

# Using the TI83/84 with *Statistics: Informed Decisions Using Data*, Sullivan 4<sup>th</sup> ed.



## Chapter 1

### To get a Simple Random Sample

Set the seed (Only used in class when the instructor wants all students to have the same results):

Enter any nonzero number (possibly provided by the instructor) press **STO>**, then press **MATH**.

Highlight the PRB menu and select 1: rand and press **ENTER**.

### Getting an SRS:

Press **MATH**, highlight the PRB menu and select 5: randInt

enter randInt(1,N) and press **ENTER** to obtain the first individual in the sample.

Continue pressing **ENTER** until you obtain the sample size desired ( $n$ ).

Or enter randInt(1,N,n); this will generate  $n$  random numbers.



## Chapter 2

### Entering the data:

1. Enter the raw data in L1 by pressing **STAT** and selecting 1:Edit.
2. Sort lists in order by selecting 2:SortA(list name) or 3:SortD(list name)
3. Clear the entries in a list by selecting 4:ClrList list name
4. To clear a list in the EDIT mode, highlight the list name, then press CLEAR, then **ENTER**

### Histogram:

1. Enter the raw data in L1 by pressing **STAT** and selecting 1:Edit.
2. Press **Y=** and make sure that there are no functions in any of the Y-values. Press clear next to any Y-value that has a function with it.
3. Press **2nd** **Y=** to access the StatPlot menu. Select 1:Plot 1.
4. Place the cursor on On and press **ENTER**.
5. Place the cursor on the histogram icon and press **ENTER**.
6. Press **WINDOW** and set Xmin to equal the lower class limit of the first class, Xmax to equal the lower class limit of the class that would follow the last class (for example, if the last class is 90–99, set Xmax to 100), and Xscl to equal the class width. Set Ymin to 0 (or a negative value for better viewing, like -5), Ymax must be larger than the largest frequency value in your data set.
7. Press **GRAPH**. You can use the **TRACE** button to allow you to see the class limits and frequency for each bar in the histogram.

### To help draw a stem and leaf plot:

1. Enter the raw data in L1 by pressing **STAT** and selecting 1:Edit
2. Sort the list in ascending order by selecting 2:SortA(list name)
3. Determine the stems and the leaves from the sorted list.



## Chapter 3

### *Creating a Table to Show Calculations “By Hand” When Finding the Mean*

1. Enter the raw data in L1 by pressing **STAT** and selecting 1:Edit.
2. Quit to the home screen. **2nd** **MODE** Enter.
3. To find the **mean**: Find the sum of the data values,  $\sum x_i$ . **2nd** **STAT** Math/sum(L1)
4. Store this value **STO** **X,T,θ,n** Enter. Or write the value down on paper.  $\sum x_i = ###$

Substitute the value you found above in either  $\mu = \frac{\sum x_i}{N}$  or  $\bar{x} = \frac{\sum x_i}{n}$

### *Creating a Table to Show Calculations “By Hand” When Finding the Mean, Variance, and Standard Deviation using the Computational Formula*

1. Enter the raw data in L1 by pressing **STAT** and selecting 1:Edit.
2. Quit to the home screen. **2nd** **MODE** Enter.
3. To find the **mean**: Find the sum of the data values,  $\sum x_i$ . **2nd** **STAT** Math/sum(L1)
4. Store this value **STO** **X,T,θ,n** Enter. Or write the value down on paper.  $\sum x_i = ###$

Substitute the value you found above in either  $\mu = \frac{\sum x_i}{N}$  or  $\bar{x} = \frac{\sum x_i}{n}$

This is the *mean*. Store this value or write it down on paper.

5. To find the **variance**: press **STAT** and selecting 1:Edit. go to List 2 , up to the name L2.

Type  $= (L1 - \text{mean from step 4})^2$  This will calculate  $(x_i - \text{mean})^2$ .

6. Quit to the home screen. **2nd** **MODE** Find the sum of L2 **2nd** **STAT** Math/sum(L2)
7. Write this value down on paper. It is equal to  $\sum (x_i - \text{mean})^2$ .
8. Divide this number by N or n-1 depending if you are working with a population or a sample.

$$\sigma^2 = \frac{\sum (x_i - \mu)^2}{N} \quad s^2 = \frac{\sum (x_i - \bar{x})^2}{n-1}$$

9. The result from step 8 is the variance.
10. To find the **standard deviation**: take the square root of the value you found in step 9.

$$\sigma = \sqrt{\frac{\sum (x_i - \mu)^2}{N}} \quad s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

## Chapter 3 continued

### *Determine the Mean, Median, Standard Deviation, Quartiles*

1. Enter the raw data in L1 by pressing **STAT** and selecting 1:Edit.
2. Press **STAT**, highlight the CALC menu, and select 1:1-VarStats.
3. With 1-VarStats appearing on the HOME screen, press **2nd** 1 to insert L1 on the HOME screen. Press **ENTER**.

### *Creating a Table to Show Calculations “By Hand” When Finding the Mean, Variance, and Standard Deviation from Grouped Data*

1. Find the midpoints  $x_i$  for each class. (*lower + next lower*)divided by 2. Input into L1.
2. Input the frequencies  $f_i$  into L2.
3. Multiply the midpoint by the corresponding frequency  $x_i f_i$ .  $L3 = L1 \cdot L2$
4. Quit to the home screen. **2nd** **MODE** Enter.
5. Find the sum of the frequencies.  $\sum f_i$  **2nd** **STAT** Math/sum(L2)
6. Find  $\sum x_i f_i$ . **2nd** **STAT** Math/sum(L3) Write this number down on paper.  $\sum x_i f_i = ###$
7. To find the **mean**: Substitute the values you calculated in steps 5 and 6 into the formula.

$$\mu = \frac{\sum x_i f_i}{\sum f_i} \quad \text{or} \quad \bar{x} = \frac{\sum x_i f_i}{\sum f_i} \quad \text{Store this number or write it down on paper.}$$

8. To find **variance**: press **STAT** and selecting 1:Edit. go to List 4, up to the name L4.

Type  $= (L1 - \text{mean from step 7})^2 * L2$  This will calculate  $(x_i - \text{mean})^2 f_i$ .

9. Find the sum List 4.  $\sum (x_i - \text{mean})^2 f_i$ . Where *mean* =  $\mu$  or  $\bar{x}$ .

**2nd** **STAT** Math/sum(L4) Write this number down on paper.

10. Divide this number by  $\sum f_i$  or  $(\sum f_i) - 1$ . This is the variance.

$$\sigma^2 = \frac{\sum (x_i - \mu)^2 f_i}{\sum f_i} \quad s^2 = \frac{\sum (x_i - \bar{x})^2 f_i}{(\sum f_i) - 1}$$

11. To find the **standard deviation**: take the square root of the value you found in step 10.

$$\sigma = \sqrt{\frac{\sum (x_i - \mu)^2 f_i}{\sum f_i}} \quad s = \sqrt{\frac{\sum (x_i - \bar{x})^2 f_i}{(\sum f_i) - 1}}$$

## Chapter 3 continued

### *Determine the Mean and Standard Deviation from Grouped Data*

1. Enter the class midpoint in L1 and the frequency, relative frequency, or weight (for weighted means) in L2 by pressing **STAT** and selecting 1:Edit.
2. Press **STAT**, highlight the **CALC** menu, and select 1:1-VarStats.
3. With 1-VarStats appearing on the HOME screen, press **2nd** 1 to insert L1 on the HOME screen. Then press the comma and press **2nd** 2 to insert L2 on the HOME screen. So the HOME screen should have the following: 1-VarStats L1,L2

Press **ENTER** to obtain the mean and standard deviation

### *Draw a Boxplot*

1. Enter the raw data in L1.
2. Press **2nd** **Y=** and select 1:Plot 1.
3. Turn the plot ON. Use the cursor to highlight the first boxplot icon in the 2<sup>nd</sup> row.

Your screen should look like:

4. Press **ZOOM** and select 9:ZoomStat.
5. If you press **TRACE** and then use the arrow keys, you will find the values of the important points along the boxplot.



## Chapter 4

### *Scatter Diagrams*

1. Enter the explanatory variable into L1 and the response variable into L2.
2. Press **2nd** **Y=** to bring up the StatPlot menu. Select 1: Plot1.
3. Turn Plot1 ON.
4. Highlight the scatter diagram icon (see the figure) and press **ENTER**. Be sure that XList is L1 and YList is L2.
5. Press **ZOOM** and select 9: ZoomStat.

### *Correlation Coefficients*

1. Turn the diagnostics on by selecting the catalog: **2nd** **0**. Scroll down and select **DiagnosticOn**. Press **ENTER** to activate the diagnostics. **(You should only have to do this once.)**
2. With the explanatory variable in L1 and the response variable in L2, press **STAT**, highlight **CALC** and select 4: LinReg(ax+b). With LinReg on the HOME screen, press **ENTER**

### *Least-Squares Regression Line*

Use the same steps that were followed to obtain the correlation coefficient. (STAT-CALC- LINREG)

## Chapter 4 continued

### *Sum of the squared residuals*

After running the LINREG function on the calculator, the residuals are saved in a list called RESID.

Press **2nd** **STAT**, MATH 5: sum( Then **2nd** **STAT** NAMES and scroll down until you find RESID.  
Press **ENTER**. Press  $x^2$  key. Then **ENTER**.

### *Residual Plots*

1. Enter the raw data in L1 and L2. Obtain the least-squares regression line.
2. Access STATPLOTS. Select Plot 1. Choose the scatter diagram icon.

Let XList be L1. Let YList be RESID by putting the cursor next to YList, pressing **2nd** **STAT** and choosing the list entitled RESID.

3. Press **ZOOM** and select 9: ZoomStat



## Chapter 5

### *To find combinations or permutations:*

1. Enter “n” on the home screen, then press **MATH** /PRB/ select nCr or nPr. **ENTER**
2. Then enter “r” on home screen. **ENTER**



## Chapter 6

### *Compute Binomial Probabilities $P(X = x)$*

1. Press **2nd** **VAR** to access the probability distribution menu.
2. Press **0** to select 0:binompdf(
3. With binompdf( on the HOME screen, type the number of trials  $n$ , the probability of success,  $p$ , and the number of successes,  $x$ . binompdf( $n, p, x$ ) Then hit **ENTER**.

### *Computing Binomial Probabilities $P(X \leq x)$*

4. Press **2nd** **VAR** to access the probability distribution menu.
5. Highlight A:binomcdf( and hit **ENTER**.
6. With binomcdf( on the HOME screen, type the number of trials  $n$ , the probability of success,  $p$ , and the number of successes,  $x$ . binomcdf( $n, p, x$ ) Then hit **ENTER**.



## Chapter 7

### Find an area under a normal curve

1. Press **2nd** **VAR** to access the Distribution menu (DISTR)
2. Select 2:normalcdf( Press **ENTER**.
3. Type the inputs to the normalcdf (lower bound of region, upper bound of region,  $\mu$ ,  $\sigma$ ).  
Press **ENTER** For  $-\infty$ : use  $-1EE99$ . For  $+\infty$ : use  $1EE99$

### Find a z-score given an area under the normal curve

1. Press **2nd** **VAR** to access the Distribution menu (DISTR)
2. Select 3:invNorm(. Press **ENTER**.
3. Type the inputs to the invNorm (area to the left,  $\mu$ ,  $\sigma$ ). Press **ENTER**.

### Graph Normal Probability Plots

1. Enter the raw data into L1.
2. Press **2nd** **Y=** to access the StatPlot menu. Select 1:Plot 1.
3. Place the cursor on On and press **ENTER**.
4. Place the cursor on the normal probability icon (lower right corner under TYPE). Press **ENTER**.
5. The data list should be L1 and the data axis should be x-axis. Press **ZOOM** and select 9:ZoomStat



## Chapter 9

### Confidence Intervals about $p$ **check only**

1. Press **STAT**, highlight TESTS, and select A:1-PropZInt.
2. Enter the values of  $x$  and  $n$ .
3. Enter the confidence level following C-Level:
4. Highlight Calculate and press **ENTER**

### Confidence Intervals for $\mu$ **check only**

1. If necessary, enter the raw data into L1.
2. Press **STAT**, highlight TESTS, and select 8: TInterval.
3. If the data are raw, highlight DATA—make sure List is set to L1 and Freq to 1.  
If summary statistics are known, highlight STATS and enter the summary statistics.
4. Enter the confidence level following C-Level:.
5. Highlight Calculate and press **ENTER**

**\*\*UPLOAD programs for Inverse T-distribution and Inverse  $\chi^2$ - distribution from your instructor or the Math Learning Center: INV T and INVCHI2**



## Chapter 10

### *Test Statistic and P-Value for Hypothesis Tests Regarding a Population Proportion, $p$* **check only**

1. Press **STAT**, highlight TESTS, and select 5: 1-PropZTest.
2. Enter the “status quo” value of the population proportion  $p_0$ , the number of successes,  $x$ , and, the sample size,  $n$ .
3. Select the direction of the alternative hypothesis.
4. Highlight Calculate, press **ENTER**.

### *Test Statistic and the P-Value for Hypothesis Tests Regarding $\mu$ ,* **check only**

1. If necessary, enter the raw data into L1.
2. Press **STAT**, highlight TESTS, and select 2: T-Test.
3. If the data are raw, highlight DATA—make sure List is set to L1 and Freq to 1.  
If summary statistics are known, highlight STATS and enter the summary statistics.
4. Select the direction of the alternative hypothesis.
5. Highlight Calculate, press **ENTER**.



## Chapter 11

### *Two Population Proportions Hypothesis Tests* **check only**

1. Press **STAT**, highlight TESTS, and select 6: 2-PropZTest.
2. Enter the values of  $x_1$ ,  $n_1$ ,  $x_2$ , and  $n_2$ .
3. Highlight the appropriate relation between  $p_1$  and  $p_2$  in the alternative hypothesis.
4. Highlight Calculate and press **ENTER**. Gives the test statistic and P-value.

### *Confidence Intervals for Two Proportions*

Follow the same steps as those given for hypothesis tests, select B: 2-PropZInt.

### *Two-Sample T-tests, Independent Sampling Hypothesis Tests,* **check only**

1. If necessary, enter the raw data into L1 and L2.
2. Press **STAT**, highlight TESTS, and select 4: 2-SampTTest.
3. If the data are raw, highlight DATA—make sure List1 is set to L1 and List2 is set to L2 with Freq1 and Freq2 set to 1.  
If summary statistics are known, highlight STATS and enter the summary statistics.
4. Highlight the appropriate relation between  $\mu_1$  and  $\mu_2$  in the alternative hypothesis.  
Set Pooled: to No.
5. Highlight Calculate and press **ENTER**. Calculate gives the test statistic and P-value.  
Draw will draw the t-distribution with the P-value shaded.

### *Confidence Intervals for Independent sampling*

Follow the same steps as those given for hypothesis tests, except select 0: 2-SampTInt

## Chapter 11 continued

### *Dependent Sampling(matched-pairs) Hypothesis Tests, check only*

1. If necessary, enter the raw data into L1 and L2.  
Let  $L3 = L1 - L2$  or  $L2 - L1$  depending upon how the alternative hypothesis was defined.
2. Press **STAT**, highlight TESTS, and select 2: T-Test.
3. If the data are raw, highlight DATA—make sure List is set to L3 and Freq to 1.  
If summary statistics are known, highlight STATS and enter the summary statistics.
4. Highlight the appropriate relation between  $\mu_d$  and 0 in the alternative hypothesis.
5. Highlight Calculate and press **ENTER**. Calculate gives the test statistic and P-value.

### *Confidence Intervals for Matched-Pairs*

Follow the same steps as those given for hypothesis tests, except select 8: TInterval

### *P-Value for Hypothesis Tests Regarding a Two Population Standard Deviations, Independent samples*

1. Press **2nd** **VAR** to access the Distribution menu (DISTR)
2. Select 0:Fcdf(. Press **ENTER**.
3. Type the inputs to the Fcdf  
(LB, UB, degrees of freedom in numerator, degrees of freedom in denominator). Press **ENTER**.  
For  $-\infty$ : use  $-1EE99$ . For  $+\infty$ : use  $1EE$

### *Two Population Standard Deviations Hypothesis Tests check only*

1. If necessary, enter the raw data in L1 and L2.
2. Press **STAT**, highlight TESTS, and select D: 2-SampFTest.
3. If the data are raw, highlight DATA—make sure List1 is set to L1 and List2 is set to L2, with Freq1 and Freq2 set to 1.  
If summary statistics are known, highlight STATS and enter the summary statistics.
4. Highlight the appropriate relation between  $\sigma_1$  and  $\sigma_2$  in the alternative hypothesis.
5. Highlight Calculate and press **ENTER**. Calculate gives test statistic and p-value



## Chapter 12

### *Chi-Square Goodness of Fit Test $\chi^2$ -GOF*







(If you do not have this function in the STAT TEST menu, upload it from your instructor or the MLC.)

1. Enter observed values into L1 and expected values into L2.
2. Press **STAT** TESTS, and scroll down until you see GOF test. Press enter.
3. Highlight CALCULATE and press **ENTER**



## Chapter 12 continued



### *Chi-Square Test for Independence and Homogeneity of Proportions*

1. Press   to access the MATRX menu. Highlight the EDIT menu, select 1: [A].
2. Enter the number of rows and columns of the matrix.
3. Enter the cell entries for the observed matrix, and press   (this quits the matrix editor and goes back to the home screen).
4. Press , highlight TESTS, and select C:  $\chi^2$ -Test.
5. With the cursor after the Observed:, enter matrix [A] by accessing the MATRX menu, highlighting NAMES, and selecting 1: [A].
6. With the cursor after the Expected:, enter matrix [B] by accessing the MATRX menu, highlighting NAMES, and selecting 2: [B]. (The test fills in the expected values of the matrix.)
7. Highlight Calculate and press .  
Calculate gives the test statistic and P-value.  
Draw will draw the  $\chi^2$ -distribution with the P-value shaded.



## Chapter 13



### *ANOVA Tests*

1. Enter the raw data into L1, L2, L3, and so on, for each population or treatment.
2. Press , highlight TESTS, and select F: ANOVA(
3. Enter the list names for each population or treatment  
For example, if there three treatments in L1, L2, and L3, enter ANOVA(L1,L2,L3
4. Press 



## Chapter 14

### *Test the Least-Squares Regression Model*

1. Enter the explanatory variable in L1 and the response variable in L2.
2. Press , highlight TESTS, and select E: LinRegTTest.
3. Be sure XList is set to L1 and YList is set to L2 with Freq to 1.
4. Select the direction of the alternative hypothesis.
5. Highlight Calculate and press 

**\*\*UPLOAD programs for Confidence and Prediction Intervals from your instructor or the MLC.**