

Chapter 1

Visualizing Data Using Statistics Menus

1.1 Using Lists for Data Entry

To enter data into the calculator you use the statistics menu. You can store data into lists labeled L1 through L6.

Note: The TI-83 can store data to additional lists by giving them a name. See the owners manual for more detail.

Press **STAT**. To clear any data stored in List 1, and List 2, select **[4:ClrList]** then press **2nd** **L1** **,** **2nd** **L2** **ENTER** (see Figs. 1.1 and 1.2).

Now you are ready for data entry.

Press **STAT**; select **[1:Edit]** (see Fig. 1.3).

Example 1

Ten students were surveyed. Make a histogram for the number of hours the students worked last week:

hours worked
0
0
4
10
10
16
16
18
20
20

Table 1.1

Enter the above data into List 1 (L1).

In column L1 type **0** **ENTER** **0** **ENTER** **4** **ENTER** ... etc. Always press **ENTER** or **↓** after each data entry (see Fig. 1.4).

Trouble Shooting: Placing the cursor on the label L1 will display the list using braces { }. If you press **CLEAR** the list will be deleted. This is a quick way to clear. When the down arrow is pressed you can begin entering data into the list.



Figure 1.1

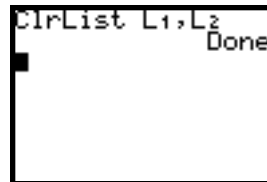


Figure 1.2

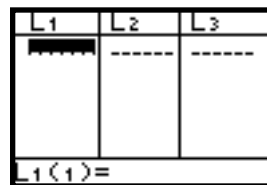


Figure 1.3

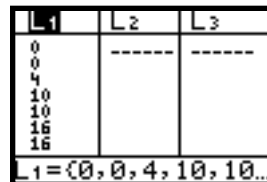


Figure 1.4

1.2 Histogram Setup

A histogram is a graph that helps you visualize data. To graph the data in Table 1.1, you must first set up the statistical plot.

Clear all old plots. Press **2nd** **STAT PLOT**

select [4:PlotsOff] **ENTER** . Press **2nd**

STAT PLOT ; select [1:Plot1] as shown in

Figure 1.5. To set up the histogram correctly see Figure 1.6 or 1.7 or follow the instructions below:

1. Select **ON**. Press **ENTER** .
2. Select the graph **Type**: **▼** **▶** ...to the **histogram icon**. Press **ENTER** .
3. Select the **Xlist: L1** . Press **ENTER** (for your horizontal axis).



Figure 1.5

Note: For the TI-83, press **2nd** **L1** .

Select the frequency, **Freq**. In Example 1 each item has a frequency of one so select **1**
Press **ENTER** . Your plot should be set up as in Figure 1.6 or 1.7.



Figure 1.6 TI-82 Plot1 menu.



Figure 1.7 TI-83 Plot1 menu,

1.3 Selecting the Correct Window for the Histogram

Note: Before you plot a STAT PLOT graph ,

1. Clear **Y=** or turn off all graphs. To turn off graphs, place the cursor on the = sign then press **ENTER** .
2. Turn OFF all plots except the one you want to see.

ERR: INVALID DIM means your lists are not the same size, you have selected a list with no data in it or you have a plot turned on that you did not want and it has different size lists.

1.3.1 Manual Window Sizing

To see your histogram you must set the graphing calculator window to the correct size. Manually set your window size based on the data in L1. Since the L1 data from Example 1 starts at 0 and ends at 20, your **x minimum** and **x maximum** values must be at least: 0 through 20. X maximum should be slightly larger than the highest data value. Y maximum should be slightly larger than the highest frequency of any data entry. Setting the **y** boundary values at -3 to 5 allows you to see the **x**-axis as well as the largest frequency value.

Press **WINDOW** **▼** and enter the window settings as in Figure 1.8.

Press **GRAPH** then **TRACE** . Use right arrow **▶** until your screen looks like Figure 1.9.

When you TRACE on a histogram, the cursor moves to the top center of each column. The P1 in the upper right corner indicates you are tracing Plot 1. The **min** = 16, **max** = 17 indicates x is on the interval 16 to 17 or, in this case 16 hours. The **n** value (frequency) is 2. So there are two people who worked 16 hours last week.

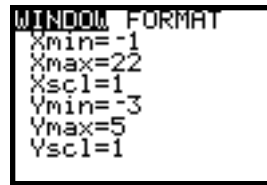


Figure 1. 8

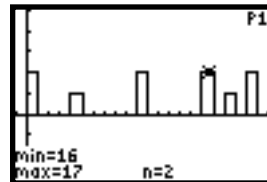


Figure 1. 9

1.4 Working with More than One List

Example 2

Graph a histogram with two data lists.

List1 represents the sum of the numbers on a pair of dice. List2 represents the possible ways of getting each number by tossing a pair of dice (the frequency). Since we already have data in L1, enter the data from Table 1.2 below into List 2 (L2) and List 3 (L3).

Clear any data stored in List 2, and List 3.

Press **STAT** ; select [4:ClrList]. Press **2nd**

L2 **,** **2nd** **L3** **ENTER** (see Figs. 1.10 and 1.11).

L2	L3
2	1
3	2
4	3
5	4
6	5
7	6
8	5
9	4
10	3
11	2
12	1

Table 1. 2



Figure 1. 10

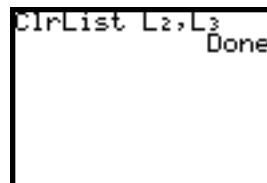


Figure 1. 11

Trouble Shooting: When using lists as frequency, the data must be whole numbers. Decimal values for frequency will produce the error message **ERR:STAT** on the TI-82.

1.4.1 Entering the Data

Press **STAT** ; select [1:Edit] (see Fig. 1.12).

Type in the L2 data from Table 2. Press 2

ENTER 3 **ENTER** 4 **ENTER** ... etc.;

always press **ENTER** or **↓** after each data entry (see Fig. 1.13).

Press **→** to get to column L3. Type in all the L3 data from Table 1.2.

Press **ENTER** or **↓** after each number (see Fig. 1.13).



Figure 1.12

L1	L2	L3
0	2	1
0	3	2
4	4	3
10	5	4
10	6	5
16	7	6
16	8	5

L3=(1,2,3,4,5,6...)

Figure 1.13

1.4.2 Turn Off Old Plots

Press **2nd** **STAT PLOT** ; select [4: PlotsOff]

then **ENTER** (see Figs. 1.14 and 1.15).



Figure 1.14

1.4.3 Setting up Plot2

Press **2nd** **STAT PLOT** ; select [2: Plot2].

1. Select ON press **ENTER** .
2. Select the graph Type: **histogram icon** . Press **ENTER** .
3. Select the Xlist **L2** (for your horizontal axis). Press **ENTER** .
4. Select the frequency **L3**. Press **ENTER** .

In Example 2 each item has a frequency located in L3.

Set up the plot as in Figure 1.16 or 1.17.

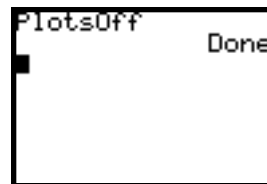


Figure 1.15

Figure 1.16 TI-82 Plot2 menu.

Figure 1.17 TI-83 Plot2 menu.

1.4.4 Size the Window

Size the window to accommodate the data in Table 1.2 . Press **WINDOW** **↓** ; then enter the window settings as in Figure 1.18.

Press **GRAPH** .

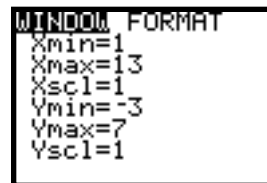


Figure 1.18

Note: Automatic Window Sizing. You can have the calculator automatically set your window by pressing **ZOOM**, then select [9:ZoomStat] (see Figure 1.19). You lose control of the max and min values, however, and you may still want to adjust the window.

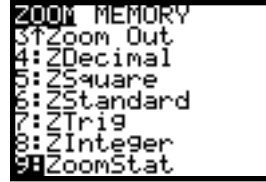


Figure 1. 19

1.4.5 Tracing on the Histogram

Press **GRAPH** then **TRACE** and use your right arrow **▶** until your screen looks like Figure 1.20 or 1.21. When you TRACE on a histogram, the cursor moves to the top center of each interval column. Your histogram represents the possible ways of getting each outcome by tossing a pair of

dice. The P2 tells that you are tracing on Plot2. The min = 6, max = 7 indicates that you are tracing on the interval 6 to 7 or, in this case, 6. The **n** value (frequency) is 5. This means there are five possible ways to get the number six when a pair of dice is thrown.

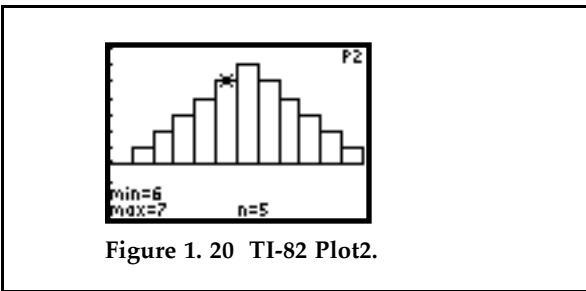


Figure 1. 20 TI-82 Plot2.

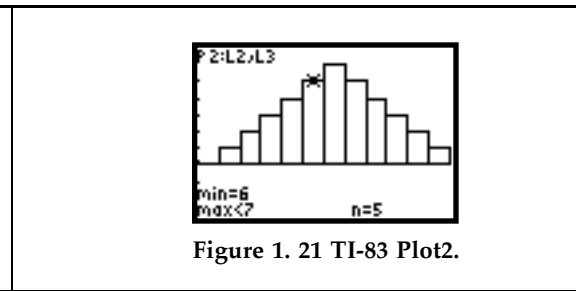


Figure 1. 21 TI-83 Plot2.

Trouble Shooting: Dimension Mismatch. The error message shown in Figure 1.22 is telling you that your lists are not the same size. Either one list is longer than the other or you have set up your plot with the wrong lists. To graph two lists they must have the same number of elements.

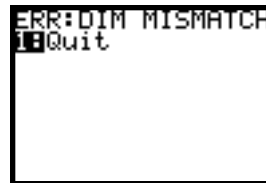


Figure 1. 22

1.5 Changing the Interval Width.

Change your WINDOW to the settings as in Figure 1.23. When you change the Xscl, you are setting the width size of the interval. In this case the histogram will be 2 units wide, beginning at Xmin.

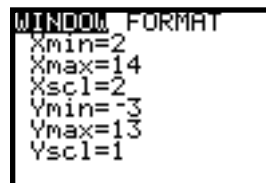


Figure 1. 23

Press **GRAPH**. Figure 1.24 shows the new histogram with interval width of 2 units. You would interpret the TRACE point to mean there are 11 ways to get a 6 or 7 on the roll of two dice.

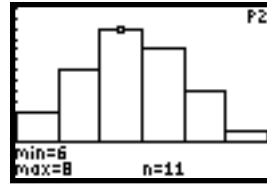


Figure 1. 24

Change your WINDOW so that $X_{scl} = 3$ and $Y_{max} = 16$.

Figure 1.25 shows the histogram with an interval width of 3 units. Press **TRACE** **▷**. The second interval has $n = 15$. This means there are 15 ways to get a 5,6, or 7 on a roll of two dice.

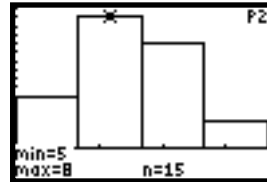


Figure 1. 25

1.6 One Variable Statistics Mean and Median

Example 3

Below are SAT scores of 10 randomly selected students.

SAT	600	640	430	500	510	530	550	370	500	530
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Table 1. 3

Enter this data using the STAT menu. First **CLEAR** all values from L1, L2, and L3 using the techniques learned in Section 1.1 and 1.4 above (see Fig. 1. 26).

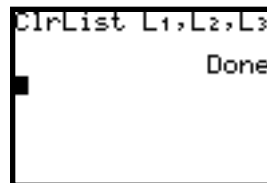


Figure 1. 26

Enter the SAT scores in L1. Refer to Section 1.1 if you need help. Press **ENTER** after each number (see Fig. 1.27).

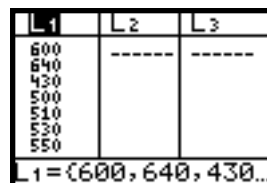


Figure 1. 27

1.6.1 One Variable Statistics.

Let us look at the *one-variable* statistics performed on List1 (L1).

Press: **STAT** **▷** to <CALC>. Select [1:1-Var Stats] (see Fig. 1.28).

Then press **2nd** **L1** **ENTER** (see Fig. 1.29).

Note: To perform *one-variable* statistics on L2 or any other list, select [1:1-Var Stats] followed by the list number or name.



Figure 1. 28

We see the command line in Figure 1.29; press **ENTER** to see the L1 *one-variable* statistics information in Figure 1.30.

1.6.2 The Mean.

In Figure 1.30 the statistics we are most interested in are:

1. \bar{x} , the **mean** (average) represented by \bar{x} = 516 and
2. n , the number of elements in the list, n = 10,

This means that 516 was the average (mean) SAT score for the ten students.

1.6.3 The Median

Press **▽** to see the information in

Figure 1.31. We are interested in **Med**, the **median** score. The median, represented by **Med** = 520, is the middle score when the data is in rank order. This means that of the ten SAT scores, five will be above 520 and five SAT scores will be below 520.

1.6.4 Sorting a List.

Sort L1 from low to high. Press **STAT**, select [2:SortA()] (see Fig. 1.32). Type the list you want to sort. Press **2nd** **L1** **)** **ENTER** (see Fig. 1.33). Figure 1.34 shows that we have sorted L1.

Trouble Shooting: If you have two lists L1 and L2 that you want to sort as an ordered pair, type **SortA(L1,L2)** **ENTER**. L1 will be sorted in ascending order with L2 as its paired list.

1.6.5 Looking for the Median.

Press **STAT**; select [1:Edit].

Look at your list now (see Fig. 134). The **median** score is the middle score on the list, however, since there are 10 elements (an even number) the median is the score in between the fifth and sixth score, or

$$\frac{510 + 530}{2} = 520$$

Note: You may think of the median of an even number of elements as the average of the middle two scores.

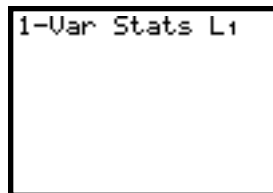


Figure 1.29

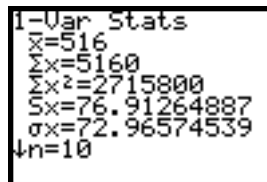


Figure 1.30

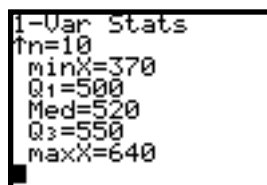


Figure 1.31



Figure 1.32

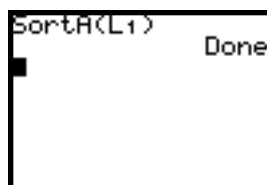


Figure 1.33

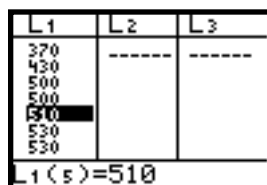


Figure 1.34

1.7 Visualizing the Median; The Box and Whiskers Plot

Do a box and whisker plot. Select a plot. Turn all plots OFF (see Section 1.4.2).

Press **2nd** **STATPLOT** ; select [1:Plot1].

1. Select: ON **ENTER** **▽** .
2. Select graph type: **▷** to the **Boxplot** icon **ENTER** (see Fig. 1.35).

Note: TI-83 icons are slightly different.

3. Select Xlist: L1 **ENTER** .
4. Select Frequency: Choose 1 as the frequency (see Fig. 1.35).

To graph the Boxplot: press **ZOOM** ; select [9:ZoomStat] (see Fig. 1.36).

The Boxplot shows one-variable statistics.

Press **TRACE** . The middle of the box is the median (**Med**) (see Fig. 1.37). The whiskers on the plot extend from the minimum list value on the left to the first quartile (Q_1) and from the third quartile (Q_3) to the maximum list value. Use **◀** and **▶** arrows to view these scores (see Fig. 1.31 for the Q_1 , Med, and Q_3 numerical display).

Note: *Quartiles* are 1/4 or 25% of the list when put in rank order.

1.7.1 Show a Histogram of L1.

Make a histogram. Select the plot.

Press **2nd** **STATPLOT** ; select [1:Plot 1].

1. Select: ON **ENTER** .
2. Select: (histogram icon) **ENTER** .
3. Xlist: L1 **ENTER** .
4. Freq: Select 1 (see Fig. 1.38).

Press **WINDOW** **▽** . Select an appropriate range and interval scale based on the data in L1 (see Fig. 1.39).

Press **GRAPH** . Press **TRACE** to view the frequency, **n**, of each SAT score (see Fig. 1.40).

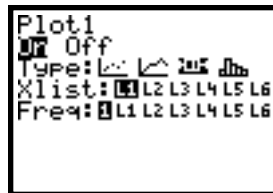


Figure 1.35

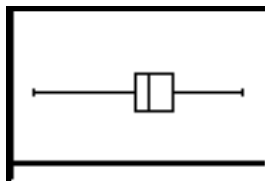


Figure 1.36

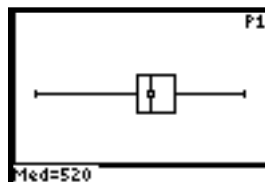


Figure 1.37

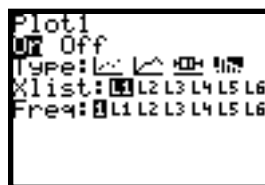


Figure 1.38

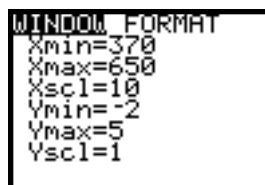


Figure 1.39

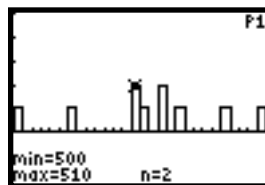


Figure 1.40

1.8 Other List Techniques

Example 4

Find the mean age of students in a mathematics class.

Age Interval	Frequency Count
15 - 19	2
20 - 24	8
25 - 29	4
30 - 34	3
35 - 39	2
40 - 44	1
45 - 49	1
Total	21

Table 1. 4

Table 1.4 gives the age of students. Since the age is given as an interval, calculate the median of each interval so that a single number can be entered into a list (i.e. 17 is the median of 15 - 19). Go to the home screen and type the median data from Table 1.4 in L1. Remember to enclose the list in braces, { } as in Figure 1.41.

Press $\boxed{2\text{nd}} \boxed{\{}$ 17, 22, 27, 32, 37, 42, 47 $\boxed{2\text{nd}} \boxed{\}}$

$\boxed{\text{STO}} \boxed{2\text{nd}} \boxed{\text{L1}} \boxed{\text{ENTER}}$. Store the frequency

in L2. Press $\boxed{2\text{nd}} \boxed{\{}$ 2, 8, 4, 3, 2, 1, 1 $\boxed{2\text{nd}} \boxed{\}}$

$\boxed{\text{STO}} \boxed{2\text{nd}} \boxed{\text{L2}} \boxed{\text{ENTER}}$ (see Fig. 1.41).

Note: To calculate the mean you need to multiply the age times the frequency, sum all the ages then divide by the total frequency (see Figs. 1.42 to through 1.45).

Give this mean calculation a try from the Home Screen.

1. Multiply L1 x L2; then store to L3.

$\boxed{2\text{nd}} \boxed{\text{L1}} \boxed{\times} \boxed{2\text{nd}} \boxed{\text{L2}} \boxed{\text{STO}} \boxed{2\text{nd}} \boxed{\text{L3}}$

(see Fig. 1.42).

2. Sum L3.

$\boxed{2\text{nd}} \boxed{\text{LIST}} \boxed{\triangleright}$ to <MATH>; select [5:sum]

$\boxed{2\text{nd}} \boxed{\text{L3}} \boxed{\text{ENTER}}$ (see Figs. 1.43 and 1.44).

3. Divide by the Total Number .

$\boxed{\div}$ 21 (see Fig. 1.45).

1.8.1 Use the Mean Command for Two Lists

$\boxed{2\text{nd}} \boxed{\text{LIST}} \boxed{\triangleright}$ to <MATH>, select [3:mean],

$\boxed{2\text{nd}} \boxed{\text{L1}} \boxed{,} \boxed{2\text{nd}} \boxed{\text{L2}}$ (see Fig. 1.45).

Either method gives the same answer.

Figure 1. 41

Figure 1. 42

Figure 1. 43

Figure 1. 44

Figure 1. 45