116, left-tailed). The sample mean of 98.12°F is significantly less than 98.6°F.