

Chapter 2

Methods for Describing Sets of Data

Graphical Methods for Describing Quantitative Data

Example 2.2 Graphing a Quantitative Variable – The “Water-Level Task”

Problem: Over 60 years ago famous child psychologist Jean Piaget devised a test of basic perpetual and conceptual skills dubbed the “water-level task.” Subjects were shown a drawing of a glass being held at a 45 degree angle and asked to draw a line representing the true surface of the water. Today, research psychologists continue to use the task to test the perception of both adults and children. In one study, the water-level task was given to several groups that included 20 male bartenders and 20 female waitresses (*Psychological Science*, March 1995). For each participant, the researchers measured the deviation (in angle degrees) of the judged line from the true line. These deviations (simulated on the basis of summary results presented in the journal article) are shown in Table 2 – 1. [Note: Deviations can be negative if the judged angle is smaller than the angle of the true line.] Create a frequency histogram for the bartender and the waitress data.

| | Bartenders | | | | | Waitresses | | | | |
|-------------|------------|----|----|----|---|------------|----|----|----|----|
| Table 2 – 1 | -9 | 10 | 6 | -5 | 2 | 7 | 10 | 35 | 7 | 4 |
| Water-Level | 6 | -3 | 14 | 2 | 3 | 10 | 8 | 10 | 10 | 0 |
| Task | 10 | 7 | 7 | -1 | 0 | 25 | 12 | 12 | 21 | 16 |
| Deviations | 6 | 8 | 8 | 0 | 2 | 8 | 9 | 11 | -1 | -1 |
| [angle | | | | | | | | | | |
| degrees] | | | | | | | | | | |

Solution: To create a frequency histogram, or any other type of statistical plot on the calculator you must first enter the data into one of the 6 lists found on the calculator.

In order to enter the data,

1. Press **[STAT]**. You will see Figure 2 – 1. You have now entered the statistics editor menu.
2. With EDIT highlighted, press **[1]** or **[ENTER]**. The LISTS menu will appear on your home screen. See Figure 2 – 2. You will be using the LISTS menu screen every time you enter data. (The only exception is when entering data for a χ^2 test. You will then use the matrix menu.)

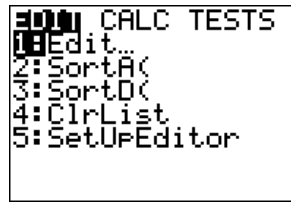


Figure 2 – 1

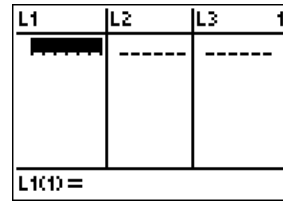


Figure 2 – 2

If there is data listed under List 1, follow steps 3 and 4, otherwise skip to step 5.

3. To remove old data, before entering new data, arrow up until the name of the list is highlighted. See Figure 2 – 3.

4. Press **[CLEAR]** and then arrow back down. Note: The list will not clear until the down arrow key is pressed. List 1 should now be clear as in Figure 2 – 4. [Note: To delete any individual entry within a given list highlight that entry and press: **[DEL]**].

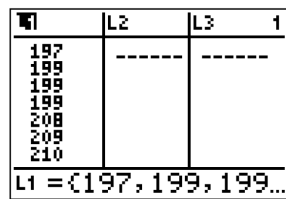


Figure 2 – 3

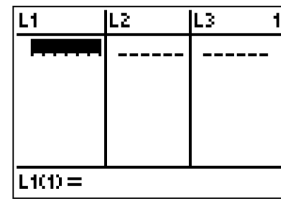


Figure 2 – 4

5. Begin to enter your data by entering the number followed by pressing the down arrow key or **[ENTER]** after each entry. Note: The TI-83/84 Plus distinguishes between negative signs and subtraction. For negative signs be sure to use the gray **[(-)]** key located next to the **[ENTER]** key.

6. Check your entries to make sure all the numbers are correct. If an entry is wrong, use the arrow keys to highlight the entry and then type in the correct number pressing **[ENTER]** when you are done.

We have stored the data for bartenders in List 1 and the data for waitresses in List 2. The data will remain in the calculator even after the calculator has been turned off unless we clear the list or reset the calculator memory.

After entering all the data, you will see the screen in Figure 2 – 5. Only seven of the data are seen on the screen.

| L1 | L2 | L3 | Σ |
|--------|----|----|---|
| -9 | 7 | | |
| 6 | 10 | | |
| 10 | 25 | | |
| 6 | 8 | | |
| 10 | 10 | | |
| -3 | 8 | | |
| 7 | 12 | | |
| L3(1)= | | | |

Figure 2 – 5

Note: The bottom of the TI-84 screen indicates which LIST and which entry is active. (LIST3 & it is waiting for the 1st entry)

To Construct the Frequency Histogram,

Whenever you want to plot a graph you will need to adjust the parameters within this menu. You may graph up to 3 things on the same screen by turning on up to 3 Plots. For now we only want 1 plot (a histogram) of the data we just entered so we will only turn on Plot1.

1. Press **[2nd]** STAT PLOT to begin setting up the STAT PLOT window. Your screen should look something like Figure 2 – 6.
2. Choose which of the 3 plots you want to use and make sure that the others are turned off. Select a plot by pressing its number or by arrowing to it and pressing **[ENTER]**. For this example, we will use Plot 1.
3. Using your arrow keys, highlight ON with the cursor and press **[ENTER]**. See Figure 2 – 7



Figure 2 – 6

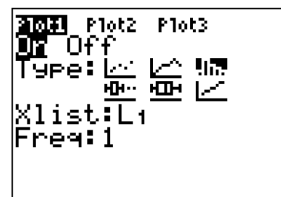



Figure 2 – 7

4. Arrow down to Type and highlight , the histogram icon, by arrowing to the right and pressing **[ENTER]**. See Figure 2 – 7.
5. Arrow to Xlist and press **[2nd]** L1 to enter the list as L₁. See Figure 2 – 7.
6. Arrow to frequency and set it as 1. Note: The TI-83/84 Plus will automatically go into alpha mode when it reaches the list and frequency entries. To return to normal mode, press **[ALPHA]**. Your screen should now appear as in Figure 2 – 7.

Now we must set the window. The window tells the TI-83/84 Plus which portion of the graph you wish to view. It is important to reset the window for every new graph.

7. Press **WINDOW**.
8. For a histogram, the Xmin is the lowest value in your first class. Here we will choose -15 since that is lower than the smallest value in either set of data.
9. The Xmax is the first value beyond your last class. For our example, we will choose 40 since that is larger than the largest value in either set of data
10. The Xscl is your class width, we will select 5 for these 2 data sets.
11. Set the Ymin at either -1 or 0. (If it is set at -1, viewing is easier when using the **TRACE** key. Therefore many people prefer to use -1.) The TI-83/84 Plus distinguishes between negatives and subtraction, so be sure to use the **(-)** key located next to **ENTER**.
12. The Ymax is set just beyond your highest class frequency. If this is not known, estimate it. After graphing, use the **TRACE** key (explained below) to determine the highest class frequency and reset your window if necessary and graph again. Here, a Ymax of 10 will do.
13. Your Yscl should be set based on how far apart your Ymin and Ymax are. Here a Yscl of 1 is sufficient.

The Xres key sets the pixel resolution for function graphs only. For most of our graphs, its setting will not matter. Your window screen should appear as in Figure 2 – 8. Note: Although the TI-83/84 Plus has a ZoomStat feature it is generally not advisable to use it for graphing histograms.

```

WINDOW
Xmin=-15
Xmax=40
Xscl=5
Ymin=-1
Ymax=10
Yscl=1
Xres=1
    
```

Figure 2 – 8

14. Once the plot and window screens are set, press **GRAPH**. The TI-83/84 Plus will display your histogram for List 1 which is the bartenders. See Figure 2 – 9.

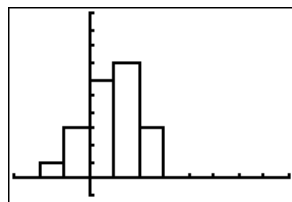


Figure 2 – 9

15. Now graph the data for the waitresses. Press **[2nd]** STAT PLOT to return to the STAT PLOT window. Arrow to Plot 1 and press **[ENTER]**. Change Xlist to List 2 which contains the data for the waitresses. See Figure 2 – 10.

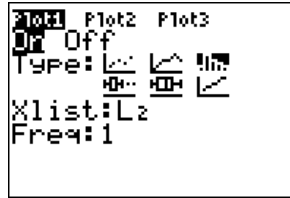


Figure 2 – 10

16. Once the plot and window screens are set, press **[GRAPH]**. The TI-83/84 Plus will now display your histogram for List 2 which is the waitresses. See Figure 2 – 11.

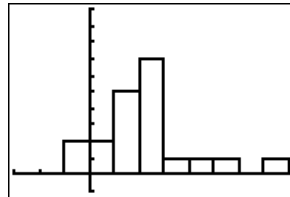


Figure 2 - 11

Since we used the same scale, we can now compare the graph for the bartenders in Figure 2 – 9 with the graph for the waitresses in Figure 2 – 11. We see the deviations for the waitresses tend to appear to the right of the deviations for the bartenders. Thus, the 2 histograms together imply that waitresses tend to overestimate the angle of the true line relative to the bartenders.

Note: the calculator does not display titles units or numerical scale. If you are printing any graph you must add those items yourself using a word processor.

Remember: You will need to adjust the window settings for each new problem. The calculator does not “know” what is appropriate for your problem.

Exercise 2.28 Constructing a Relative Frequency Histogram

Problem: Graph the relative frequency histogram for the 500 measurements summarized in the accompanying Relative Frequency Table 2 – 2.

Table 2 – 2
Relative
Frequency
Table

| Class Interval | Relative Frequency |
|----------------|--------------------|
| 0.5 – 2.5 | 0.10 |
| 2.5 – 4.5 | 0.15 |
| 4.5 – 6.5 | 0.25 |
| 6.5 – 8.5 | 0.20 |
| 8.5 – 10.5 | 0.05 |
| 10.5 – 12.5 | 0.10 |
| 12.5 – 14.5 | 0.10 |
| 14.5 – 16.5 | 0.05 |

Solution: To graph a histogram for this problem we must first locate the class mark for each of the classes. Recall the class mark is the midpoint of the class. We will enter the class marks into List1 (L1) and the corresponding relative frequency into List2 (L2). See Table 2 – 3.

Table 2 – 3
Relative Frequency
Table with Class
Marks

| Class Mark (L1) | Class Interval | Relative Frequency (L2) |
|-----------------|----------------|-------------------------|
| 1.5 | 0.5 – 2.5 | 0.10 |
| 3.5 | 2.5 – 4.5 | 0.15 |
| 5.5 | 4.5 – 6.5 | 0.25 |
| 7.5 | 6.5 – 8.5 | 0.20 |
| 9.5 | 8.5 – 10.5 | 0.05 |
| 11.5 | 10.5 – 12.5 | 0.10 |
| 13.5 | 12.5 – 14.5 | 0.10 |
| 15.5 | 14.5 – 16.5 | 0.05 |

Solution: To create a relative frequency histogram, or any other type of statistical plot on the calculator you must first enter the data into one of the 6 lists found on the calculator.

In order to enter the data

1. Press **[STAT]**. You will see Figure 2 – 12. You have now entered the statistics editor menu.
2. With EDIT highlighted, press **[1]** or **[ENTER]**. The LISTS menu will appear on your home screen. See Figure 2 – 13. You will be using the LISTS menu screen every time you enter data (*The only exception is when entering data for a χ^2 test. You will then use the matrix menu.*)

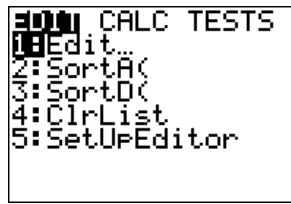


Figure 2 – 12

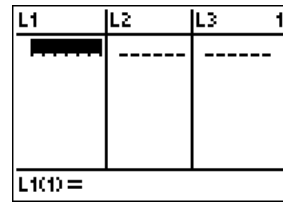


Figure 2 – 13

Always enter data for each new problem into an empty list. If there is data listed under List 1, follow steps 3 and 4, otherwise skip to step 5.

3. To remove old data, before entering new data, arrow up until the name of the list is highlighted. See Figure 2 – 14.

4. Press **[CLEAR]** and then arrow back down. Note: The list will not clear until the down arrow key is pressed. List 1 should now be clear as in Figure 2 – 15. [Note: To delete any individual entry within a given list highlight that entry and press: **[DEL]**].

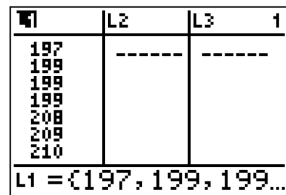


Figure 2 – 14

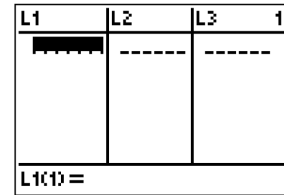


Figure 2 – 15

5. Begin to enter your data by entering the number followed by pressing the down arrow key or **[ENTER]** after each entry. Note: The TI-83/84 Plus distinguishes between negative signs and subtraction. For negative signs be sure to use the gray **[(-)]** key located next to the **[ENTER]** key.

6. Check your entries to make sure all the numbers are correct. If an entry is wrong, use the arrow keys to highlight the entry and then type in the correct number pressing **[ENTER]** when you are done.

After you have entered the class marks into **L1** and the relative frequencies into **L2** the screen will look like Figure 2 – 16. Remember to enter the decimal points as they appear in the text.

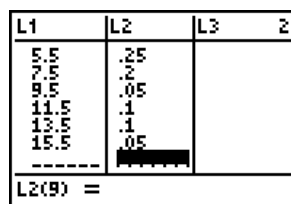


Figure 2 – 16

To Construct the Relative Frequency Histogram,

Whenever you want to plot a graph you will need to adjust the parameters within this menu. You may graph up to 3 things on the same screen by turning on up to 3 Plots. For now we only want 1 plot (a histogram) of the data we just entered so we will only turn on Plot1.

1. Press **[2nd]** STAT PLOT to begin setting up the STAT PLOT window. Your screen should look something like Figure 2 – 17.
2. Choose which of the 3 plots you want to use and make sure that the others are turned off. Select a plot by pressing its number or by arrowing to it and pressing **[ENTER]**. For this example, we will use Plot 1.
3. Using your arrow keys, highlight ON with the cursor and press **[ENTER]**. See Figure 2 – 18.

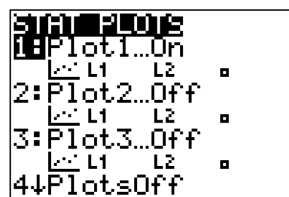


Figure 2 – 17

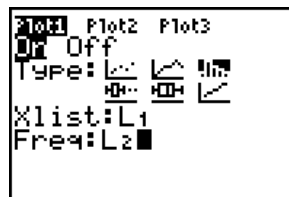



Figure 2 – 18

4. Arrow down to Type and highlight , the histogram icon, by arrowing to the right and pressing **[ENTER]**.
5. Arrow to Xlist and press **[2nd]** L1 to enter the list as L₁.
6. There is only 1 thing to change here for this newest problem. We entered the frequency into List2 and so we must tell the calculator the Freq: is in L2. Arrow to frequency and set it as L2. To return to normal mode, press **[ALPHA]**. Your screen should now appear as in Figure 2 – 18.

Now we must set the window. The window tells the TI-83/84 Plus which portion of the graph you wish to view. It is important to reset the window for every new graph.

7. Press **[WINDOW]**.
8. For a histogram, the Xmin is the lowest value in the first class interval. In this set of data, the lowest value in the first class interval is 0.5.
9. The Xmax is the highest value in the last class interval. In this set of data, the highest value of the last class interval is 16.5.

10. The Xscl is your class width, we will select 2 for this data.
11. Set the Ymin at either -1 or 0. The TI-83/84 Plus distinguishes between negatives and subtraction, so be sure to use the $\boxed{-}$ key located next to $\boxed{\text{ENTER}}$.
12. The Ymax is set just beyond your highest class frequency. If this is not known, estimate it. After graphing, use the $\boxed{\text{TRACE}}$ key (explained below) to determine the highest class frequency and reset your window if necessary and graph again. Here, a Ymax of 0.30 will do.
13. Your Yscl should be set based on how far apart your Ymin and Ymax are. Here a Yscl of 0.1 is sufficient.

The Xres key sets the pixel resolution for function graphs only. For most of our graphs, its setting will not matter. Your window screen should appear as in Figure 2 – 19. Note: Although the TI-83/84 Plus has a ZoomStat feature it is generally not advisable to use it for graphing histograms.

```

WINDOW
Xmin=.5
Xmax=16.5
Xscl=2
Ymin=0
Ymax=.3
Yscl=.1
Xres=3

```

Figure 2 – 19

14. Once the plot and window screens are set, press $\boxed{\text{GRAPH}}$. The TI-83/84 Plus will display your histogram. See Figure 2 – 20.

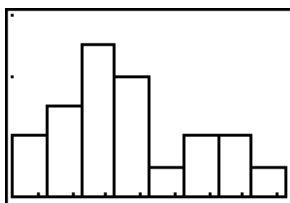


Figure 2 – 20

Exercise 2.29 Constructing a Frequency Histogram

Problem: For the data given in exercise 2.28, calculate the number of 500 measurements falling into each of the measurement classes. Then construct a frequency histogram of the data.

Solution: We begin this problem the same as exercise 2.28, namely finding the class marks. We need to enter the class marks into List1 and the corresponding frequencies into List2. We will derive the actual frequency for each class by multiplying the relative frequency of each class by 500 to achieve the actual frequency for each class. See Table 2 – 4.

Table 2 – 4
Frequency Table
with Class
Marks

| Class Mark (L1) | Class Interval | Relative Frequency | Frequency (L2) |
|-----------------|----------------|--------------------|---------------------|
| 1.5 | 0.5 – 2.5 | 0.10 | $(0.10)(500) = 50$ |
| 3.5 | 2.5 – 4.5 | 0.15 | $(0.15)(500) = 75$ |
| 5.5 | 4.5 – 6.5 | 0.25 | $(0.25)(500) = 125$ |
| 7.5 | 6.5 – 8.5 | 0.20 | $(0.20)(500) = 100$ |
| 9.5 | 8.5 – 10.5 | 0.05 | $(0.05)(500) = 25$ |
| 11.5 | 10.5 – 12.5 | 0.10 | $(0.10)(500) = 50$ |
| 13.5 | 12.5 – 14.5 | 0.10 | $(0.10)(500) = 50$ |
| 15.5 | 14.5 – 16.5 | 0.05 | $(0.05)(500) = 25$ |

Solution:

1. Enter each class mark into list 1, and the corresponding frequency that you calculated into list 2. After you have entered the class marks into L1 and the frequencies into L2 the screen will look like Figure 2 – 21.

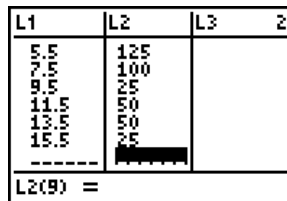


Figure 2 – 21

2. Once again we must adjust the window to fit our current data. Figure 2 – 22 shows the menu after all adjustments have been made.

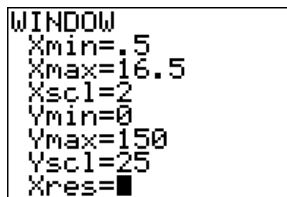


Figure 2 – 22

3. Since the last problem used List1 for class marks and List2 for relative frequency and we graphed a Histogram there are no changes needed within the STAT PLOT Menu. Press **[GRAPH]**. The TI-83/84 Plus will display your histogram. See Figure 2 – 23.

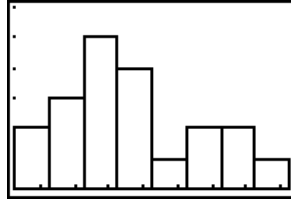


Figure 2 – 23

Numerical Measures of Central Tendency

Example 2.3 Computing the Sample Mean

Problem: Calculate the mean of the following five sample measurements: 5, 3, 8, 5, 6.

Solution:

1. To calculate the mean you must first enter the data into the list. Be sure to start from an empty list. Type all the data into List1 (L1). Remember to press **[ENTER]** after each number. Once all the data is entered the screen will appear as Figure 2 – 24.

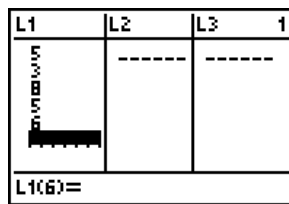


Figure 2 – 24

2. Press **[STAT]**. Arrow over to CALC. Press **[1]** or **[ENTER]**. **1 - Var Stats** will appear on your home screen. See Figure 2 – 25.

3. Enter the list where the data are stored, here List 1, **[2nd]** L1. See Figure 2 – 26.

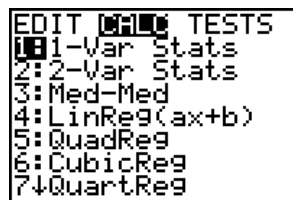


Figure 2 – 25

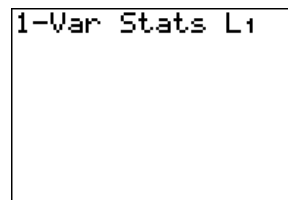


Figure 2 – 26

4. Press **ENTER**. See Figure 2 – 27. Notice the arrow pointing downward in front of the n=5. This tells us there is more data that can be seen by pressing the arrow down key. You will see the screen in Figure 2 – 28.

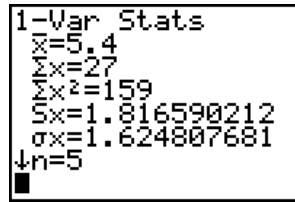


Figure 2 – 27

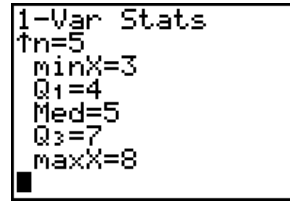


Figure 2 – 28

As can be seen from the Figure 2 – 27 the sample mean is 5.4.

Exercise 2.55 Calculating Summary Statistics

Problem: Calculate the mode, mean, and median of the following data:

18 10 15 13 17 15 12 15 18 16 11

Solution:

1. To calculate the mean you must first enter the data into the list. Be sure to start from an empty list. Type all the data into List1 (L1). Remember to press **ENTER** after each number. Once all the data is entered the screen will appear as Figure 2 – 29.

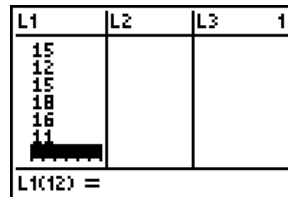


Figure 2 – 29

2. Press **STAT**. Arrow over to **CALC**. Press **1** or **ENTER**. **1 - Var Stats** will appear on your home screen. See Figure 2 – 30.

3. Enter the list where the data are stored, here List 1, **2nd** L1. See Figure 2 – 31.

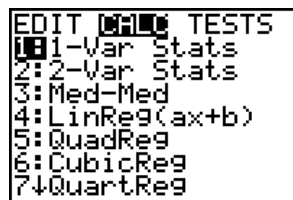


Figure 2 – 30

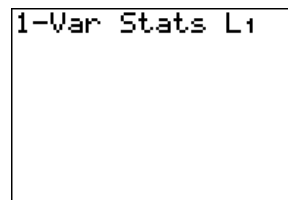


Figure 2 – 31

4. Press **[ENTER]**. See Figure 2 – 32. Notice the arrow pointing downward in front of the $n=11$. This tells us there is more data that can be seen by pressing the arrow down key. You will see the screen in Figure 2 – 33.

```

1-Var Stats
x̄=14.54545455
Σx=160
Σx²=2402
Sx=2.733628957
σx=2.606412943
↓n=11

```

Figure 2 – 32

```

1-Var Stats
fn=11
minX=10
Q1=12
Med=15
Q3=17
maxX=18

```

Figure 2 – 33

The TI-84 will display a lot of statistics including the ones required for this exercise. As can be seen from the Figure 2 – 32 the sample mean is 14.545454. As can be seen from the Figure 2 – 33 the sample median is 15. The mode is the piece of data with the highest frequency which is 15 in this exercise.

Together these two screens in Figures 2 – 32 and 2 – 33 give you most everything wanted when someone asks for “the basic descriptive statistics.”

Numerical Measures of Variability

Example 2.9 Computing Measures of Variation

Problem: Calculate the variance and standard deviation of the following sample: 2,3,3,3,4.

Solution: To calculate the Variance and Standard Deviation of this data set we will use the same procedures as finding the mean and median.

1. First enter the data into the list. Be sure to start from an empty list. Type all the data into List1 (L1). Remember to press **[ENTER]** after each number
2. Press **[STAT]**. Arrow over to CALC. Press **[1]** or **[ENTER]**. **1 - Var Stats** will appear on your home screen. Enter the list where the data are stored, here List 1, **[2nd]** L1.
3. Press **[ENTER]**. See Figure 2 – 34.

```

1-Var Stats
x̄=3
Σx=15
Σx²=47
Sx=.7071067812
σx=.632455532
↓n=5

```

Figure 2 – 34

The TI-84 will display a lot of statistics including the ones required for this exercise. As can be seen from the Figure 2 – 34 the Standard Deviation can be seen on the resulting screen. It is 0.7071067812. We choose “Sx” because this is a sample data set so we need the sample Standard Deviation.

The Variance can be calculated directly from the Standard Deviation as it is the square of the Standard Deviation, variance = $(0.7071067812)^2 = 0.5$. Thus, we calculate the Variance = 0.5.

Methods for Detecting Outliers: Box Plots

Example 2.16 Computer-Generated Box Plot – The “Water-Level Task”

Problem: Refer to the “water-level task” data in example 2.2. Construct a box plot for the 40 water-level task deviation angles given in Table 2 – 1. Identify any outliers in the data set.

Solution: Drawing a box-plot on the TI-84 is the nearly the same procedure as drawing a histogram.

1. First you must enter the data into the list 1.
2. Setup the Stat Plot by pressing $\boxed{2\text{nd}}\boxed{\text{STAT PLOT}}$. Enter Plot 1 and turn it on by highlighting On and pressing $\boxed{\text{ENTER}}$. See Figure 2 – 35.
3. The boxplot icon is the fourth one under Type. Highlight $\boxed{\text{I-Box}}$ and press $\boxed{\text{ENTER}}$. See Figure 2 – 35.
4. For Xlist enter L_1 and set the frequency as 1. See Figure 2 – 35.

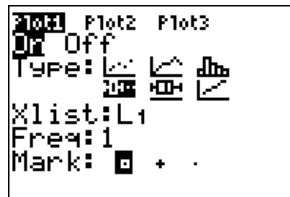


Figure 2 – 35

5. Set your window by choosing Xmin slightly lower than your data's minimum, and Xmax slightly above your data's maximum. Choose an appropriate Xscl based on how far apart your max and min are. For our problem, we can use Xmin = -10, Xmax = 40, and Xscl = 2. See Figure 2 – 36.

Note: The Y values do not affect boxplots as the TI-83/84 Plus will always plot the first boxplot at the top of the screen, the second in the middle and the third on the bottom. However, it is generally advisable not to have the y-axis cutting through a boxplot. To prevent this, set Ymin = 0. You can also use ZoomStat to set the window for you.

```

WINDOW
Xmin=-10
Xmax=40
Xscl=2
Ymin=0
Ymax=150
Yscl=25
Xres=1

```

Figure 2 – 36

6. When you are finished setting the plot window (see Figure 2 – 36) press **[GRAPH]**. The graph is plotted in Figure 2 – 37.

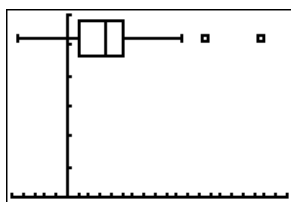


Figure 2 – 37

The two unconnected marks on the right are the possible outliers.

You may use **[TRACE]** to display several characteristics of a graph. For a boxplot, the calculator will find the five number summary and identify any outliers. For this graph, it will display:

The minimum is $\text{MinX} = -9$ (See Figure 2 – 38)

First Quartile is $Q1 = 2$ (See Figure 2 – 39),

Median is $\text{Med} = 7$ (See Figure 2 – 40),

Third Quartile is $Q3 = 10$ (See Figure 2 – 41),

Largest Value that is not an outlier is $X = 21$ (See Figure 2 – 42)

Outliers are $X = 25$ and $X = 35$ (See Figures 2 – 43 and 2 – 44),

Maximum is $\text{MaxX} = 35$ (See Figure 2 – 44)

One number at a time will appear by flashing the cursor on the appropriate location as you arrow from left to right.

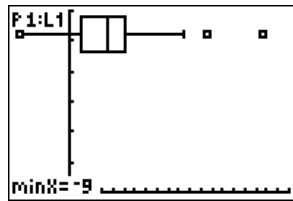


Figure 2 - 38

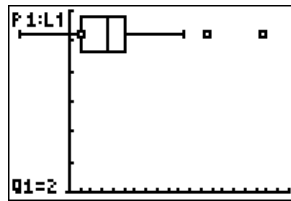


Figure 2 - 39

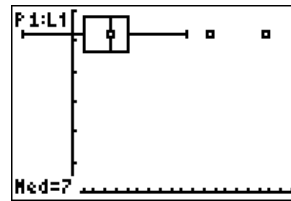


Figure 2 - 40

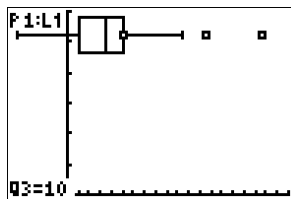


Figure 2 - 41

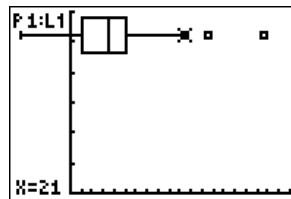


Figure 2 - 42

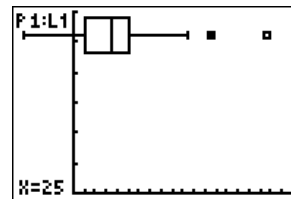


Figure 2 - 43

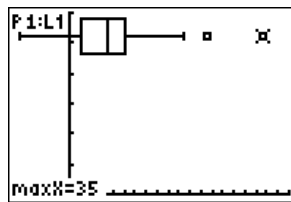


Figure 2 - 44

Note: The calculator does not display titles, units or numerical scale. If you are printing any graph you must add those items yourself using a word processor.

Exercise 2.132 Constructing Side-by-Side Box Plots

Problem: Consider the two sample data sets in Table 2 – 5. Construct a boxplot for each data set and identify any outliers that may exist in the two data sets.

| Sample A | | | Sample B | | |
|----------|-----|-----|----------|-----|-----|
| 121 | 171 | 158 | 171 | 152 | 170 |
| 173 | 184 | 163 | 168 | 169 | 171 |
| 157 | 85 | 145 | 190 | 183 | 185 |
| 165 | 172 | 196 | 140 | 173 | 206 |
| 170 | 159 | 172 | 172 | 174 | 169 |
| 161 | 187 | 100 | 199 | 151 | 180 |
| 142 | 166 | 171 | 167 | 170 | 188 |

Solution: For this problem we will use two lists and two stat plots.

1. First enter the data into the appropriate lists. For this example, put Sample A data into List 1 and Sample B data into list 2. See Figure 2 – 45.

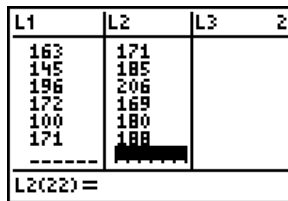


Figure 2 – 45

In order to make two stat plots, you must turn on each plot one at a time. We will use plot 1 for list 1 which is Sample A and plot 2 for list 2 which is Sample B.

2. Setup the Stat Plot 1 by pressing $\boxed{2\text{nd}} \boxed{\text{STAT PLOT}}$. Enter Plot 1 and turn it on by highlighting On and pressing $\boxed{\text{ENTER}}$. The boxplot icon is the fourth one under Type. Highlight $\boxed{\text{box}}$ and press $\boxed{\text{ENTER}}$. For Xlist enter L_1 and set the frequency as 1. See Figure 2 – 46.

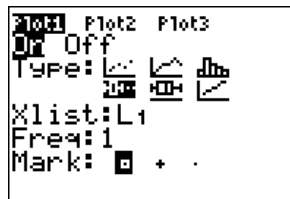



Figure 2 – 46

3. Setup the Stat Plot 2 by pressing $\boxed{2\text{nd}} \boxed{\text{STAT PLOT}}$. Enter Plot 2 and turn it on by highlighting On and pressing $\boxed{\text{ENTER}}$. The boxplot icon is the fourth one under Type.

Highlight  and press **ENTER**. For Xlist enter L₂ and set the frequency as 1. See Figure 2 – 47.

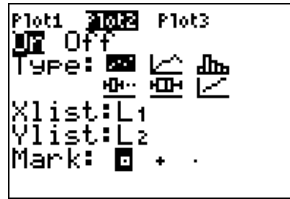


Figure 2 – 47

4. Set your window by choosing Xmin slightly lower than your data's minimum, and Xmax slightly above your data's maximum. Choose an appropriate Xscl based on how far apart your max and min are.

5. When you are finished setting the plot window, press **GRAPH**. The graph is plotted in Figure 2 – 48.

Pressing **TRACE** will display all important information associated with these boxplots. **Arrow up/down** to move from plot1/plot2. **Arrow right/left** to move within a plot.

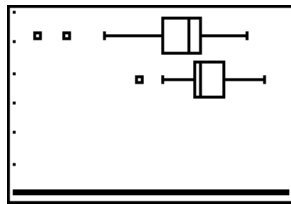


Figure 2 – 48

The similarity between these two box-plots is they both have possible outliers on the low side. Plot 2 which is the Sample B data has a higher value in every category. (e.g. minimum, Q1, Median, Q3, maximum) Sample A has two possible outliers : 85, 100. Sample B has 1 possible outlier: 140.

Graphing Bivariate Relationships

Exercise 2.147: Constructing a Scatterplot

Problem: Construct a scatterplot for the data in Table 2 – 6. Discuss any trend you detect.

Table 2 – 6
Sample Data

| Variable #1 | Variable #2 |
|-------------|-------------|
| 5 | 14 |
| 3 | 3 |
| -1 | 10 |
| 2 | 1 |
| 7 | 8 |
| 6 | 5 |
| 4 | 3 |
| 0 | 2 |
| 8 | 12 |

Solution:

1. To construct a scatterplot using the TI-84 you must first enter the data into two lists. The Independent variable (x) usually goes in List 1 and the Dependent Variable (y) usually goes in List 2. It is not “carved in stone”. It’s just a general rule. For this problem enter Variable #1 into List 1 and Variable #2 into List2. See Figure 2 – 49.

Note: For all data given in a frequency table or listed as two or more variables it is necessary to enter the data in the **EXACT** order it is given.

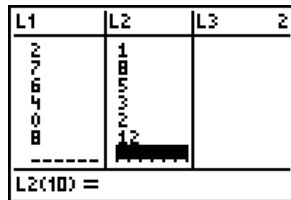


Figure 2 – 49

Note: It is good to glance at the two lists to see if they are the same length. If they are not the same length you probably missed a piece of data in the shorter list. Many mistakes occur at data entry. Make sure you have entered the data correctly. If you make a mistake here nothing else will be correct!

2. Before attempting to graph any statistical plot, be sure that your function plot screen is clear, or the plots are turned off. Enter the stat plot screen by pressing $\boxed{2\text{nd}} \text{ STATPLOT}$. Your screen will appear as in Figure 2 – 50.

3. Enter the set-up screen for plot 1 by pressing $\boxed{\text{ENTER}}$. Your screen should appear similar to Figure 2 – 51.

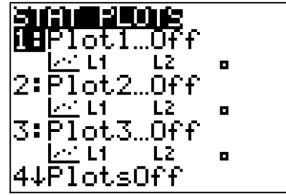


Figure 2 – 50

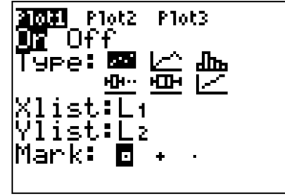



Figure 2 – 51

4. Turn Plot 1 on by highlighting On and pressing **[ENTER]**. See Figure 2 – 51.
5. Select the scatterplot by highlighting the scatterplot icon  (the first one in the Type list) and pressing **[ENTER]**. Figure 2 – 51.
6. Arrow down to Xlist and press **[2nd]** L1 for List 1. Arrow down to Ylist and press **[2nd]** L2 for List 2. See Figure 2 – 51.
7. Select the mark you would like to represent the points on the graph. Press **[ENTER]**. See Figure 2 – 51 for your final screen.
8. Press **[ZOOM]** **[9]** for ZoomStat and the graph will appear. See Figure 2 – 52. You may choose to adjust your window for a different view. Press **[WINDOW]** and change your values. Then press **[GRAPH]**.

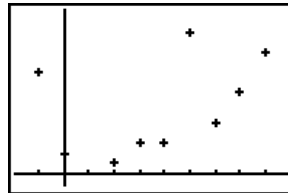


Figure 2 – 52

There does appear to be a slight positive trend in the data. It appears variable #2 tends to increase as variable #1 increases. However, there are two potential outliers at (-1,10) and (5,14).