Comparing Two Dependent Means

Speaking Couples
Listed below are the numbers of words spoken in a day by each member of six different couples. The data are randomly selected from the first two columns in Data Set 17 from Appendix B. Use a 0.05 significance level to test the claim that among couples, males speak more words in a day than females.

Males:	5,638	21,319	17,572	26,429	46,978	25,835
Females:	5,198	11,661	19,624	13,397	31,553	18,667

$\alpha = 0.05$

The first group shown is Males, so we designate that Group 1 and Females will be Group 2. We are testing that males in couples speak more than females, or:

$$\begin{aligned} & \text{Group 1} > \text{Group 2} \\ \Rightarrow\ & \text{Group 1} - \text{Group 2} > 0 \\ \Rightarrow\ & \mu_{diff} > 0 \end{aligned}$$

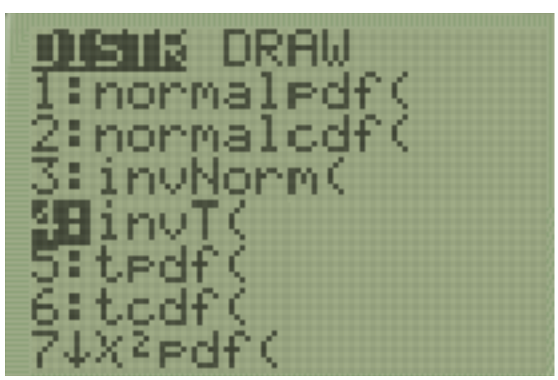
And so our hypothesis test is:

$H_0 = \mu_{diff} \leq 0$
$H_A = \mu_{diff} > 0$

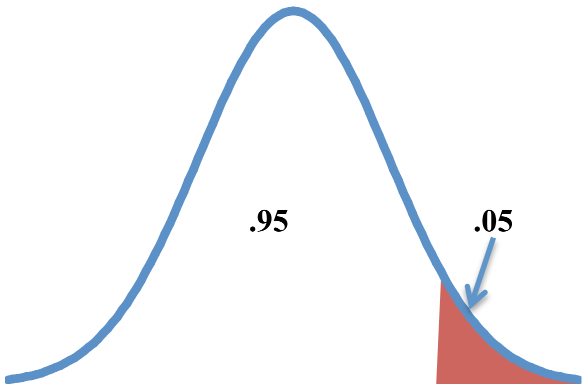
This problem is testing the difference between two dependent means. With dependent data, we must use **T Tests** for this problem.

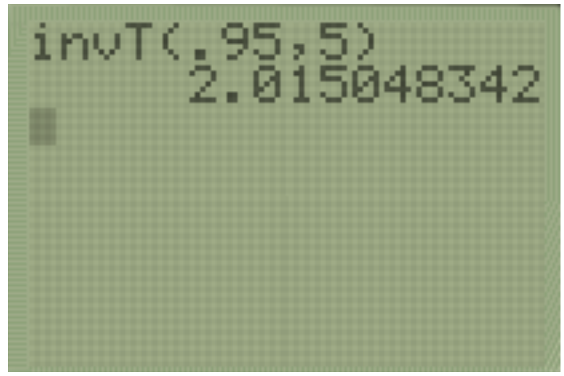
Calculating Critical Value

Push **2ND,** then **VARS**. Select **invT(** and hit **ENTER**.



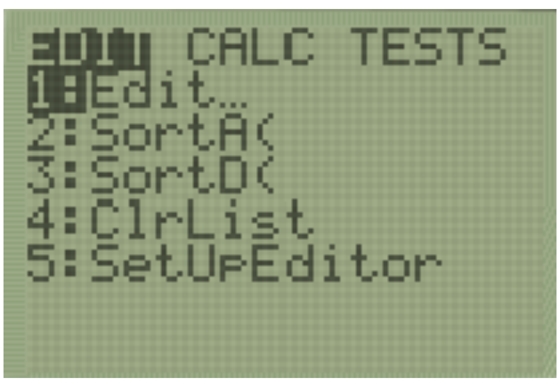
Next, we need to input two numbers into this function. First is the area from the left leading up to our rejection region (0.95). The last number is the degrees of freedom ($n_2 = 6$, $df = n - 1 = 5$). Then hit **ENTER**. The number below is our critical value.

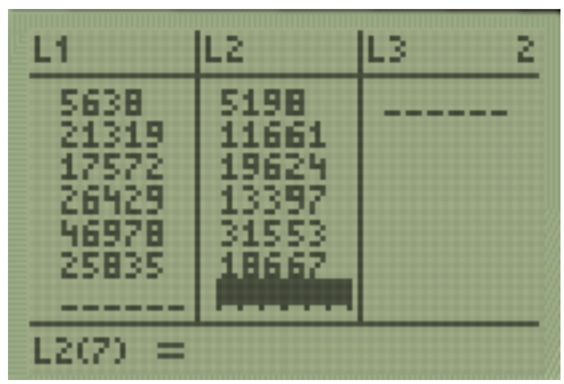




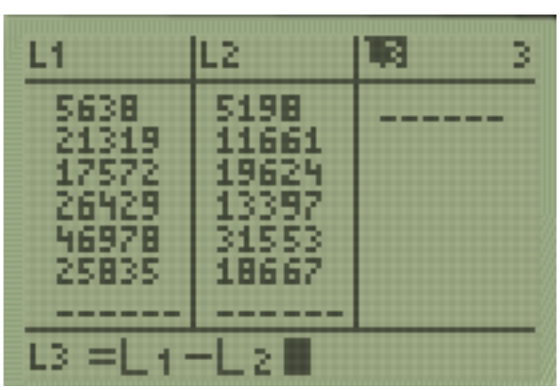
Calculating Test Statistic and P Value

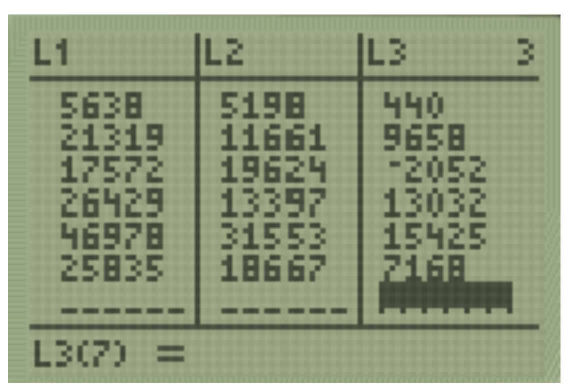
Push **STAT**, then select **Edit** and hit **ENTER**. Enter the number for Group 1 into **L1** and Group 2 into **L2**.



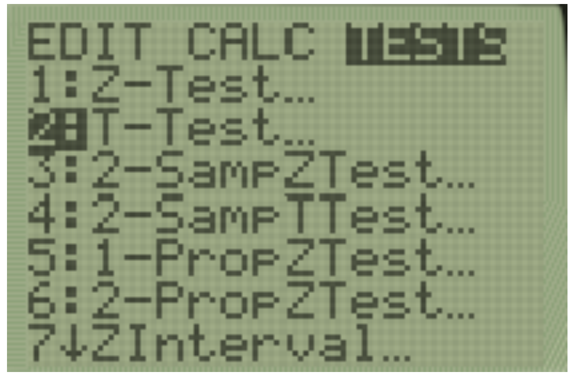


Press the right arrow key and then the up arrow key until you've highlighted the **L3** title. Then push **2ND**, then **1**, and then – (the minus button). Then push **2ND**, then **2**, and hit ENTER. **L3** now contains the differences between Group 1 and Group 2.

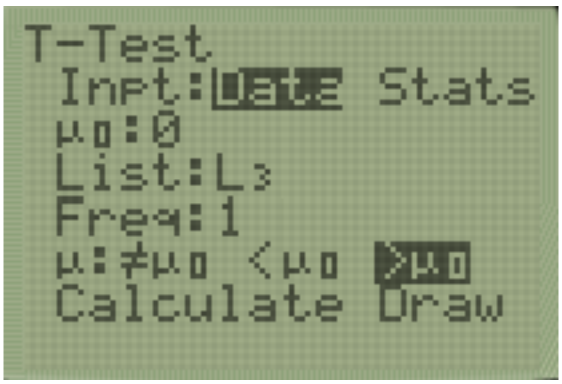


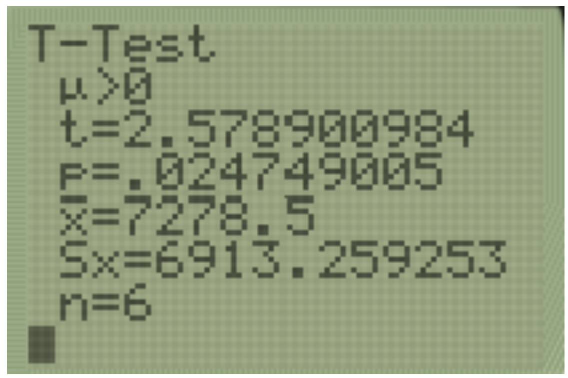


Push **STAT**, then select **TESTS** in the upper right hand corner. Select **T-Test...** and hit **ENTER**.



First, for Input, select **Data**. Next state what μ_0 is ($H_A = \mu_{diff} > 0$, so $\mu_0 = 0$). Next, list where our data is located (**L3**) and choose our alternative hypothesis ($H_A = \mu_{diff} > \mu_0$). Now select **Calculate** and hit **ENTER**. The **t =** is our test statistic and the **p =** is our p value.



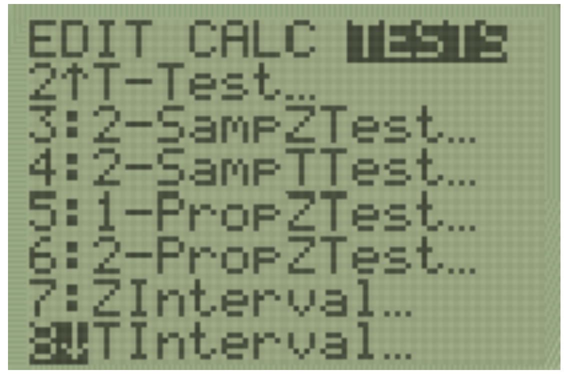


<u>Calculating a Confidence Interval</u>

We refer to the following table to choose our confidence level. We have a one-tailed test and $\alpha = 0.05$, so we will use a confidence level of 90%.

	α	Two-Tailed Test	One-Tailed Test
Significance	0.01	99%	98%
Level for	0.05	95%	90%
Hypothesis Test	0.10	90%	80%

Push **STAT**, then select **TESTS** in the upper right hand corner. Select **TInterval...** and hit **ENTER**.



First, for Input, select **Stats**. Next, list where our data is located (**L3**) and choose our confidence level (90%). Now select **Calculate** and hit **ENTER**. The top numbers in parentheses is our confidence interval.