## Dependent Samples: <br> 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 $\bar{d}$ :
2. How to Find $s_{d}$ :

$$
\begin{array}{r}
\text { STAT }>\mathrm{CALC}>1 \text {-Var STATS }>L_{3}>\text { ENTER, } \bar{d}=\bar{x} \\
\text { STAT }>\mathrm{CALC}>1 \text {-Var STATS }>L_{3}>\text { ENTER, } s_{d}=s_{x}
\end{array}
$$

## Confidence Interval For $\mu_{d}$ :

1. How to Write the Final Answer:
2. Confidence Interval Using TI:

$$
<\mu_{d}<
$$

TInterval > Inpt: Data, List: $L_{3}$, and Freq:1.

## Hypothesis Testing For $\mu_{d}$ :

$$
\begin{aligned}
& H_{0}: \mu_{d}=0 \\
& H_{1}: \begin{cases}\mu_{d} \neq 0 & \text { Two - Tail Test } \\
\mu_{d}>0 & \text { Right - Tail Test } \\
\mu_{d}<0 & \text { Left - Tail Test }\end{cases}
\end{aligned}
$$

1. Finding Critical Values Using TI:

PRGM $>$ TVAL $>$ ENTER (Twice)

$$
d f=n-1
$$

STAT $>$ TESTS $>$ 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.

| Before Diet: | 185 | 170 | 190 | 200 | 180 | 195 | 175 | 200 | 215 | 220 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| After Diet: | 200 | 180 | 190 | 195 | 195 | 180 | 200 | 225 | 220 | 215 |

After entering these data in $L_{1}$ and $L_{2}$, followed by the difference in $L_{3}$, we should have the following:

| Before Diet $\longrightarrow L_{1}$ | 185 | 170 | 190 | 200 | 180 | 195 | 175 | 200 | 215 | 220 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| After Diet $\longrightarrow L_{2}$ | 200 | 180 | 190 | 195 | 195 | 180 | 200 | 225 | 220 | 215 |
| Difference $\longrightarrow L_{3}$ | -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: $\quad-18.6<\mu_{d}<4.6$
4. test the claim at $\alpha=.01$ that this diet plan is effective to help athletes to gain weight. Answer:
$H_{0}: \mu_{d} \geq 0$
$H_{1}: \mu_{d}<0$, LTT, Claim
5. Using TVAL andT-Test, find C.V., C.T.S., and $\mathrm{P}-$ value.

Answer: C.V. $=-2.821$, C.T.S. $=-1.703$, and $\mathrm{p}-$ 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 $\mathrm{p}-$ value $\leq \alpha$ such as $\alpha=0.08$, or $\alpha=0.1$.

