Dependent Samples:
Matched Pairs & TI

Tips & Notations:
1. Key Words: Before & After.

2. Preparation:
   (a) Enter data from before group in \( L_1 \).
   (b) Enter matched data from after group in \( L_2 \).
   (c) Highlight \( L_3 \) and then do \( L_1 - L_2 \) followed by ENTER.

3. Mean of the differenced data: \( \bar{d} \)

4. Standard Deviation of the differenced data: \( s_d \)

5. Population mean difference of the matched-pairs data: \( \mu_d \)

Basic Statistics Computations For \( \bar{d} \) & \( s_d \):

1. How to Find \( \bar{d} \): \[ \text{STAT} > \text{CALC} > 1\text{-Var STATS} > L_3 \text{ ENTER, } \bar{d} = \bar{x} \]
2. How to Find \( s_d \): \[ \text{STAT} > \text{CALC} > 1\text{-Var STATS} > L_3 \text{ ENTER, } s_d = s_x \]

Confidence Interval For \( \mu_d \):

1. How to Write the Final Answer: \[ \mu_d < \]
2. Confidence Interval Using TI: \( \text{TInterval} > \text{Inpt: Data, List: } L_3 \text{, and Freq:1.} \)

Hypothesis Testing For \( \mu_d \):

\[ H_0 : \mu_d = 0 \]
\[ H_1 : \begin{cases} \mu_d \neq 0 & \text{Two - Tail Test} \\ \mu_d > 0 & \text{Right - Tail Test} \\ \mu_d < 0 & \text{Left - Tail Test} \end{cases} \]

1. Finding Critical Values Using TI: \( \text{PRGM} > \text{TVAL} \text{ ENTER (Twice)} \)

2. Degrees Of Freedom: \( df = n - 1 \)

3. Finding C.T.S. & P-Value Using TI: \( \text{STAT} > \text{TESTS} > \text{TTest} \)
Guided Example:

10 different athletes were randomly selected to join a 3-month diet program to gain weight. The results are given in the following table.

<table>
<thead>
<tr>
<th>Before Diet:</th>
<th>185 170 190 200 180 195 175 200 215 220</th>
</tr>
</thead>
<tbody>
<tr>
<td>After Diet:</td>
<td>200 180 190 195 195 180 200 225 220 215</td>
</tr>
</tbody>
</table>

After entering these data in $L_1$ and $L_2$, followed by the difference in $L_3$, we should have the following:

| Before Diet $\rightarrow L_1$ | 185 170 190 200 180 195 175 200 215 220 |
| After Diet $\rightarrow L_2$  | 200 180 190 195 195 180 200 225 220 215 |
| Difference $\rightarrow L_3$  | $-15 -10 0 5 -15 15 -25 -25 -5 5$ |

1. Using $L_3$, find $\bar{d}$. Round to the nearest whole number. Answer: $\bar{d} = -7$

2. Using $L_3$, find $S_d$. Round to the nearest whole number. Answer: $S_d = 13$

3. Using these results, find the 98% confidence interval for the mean of all differences $\mu_d$. Round to the one decimal place value.
   Answer: $-18.6 < \mu_d < 4.6$

4. test the claim at $\alpha = .01$ that this diet plan is effective to help athletes to gain weight.
   Answer:
   
   \begin{align*}
   H_0 &: \mu_d \geq 0 \\
   H_1 &: \mu_d < 0, \text{ LTT, Claim}
   \end{align*}

   Answer: C.V. = $-2.821$, C.T.S. = $-1.703$, and P−value = .061

6. Conclusion: C.T.S. is in NCR. P−Value > $\alpha$. $H_0$ is valid. $H_1$ is invalid. Reject the claim.

7. Suggest a couple of values for $\alpha$ that reverses the conclusion.
   Answer: Pick any value such that P−value $\leq \alpha$ such as $\alpha = 0.08$, or $\alpha = 0.1$. 