

## Getting your TI-83 to do your Statistics II

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#### 4. Graphical Description of data (histograms)

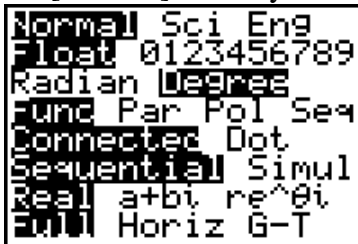
Turn your calculator on; get to the **Edit screen** (hit **STAT**, **ENTER**) and punch in data in an available column (L1, or L2 or L3 etc.) For your convenience let us keep the same data that we started with. Yet to show you that these operations can be done on data in any of the columns and that the data can be punched in any order, I will work with the original (unsorted) data that we started with and keep it in **L2**.

Having punched in the data in **L2** the Edit screen would look like:

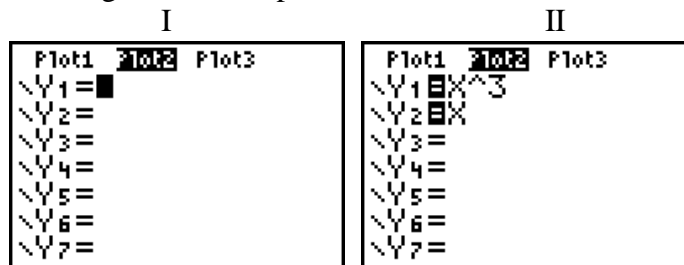
L1	L2	L3	Z
-44	28	-----	
-2	27		
16	24		
16	31		
19	36		
20	37		
21	36		
L2(1)=28			

I have kept the sorted data in **L1** and you will see that it does not interfere with the workings of the data in **L2**. Next comes the step that I call **Preparing for statistical graphing**.

For this procedure your calculator should be in the **function mode**. That is if you press the **[MODE]** button you should see “Func” highlighted as you see here:



After making sure that your calculator is in the function mode, press the **[Y = ]** button on your calculator. Following are the two possible screens:



If you got the first screen (I), you are ready for the next step. If, however, you got something like the second screen (II), you need to clear this screen. By using the up and down arrows take the blinking cursor to where you see an expression in **X** and press **CLEAR**. I have taken the blinking cursor to **Y2=X** and pressed **CLEAR**. The resulting screen is now:

```

Plot1 Plot2 Plot3
\Y1=X^3
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=

```

Now I take the cursor to  $Y_1 = X^3$  and press CLEAR to get a nice and clear screen:

```

Plot1 Plot2 Plot3
\Y1=
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=

```

Now press [2<sup>nd</sup>] [Y =] to see:

```

STAT PLOTS
1:Plot1...Off
  L1 1
2:Plot2...On
  L4 yAxis
3:Plot3...Off
  L2 yAxis
4↓PlotsOff

```

If you see a screen like this it simply means that someone has been using this calculator (behind your back) for statistics. It shows that **Plot 2** is on. Let us press the [4] key and hit **ENTER** to turn all the plots off. This is the kind of screen that we will get:

```

√(5
      2.236067977
22-√(22
      17.30958424
PlotsOff
                        Done

```

Let us do a little bit of exploring. Press the [Y=.] button to see:

```

Plot1 Plot2 Plot3
\Y1=
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=

```

You see that no **Stat Plot** is on! Now hit [2<sup>nd</sup>] and [Y =.] keys, in that order, to see:

```

STAT PLOTS
1:Plot1...Off
  ▽ L1 1
2:Plot2...Off
  ▽ L4 yAxis □
3:Plot3...Off
  ▽ L2 yAxis .
4↓PlotsOff

```

(Do not worry if your Plots screen does not look like this. All that matters is that the plots should be off!)

Next take the cursor to the plot that you want to turn on. Lets make it easy. The cursor is on **Plot 1**. Hit [ENTER]:

```

Plot1 Plot2 Plot3
On Off
Type: ▽ ▽ ▽
  ▽ ▽ ▽
Xlist:L1
Freq:1

```

This indicates that **Plot 1** is still “off” but the cursor is blinking on “On”. Hit [ENTER] to see that “On” is lighted:

```

Plot1 Plot2 Plot3
On Off
Type: ▽ ▽ ▽
  ▽ ▽ ▽
Xlist:L1
Freq:1

```

Now that we have turned **Plot 1** on, the question is what graphs can we make? Let us explore the possibilities. Press the down arrow once. The blinking cursor is in front of Type blinking on the first picture in front of type. Press **ENTER** to see the following picture:

```

Plot1 Plot2 Plot3
On Off
Type: ▣ ▽ ▽
  ▽ ▽ ▽
Xlist:L1
Ylist:L2
Mark: ▣ + .

```

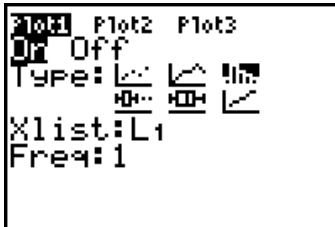
Notice that this type of data requires the “**Xlist**” and the “**Ylist**”. This means that this graph is to do with two variable data. But we have only 1-variable data. If you press the right arrow key once (again) and hit **ENTER** you would see:

```

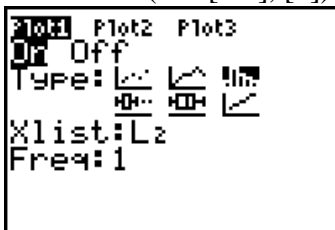
Plot1 Plot2 Plot3
On Off
Type: ▽ ▣ ▽
  ▽ ▽ ▽
Xlist:L1
Ylist:L2
Mark: ▣ + .

```

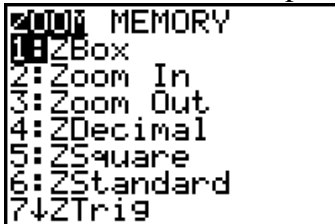
This too has to do with two variable data. Let us press the right arrow key once again and hit **ENTER**. Now you see the following picture:



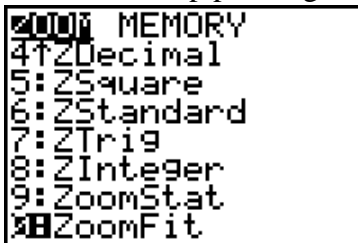
A picture like the Histogram is highlighted and we know that histograms represent one variable data. There is one problem though. We decided to have a graphic representation of the data in **L2** but the screen talks about **Xlist** in **L1**. To cure that let us press the down arrow key once. The blinking cursor is now on **L1** (in front of **Xlist**). Punch in **L2** you know how ( hit [2<sup>nd</sup>], [2]) to see the following screen:



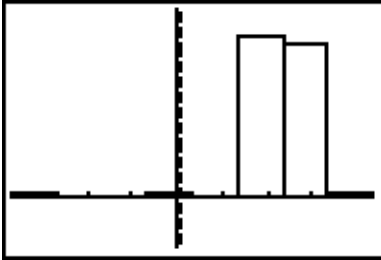
Now the question is: How do we determine the interval size? Let us leave it to the calculator! To do this press the **ZOOM** key once to see:



In addition to all those nice choices there is a down arrow that means there is some more to come. Start pressing the down arrow. There is no change in the screen until your cursor reaches 7. Keep pressing the down arrow and stop when you reach **Zoom Fit**:



You want **ZoomStat**. So punch [9] on your calculator. When you have practice you would think **Zoom Stat the data** and punch **ZOOM**, [9]. Do that to see the following horrible picture:



It looks remotely like a histogram but not quite. Let us see if we can adjust the picture a little. Press the **WINDOW** key.

```

WINDOW
Xmin=-44
Xmax=52
Xscl=12
Ymin=-9.62208
Ymax=37.44
Yscl=1
Xres=1

```

Xmin = -44, Xmax=52 we understand but what does **Xscl = 12** mean? It means that **X** measures in steps of **12**. So, the interval size is **12**. let us change **Xscl** to **10**:

```

WINDOW
Xmin=-44
Xmax=52
Xscl=10
Ymin=-9.62208
Ymax=37.44
Yscl=1
Xres=1

```

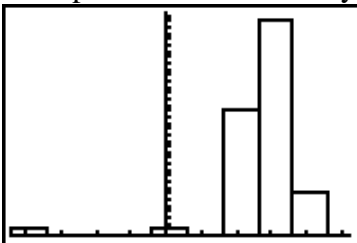
and while we are at it let us note that Ymin = -9.6... We are recording frequencies what are negative numbers doing there! Change Ymin to 0.

```

WINDOW
Xmin=-44
Xmax=52
Xscl=10
Ymin=0
Ymax=37.44
Yscl=1
Xres=1

```

Now press the **GRAPH** key to see:



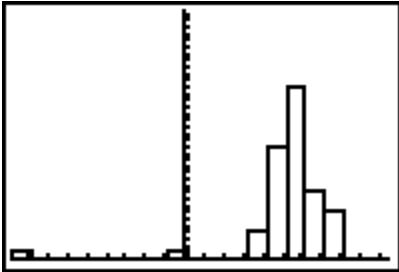
This looks more like it! Let us change the interval size to 5. The **WINDOW** would look like:

```

WINDOW
Xmin=-44
Xmax=52
Xscl=5
Ymin=0
Ymax=37.44
Yscl=1
Xres=1

```

Pressing GRAPH key you would get a nice picture:



This represents the distribution much more clearly and tells us: **If you ignore outliers the distribution is approximately symmetric.** Now the question is why didn't the calculator do the adjustments? Well the calculator is only a machine, it would do only what it is programmed to do and the programmers would include very general commands. The only thing to remember here is that after you have adjusted the Window you press **GRAPH** key (and not the **ZOOM**, [9]). You may be wondering what would happen if we remove the outliers, and how do we remove outliers from **L2**? Good questions. Let us do it! But let us put the data in **L3**, because I do not want you to lose your data in **L2**. For this, open the Edit screen (**STAT**, **ENTER**) and take the cursor to **L3**:

L1	L2	L3	3
-44	28		
-2	27		
1	24		
1	14		
19	26		
20	27		
21	26		

L3(1)=

Press the up arrow to take the cursor on **L3**:

L1	L2	L3	3
-44	28		
-2	27		
1	24		
1	14		
19	26		
20	27		
21	26		

L3 =

Hit **ENTER** to see the blinking cursor in front of **L3** at the bottom and punch in **L2**:

L1	L2	L3	3
-44	28		
-2	27		
1	24		
1	14		
19	26		
20	27		
21	26		

L3 =

Hit Enter:

L1	L2	L3	3
-44	28	28	
-2	27	27	
16	24	24	
16	31	31	
19	36	36	
20	37	37	
21	36	36	

L3(1)=28

You can check that the data in **L3** is exactly the same as in **L2**. Now sort the data in **L3** in an ascending order you know how (**Stat, Sort A (L3)**). The **Edit** screen will look like:

L1	L2	L3	3
-44	28	-44	
-2	27	-2	
16	24	16	
16	31	16	
19	36	19	
20	37	20	
21	36	21	

L3(1)=-44

We have already decided (doing numerical descriptions) that **-44** and **-2** are the only outliers. Let us remove them. This is what you do: Take the cursor up on **L3** (pressing up arrow) and hit **ENTER** to see:

L1	L2	L3	3
-44	28	-44	
-2	27	-2	
16	24	16	
16	31	16	
19	36	19	
20	37	20	
21	36	21	

L3 = -44, -2, 16, 1...

There is blinking cursor at the bottom on the “{” sign. Press the right arrow once. Now the cursor is blinking on the “-“ sign. Press the **DEL** (delete) button to see the negative sign disappear, press the delete button again 4 disappears; again the other 4 disappears and press the DEL button again to see the comma disappear. This is how you get rid of the **-44** entry. At this stage the screen looks like:

L1	L2	L3	3
-44	28	-44	
-2	27	-2	
16	24	16	
16	31	16	
19	36	19	
20	37	20	
21	36	21	

L3 = (-2, 16, 16, 19...

And the cursor is blinking on the “-“ sign of **-2**. Delete **-2** using the above procedure so that the Edit screen looks like:

L1	L2	L3	3
-44	28	-44	
-2	27	-2	
16	24	16	
16	31	16	
19	36	19	
20	37	20	
21	36	21	

L3 = (16, 16, 19, 20...

The cursor is blinking on “1” of 16. Now hit Enter to see.

L1	L2	L3	3
-44	28	16	
-2	27	16	
16	24	19	
16	31	20	
19	36	21	
20	37	21	
21	36	22	

L3(1)=16

Having gotten rid of the outliers let us go back to making a histogram. Go to the **STAT PLOT** screen. If you have not been doing something else it should look like:

```

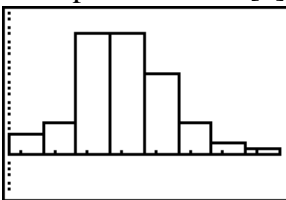
STAT PLOTS
1:Plot1...On
   L2  1
2:Plot2...Off
   L1  1
3:Plot3...Off
   L2  yAxis
4:PlotsOff
  
```

Of course we can use **Plot 1**, which is on **but it is for data in L2** and our data is in **L3**. How do we make that change? Let us do it. Press **ENTER** to get to the **Plot 1 Screen**. Take the cursor to the **Xlist** row and punch in **L3**:

```

Plot1 Plot2 Plot3
On Off
Type: L1 L2 L3
Xlist:L3
Freq:1
  
```

Now press **ZOOM [9]**, to get the histogram. The result is:



Hey, Hey, Hey! This looks much more like a histogram. This tells you that getting rid of the pesky outliers can improve the graphical description of the data. **Of course removing the outliers would also change the numerical description of the data. I suggest that you verify it.** (That is find the Numerical description of the data in **L3** and compare it with the numerical description of the data in **L1**.)

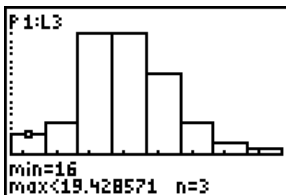
Before we start working on other things let us check the **WINDOW**:

```

WINDOW
Xmin=16
Xmax=43.428571...
Xscl=3.4285714...
Ymin=-5.41242
Ymax=21.06
Yscl=1
Xres=1
  
```

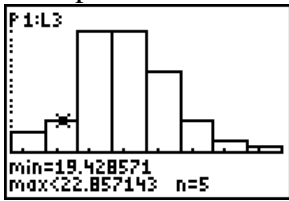
You see that  $Xscl = 3.429$  (approx.). You can change the step size (=interval =  $Xscl$ ) and experiment with the different. But for my purposes the above histogram is OK.

Now here is an interesting feature of the histogram. Press **TRACE** button to see:





The blinking star is in the first interval from the left and the bottom margin is showing some numbers. These numbers mean that the minimum of this interval is 16, and the maximum of this interval is 19.428.. and,  $n=3$  means that the frequency is 3 (i.e. there are three pieces of the data in this first interval.) Press the right arrow key once:



Now you understand what this screen means. Now you can play with the data as much as you like.

Having dealt with histograms let us take a break. Now I suggest that you store your data in L2 at a secure place say in L5 so that when we need it we do not have to punch it in, all over again. I intend to use the same data for box plots and for normality testing.