# Using Your TI-NSpire Calculator: Descriptive Statistics Dr. Laura Schultz Statistics I

This handout is intended to get you started using your TI-Nspire graphing calculator for statistical applications. Let's begin by considering the foot length measurements (in cm) for a random sample of 20 Rowan University statistics students:

26.2	23.5	23.2	20.3	27.9	28.5	24.9	29.2	26.1	23.1
28	25	26.2	26.5	24.1	28.7	25	21.6	25.5	25

When you turn on your Nspire, you will see the first screen below. You can return to this home screen at any time by pressing the from key. Navigate through the various menus using the touch pad in the center of the calculator, the arrow keys, or the two key. Start by highlighting **New Document** and then pressing either is in the center of the touch pad or the inter key.

Image: Secretchpad       Image: Documents         A Calculate       Image: New Documents         B Graph       2 My Documents         3 Recent ▷       2:Add Calculator         4 Current       3:Add Geometry         5 Settings       5:Add Notes	<b>A</b>	🖣 1.1 🕨 Unsaved 🤝 📲 🕷	Save As
Image: Save Cancel	Image: Scratchpad       Image: Documents         Image: Scratchpad       Image: Scratchpad         Image: Scratchpad       Image: Scratchpad	<ul> <li>1:Add Calculator</li> <li>2:Add Graphs</li> <li>3:Add Geometry</li> <li>4:Add Lists &amp; Spreadsheet</li> <li>5:Add Data &amp; Statistics</li> <li>6:Add Notes</li> <li>7:Add Vernier DataQuest™</li> </ul>	Save In: My Documents Name Type Size Folder MyLib Folder Confidence_Levels_prop Document 32K highjump Document 7K File Name: footlength Save Cancel

#### **Entering and Sorting Data**

- Let's begin by entering the foot length data shown above. Select option 4: Add Lists & Spreadsheet. First, press en and save your document with an informative file name, such as "footlength." An asterisk will appear next to the file name at the top of the screen whenever there are unsaved changes to your document. Regularly save your work by pressing en .
- 2. By default, data are entered into a spreadsheet. Columns are identified by letters and rows by numbers. You can name the list by highlighting the box at the top of the column and typing in a name. I named my list "footlength."
- 3. It is often helpful to sort your data in ascending order (from low to high). To do so, press the menu button and select 1: Actions and then 6: Sort. Specify that you want to sort by the column containing your data in Ascending order. Then, highlight "OK" and press enter. Use your sorted list to complete the frequency distribution table found on the bottom of page 3 of this handout. (Sorted lists are also helpful for percentile calculations or producing a stem-and-leaf plot.)

🖶 1: Actions	: 🕨 1: Move Columi	ר 🗹 🗹	•	1.1	*footlength 🗢	· 🖌 🛃	<b>₹</b> 1.1 ►	*footler	igth 🗢	< 🖌 🔁
🖄 2: Insert	▶ 2: Resize			A footlen	a	D in	A footlen	ВС	D	~
<sup>1,3,5</sup> 3: Data	B 3: Select	▶		footlength	Sort		footlength			
X 4: Statisti	cs ▶ 4: Go To	(Ctrl+G)		-	Range a[]		· · · ·			
💥 5: Table	► 5: Recalculate	(Ctrl+R)	1	26.2	Sort By		1 20.3	3		
2 23.5	6: Sort		2	23.5	a		2 21.6	5		
3 23.2			3	23.2	Ascending		3 23.1	1		
4 20.3			4	20.3			4 23.2	2		
5 27.9			5	27.9	OK Cancel		5 23.5	5		
6 5			6	20 5		V	6 24	1		~
A footleng	h	۹ 🕨	A	4 footlength	1	<ul> <li>•</li> </ul>	A footlen	gth		•

## Descriptive Statistics: The One-Variable Statistics Command

The one-variable statistics command provides "one-stop shopping" for finding the mean, median, standard deviation, and five-number summary of a data set. We'll spend the first few weeks of the semester working with the various descriptive statistics generated by this calculator command.

- 1. Press the docr key and select 4: Insert to add a new document to your file. Select 3: Calculator. You can scroll between your various documents by using the touchpad to move to the top of the screen and then clicking on the document number with the 🔀 key. At this point, "1.1" is your data list, and "1.2" will be your calculator screen.
- Once you have added a calculator display to your document, press the menu key. Select 6: Statistics and then 1: Stat Calculations. Choose 1: One-Variable Statistics and indicate that you will be using one list.

•	1.1 🕨		1: Problem	<sup></sup> <sup></sup> <sup></sup> <sup></sup> <sup></sup> <sup></sup> <sup></sup> <sup>1</sup> : Actions <sup>−</sup>	> 🕼 🎽	<	1: Actions ►	, Kana (	×
P	footlen		2: Page (Ctrl+I)	<sup>1</sup> ₂№ 2: Number	► E	^.	1: One-Variable Statistics		^
L.	Tootaariii	1: F	3: Calculator	<u>x</u> = 3: Algebra	•		2: Two-Variable Statistics		
Ĭ.		2. F		f⊗ 4: Calculus	•		3: Linear Regression (mx+b)		
1	20.	2. L	4. Graphs	🇊 5: Probability			4: Linear Regression (a+bx)		
2	21	3. V	S: Geometry	X 6: Statistics	1: Stat Calculations		5: Median-Median Line	ulations	
2	21.	4. II	6: Lists & Spreadsheet	問 7: Matrix & Vector	2: Stat Results	L	6: Quadratic Regression	ults	
2	23.	P	/: Data & Statistics	\$ 8' Finance	3: List Math		7: Cubic Regression		N
4	23.	6: R	8: Notes	9 Functions & Dro	4: List Operations		8: Ouartic Regression	ations	Ы
5	23	7: S	9: Vernier DataQuest™	m 5. Functions & Pro	5: Distributions		9: Power Regression	ons	Ы
6	23.	8: L	A: Program Editor 🛛 🕨		6 Confidence Intervals		A Exponential Regression	ce Intervals	
A	footlen	💰 9: P	B: Sensor Console (Ctrl+D)		7: Stat Tests			s	6

3. Specify that you want statistics for the "footlength" list and select "OK." Use the up and down arrow keys to scroll through all of the output.

1.1	1.2 ▶ *footlength 🕁 🚺	×	1.1 1.2	*footlength 🗢 🛛 🖁	<b>X</b>	1.1	*footlength 🗢	· 🖌 🔀
Or	ne-Variable Statistics		"Title"	"One–Variable Statistic	s 🗖	"σx := σnx"	2.31881	
	V1 List: factles at		"x"	25.425		"n"	20.	•
	AT LISE. Footlength		"Σx"	508.5		"MinX"	20.3	
	Frequency List: 1		"\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	13036.2		"Q1X"	23.8	
	Category List:		"SX := Sn-1X"	2.37905		"MedianX"	25.25	- 1
			$\sigma x := \sigma x$	2.31881		"Q₃X"	27.2	- 1
	Iclude Categories:		"n"	20.	.≻∏.	"MaxX"	29.2	- 1
	OK Cancel		"MinX"	20.3		"SSX := $\Sigma(x-\overline{x})$	)²'' 107.538	- 1
			"Q1X"	23.8				
_		<u></u>	"Median V"	25.25	<b>∨</b>			×
	0/	99			1/1			1/99

#### **Statistical Displays: Generating a Dot Plot**

- Press the docr key and select 4: Insert to add another new document to your file. Select 7: Data & Statistics. This will be screen 1.3 in your file. If you haven't saved lately, now is probably a good time to press out III.
- 2. Use the touch pad to move the cursor to the bottom center of the screen and select the name of the variable you want to plot along the *x*-axis.
- 3. The dots will dynamically reposition themselves to form the dot-plot display shown on the next page of this handout.



## Statistical Displays: Generating a Histogram

- Press the docr key and select 4: Insert to add another new document to your file. Select 7: Data & Statistics again. This will be screen 1.4 in your saved file.
- 2. Repeat steps 2 and 3 on the previous page to produce another dot plot, the default graphical display. Then, press menu and choose 1: Plot Type followed by 3: Histogram.
- 3. The dot plot will dynamically change into an equivalent histogram.



- 4. The resulting histogram is undoubtedly not what you would like to see. We can change the appearance of the histogram by pressing menu and navigating to 2: Plot Properties then
  2:Histogram Properties. Select 2: Bin Settings and then 1: Equal Bin Width.
- 5. If you haven't already completed the frequency distribution table below, navigate back to your sorted data list (screen 1.1) and do so now. Adjust the bin settings until the histogram matches your completed frequency distribution table. Note that we want the first lower class limit to be 20.0 and the class width to be 2. (The correct settings and the desired histogram are shown on the next page.)

1: Plot Ty	1: Plot Ty / 1: Connect Data Point	nts <b>Footlength (cm)</b>	Frequency
3: Action	ers 2: Bin Settings 1: Equal Bin	ties ► 20.0 - 21.9	
S: Windov S: Windov	5: Windov 😫 5: Add X Variable	Bin Width 22.0 – 23.9	
물 2 - 📴 6: Add X Summary List	호 2 - 🕅 6: Add X Summary L	list 24.0 – 25.9	
- 🎼 8: Add Y Variable 📴 9: Add Y Summary List	- 🎼 8: Add Y Variable 🖻 9: Add Y Summary L	List 26.0 – 27.9	
20 21 A: Remove Y Variable	20 21 A: Remove Y Variab	28.0 – 29.9	

6. Once you change the bin settings, the histogram will not be displayed correctly until you complete one more step. Press menu and then 5: Window/Zoom followed by 2: Zoom - Data.



- 7. Using the touch pad, move the cursor across your histogram. The class limits for a given bar will be shown along with a count of how many data points fall within that class. The bar I pointed to above includes foot lengths between 24.0 and 25.9 cm (i.e., up to but not including 26). Six students in the sample had foot lengths within this interval. The notation [24.000, 26.000) indicates that the interval is closed on the left (i.e., includes 24.000) and open on the right (i.e., does not include 26.000).
- 8. We can easily produce a relative frequency histogram by first repeating steps 1-6 above. Then, press menu and navigate to 2: Plot Properties and then 2: Histogram Properties. This time, select 1: Histogram Scale followed by 2: Percent.
- 9. If you have a TI-Nspire *cx*, you have the ability to use color in your graphical displays. Let's end by changing the color of the histogram bars. Click on one of the bars to highlight it. Then, press ctrl menu and select 7:Color followed by 2:Fill Color. Select whichever color you prefer and then press enter.



## **Statistical Displays: Generating a Box Plot**

A box plot is a graphical display of the five-number summary (Min,  $Q_1$ ,  $Q_2$ ,  $Q_3$ , Max). Any outliers will be displayed as dots beyond the whiskers. Recall from lecture that **mild low outliers** are those data values that fall between  $Q_1 - (1.5 \times IQR)$  and  $Q_1 - (3 \times IQR)$ , **extreme low outliers** are those values that are less than  $Q_1 - (3 \times IQR)$ , **mild high outliers** fall between  $Q_3 + (1.5 \times IQR)$  and  $Q_3 + (3 \times IQR)$ , and **extreme high outliers** are those values greater than  $Q_3 + (3 \times IQR)$ . The **interquartile range** (*IQR*) is equal to  $Q_3 - Q_1$ .



- Press the door key and select 4: Insert to add another new document to your file. Select 7: Data & Statistics again.
- 2. Follow the directions on page 2 of this handout to produce another dot plot, the default graphical display. Then, press menu and choose 1: Plot Type followed by 2: Box Plot.
- 3. The dot plot will dynamically change into a boxplot.
- 4. Move the cursor across the box plot using the touch pad, and you will see the values for the various components of the box plot. Note that there are no outliers present in this data set.

#### Statistical Displays: Generating a Bar Chart

Let's shift gears and work with some categorical data. The table below shows the cell phone providers used by a sample of 34 Rowan University statistics students.

<b>Cell Phone Provider</b>	Frequency
AT&T	10
Sprint	4
T-Mobile	3
Verizon	17

- Save your "footlength" file one last time by pressing erref . Then, press for on to return to the home screen. Indicate that you want to start a New Document and choose 4: Add Lists & Spreadsheet. Don't forget to press erref and save your document with an informative file name, such as "cellphone."
- 2. Label column A "provider." Press the 🗈 key (located with the letters at the bottom of your calculator) and choose the quotation mark (") before you type the name of each cell phone provider. You need to use the quotation marks so that your calculator knows that you are entering categorical data.

	📢 1.1 🕨 cellphone 🖵 📲 🌠	💶 🚺 cellphone 🖵 🛛 🕼 🗙
A provider B C D A	A provider B C D IA	A provider B tally C D IA
•	•	•
1	1 at_t	1 at_t 10
2 ? ! \$ ° ' %	<sup>2</sup> sprint	2 sprint 4
3	<sup>3</sup> t_mobile	3 t_mobile 3
4	4 "verizon►	<sup>4</sup> verizon 17
5	5	5
6	6	6
A1 4	A4 "verizon"	B4 17

- 3. Name column B something like "tally" and enter in the frequency values from the previous page. (Note that you cannot use "frequency" or "count" as a column name.)
- 4. Press menu and then 3: Data followed by 8: Summary Plot.
- 5. Specify that the *x* list is "provider" (the categorical variable), the summary list is "tally" (the list containing the frequency values), and that you want the display on a **New Page**.
- 6. Use the touch pad to move the cursor across the bars. Note that 17 students out of the sample of 34 (50.0%) use Verizon as their cell phone provider.
- You can order the bars in descending order by pressing menu and then 3: Actions followed by 7: Sort and then 2: Value Order. This special type of bar chart is called a Pareto chart.



# Statistical Displays: Generating a Pie Chart

Pie charts are my least favorite type of statistical display, but I include them here because they are commonly used in the business world. Let's finish off this exercise by adding a pie chart display to our file.

1. Use the touch pad to navigate back to your spreadsheet (1.1). Then, repeat steps 4 and 5 given above for a bar chart.

- 2. After you have produced another bar chart, press menu and then 1: Plot Type followed by 9: Pie Chart.
- 3. Use the touch pad to move across the various wedges of the pie chart. Doing so, we find that 3 out of the 34 students in the sample (8.8%) use T-Mobile as their cell phone provider.
- 4. To label all of the wedges of the bar chart, press **ctr**] **menu** and select **2:** Show All Labels. Without labels, a pie chart is pretty useless.

