

# 2

## Describing, Exploring, and Comparing Data

This chapter introduces the graphical plotting and summary statistics capabilities of the TI-83 Plus. First row keys like  $\boxed{2\text{nd}} \boxed{Y=}$  (STAT PLOTS) are used to obtain descriptive plots of data sets. Many of the summary statistics of Chapter 2 can be obtained by pressing  $\boxed{\text{STAT}} \boxed{\blacktriangleright} \boxed{1}$ . This gets you the 1-Var Stats option in the Stat <Calc> menu. The author assumes you have read and familiarized yourself with the content of Chapter 1. Based on this assumption, the presentation of subsequent chapters is more abbreviated.

### FREQUENCY TABLES

**Note:** Information on how the TI-83 Plus can aid in construction of frequency tables from raw data is found in the section entitled Histograms and Frequency Tables from Raw Data on page 10.

**EXAMPLE** [Table 2-2 ] We will use the data on the cotinine levels of smokers to illustrate the use of the TI-83 Plus in obtaining all types of frequency tables. The frequency table for this data is repeated on the right with the class midpoints included. As illustrated in screen (1), put the midpoints in L1 and the frequencies in L2.

Class Limits Cotinine levels	L1 Midpts.	L2 Freq
0-99	49.5	11
100-199	149.5	12
200-299	249.5	14
300-399	349.5	1
400-499	449.5	2

### Relative Frequency Table [Table 2-3]

We calculate relative frequencies in L3.

- Highlight L3 at the top of the column as in screen (1).
- Type  $L2 \div 40 * 100$  as in the bottom of screen (1). We use "40" because it is the sum of the frequencies.
- Press  $\boxed{\text{ENTER}}$ . You should see Screen (2).

**Note:** We could have used  $\text{sum}(L2)$  instead of 40 in step 2 with "sum(" pasted in from  $\boxed{2\text{nd}} \boxed{\text{STAT}} \boxed{\blacktriangleright} \boxed{1}$  <MATH>.

(1)

L1	L2	L3	3
49.5	11	-----	
149.5	12	-----	
249.5	14	-----	
349.5	1	-----	
449.5	2	-----	
-----	-----	-----	
$L3 = L2 / 40 * 100$			

(2)

L1	L2	L3	3
49.5	11	27.5	
149.5	12	30	
249.5	14	35	
349.5	1	2.5	
449.5	2	5	
-----	-----	-----	
$L3(1) = 27.5$			

### Cumulative Frequency Table [Table 2-4]

We calculate cumulative frequencies in L4.

- Use  $\blacktriangleright$  to continue beyond L3 to L4. Highlight L4 at the top of the column as in Screen (3).
- Press  $\text{2nd}$   $\text{STAT}$   $\blacktriangleright$   $\text{6}$   $\text{2nd}$   $\text{2}$  to type the “:cumSum(L2” as in screen (3).
- Press  $\text{ENTER}$  for Screen (4). We can see from the last row that there were a total of 40 values in this data set.

L2	L3	L4	4
11	27.5		
12	30		
14	35		
1	5		
2			
-----	-----		
L4=cumSum(L2			

L2	L3	L4	4
11	27.5	11	
12	30	23	
14	35	37	
1	5	38	
2		40	
-----	-----	-----	
L4(5)=40			

[Exercises 15-20] These exercises require the creation of frequency tables from raw data. The TI-83 Plus can aid in this process. See the section on Histograms and Frequency Tables from Raw Data.

### HISTOGRAMS FROM FREQUENCY TABLES

**FIGURE 2-1:** We continue with the cotinine level of smokers example. The class midpoints remain in L1 with the frequencies in L2.

#### 1. Turning OFF all Stat Plots

Activate your Stat Plots by pressing  $\text{2nd}$   $\text{Y=}$ . You should see a screen somewhat like Screen (5). If all plots are not off, press  $\text{4:PlotsOff}$  and  $\text{ENTER}$ . You should see screen (6).

**Note:** If you or anyone else has been using the  $\text{Y=}$  edit screen, it is a good idea to also make sure all plots on this screen are off. You can clear an equation by moving the cursor to the right of the equal sign and pressing  $\text{CLEAR}$ .

STAT PLOTS	
1: Plot1...On	■
2: Plot2...On	■
3: Plot3...Off	■
4: PlotsOff	■

PlotsOff	
Done	

#### 2. Turning On and Setting Up Stat Plot1

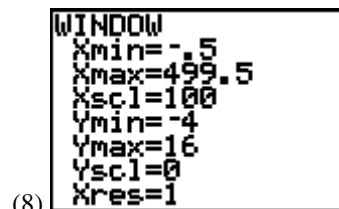
- Press  $\text{2nd}$   $\text{Y=}$   $\text{1}$  to engage **Stat Plot1**. This gives you a screen, similar to screen (7) on which you will define the properties of the type of plot you will create.
- Use the  $\blacktriangle$  and  $\blacktriangledown$  keys to highlight the choices on screen (7). You must press  $\text{ENTER}$  after each choice to activate it. Notice that we are choosing

Plot2 Plots	
Off	■
Type: L1	■
Xlist: L1	■
Freq: L2	■

to plot a histogram. It is the third choice in the “Type” row. We specify L1 as the “Xlist” and L2 as the “Freq” which is short for “frequencies”.

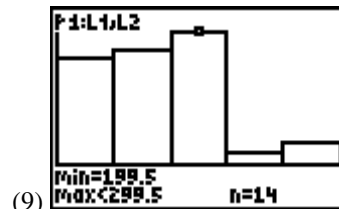
## 2. Setting Up Plot Windows.

- Press **WINDOW**. You should see a screen similar to screen (8). (Your numbers will not be the same.) We will fill in the numbers for our desired graph. After you fill in each number press **ENTER** to advance down the screen.
- Set Xmin =  $-0.5$  (This is the lowest class boundary from the frequency table. Make sure to use the **(-)** key and not the **=** key for the negative sign.)
- Set Xmax = 499.5 (the highest class boundary).
- Set Xscl = 100 (the distance between class midpoints)
- You must set Ymin and Ymax to cover the range of frequency values. Set Ymax = 16 (a little beyond the largest frequency of 14) and Ymin =  $-16/4$  (this is the negative of Ymax/4 and is the recommended setting for Ymin as it will leave room at the bottom of the screen for plot information.)
- Let Yscl = 0, so no tick marks will appear on the Y axis.
- Let Xres = 1 (This rule applies for all windows in this companion.)



## 4. Plotting the Histogram

Press **TRACE**. Wait for the graph to appear. Press **▶** twice for the graph in screen (9). Notice the information for each bar is displayed at the bottom of the screen as you move the cursor left and right. If you want a graph screen without this information, press **GRAPH** or **CLEAR**.



## Relative Frequency Histogram

**FIGURE 2-2:** We continue with the relative frequency histogram for the cotinine levels of smokers. The data should still be stored in the lists as shown in screen (2). Adjust the Stat Plot1 window as shown in Screen (10). (Note we choose the relative frequencies from L3 for



Freq.) Adjust the graph window as shown in screen (11).  
 (11). Press **TRACE** to see screen (12).

### Frequency Polygon

**FIGURE 2-3:** We construct a frequency polygon for the cotinine level data. We will fill in L5 and L6 as seen in screen (13). L5 contains the class midpoints from L1 with an extra midpoint added on each end. L6 contains the class frequencies from L2 with frequencies of 0 attributed to the two new classes.

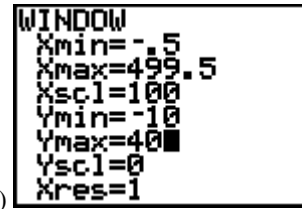
**Note:** L1 and L2 could be copied to L5 and L6. (as explained on page \_\_) Then the two bottom values 449.5 and 0 could be added. The two top values -49.5 and 0 must be inserted (as explained on page \_\_).

With the lists set up as in screen (13), set up Plot1 for an xyLine plot as in screen (14). Press **ZOOM** **9** and then **TRACE** in order to see the frequency polygon plot in screen (15).

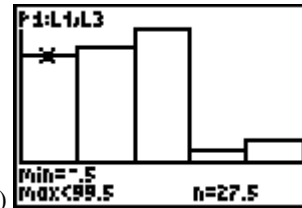
**Note:** **ZOOM** **9** is called ZoomStat. It is a zoom option which uses a programmed routine to fit a graph window to the data in the Xlist and Ylist.

### Ogives

**FIGURE 2-4:** We construct an ogive for the cotinine levels data. We begin by placing the cumulative frequencies (from L4 screen (4)) into L6 with an additional initial 0 inserted as in screen (16). L5 will contain the class boundaries which run from -0.5 to 499.5. Again, set up Plot1 as in screen (14). Press **ZOOM** **9** and then **TRACE** in order to see the frequency ogive plot in screen (17). Moving the cursor, we see there are 23 cotinine level values which were less than 199.5.



(11)



(12)

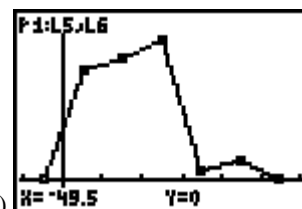
L4	L5	L6	6
11	-49.5	0	
23	49.5	11	
37	149.5	12	
58	249.5	14	
40	349.5	1	
-----	449.5	0	
	549.5	0	

L6(?) = 0

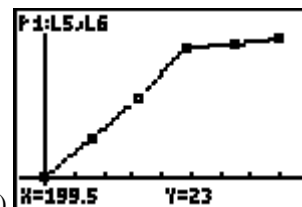
(13)



(14)



(15)



(17)

L4	L5	L6	6
11	- .5	0	
23	99.5	11	
37	199.5	12	
58	299.5	14	
40	399.5	1	
-----	499.5	0	

L6(?) =

(16)

## HISTOGRAMS AND FREQUENCY TABLES FROM RAW DATA

**TABLE 2-1:** We will obtain a histogram for the raw data set of cotinine levels for smokers.

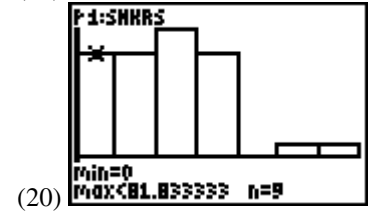
- Enter the data into a list named SMKRS (as explained on page \_\_.) Numbers may be entered in any order. It is often convenient to transfer large data sets from other calculators or from the Data Apps. (see Appendix, page \_\_). See screen (18)
- Set up Plot1 as in screen (19)
  - Choose the Xlist as SMKRS
  - The Freq is set at 1. This way each value in SMKRS will have frequency 1. If a data set member appears more than once in the list then its frequencies (1's) will add up to the true value of the frequency for that member.
- Press **ZOOM** **9** and then **TRACE** for screen (20)
- The results of step 3 gave us a good look at the shape of the data, but further inspection shows us that the calculator's built-in ZoomStat feature has left us with some rather odd choices for cell limits. Press **WINDOW** and you will see screen (21). Note the cell width = 81.833. You might wish to set your own window.
- Change the values in the Window to match those in screen (22). We set the Xmin at the lower class boundary, the Xmax at the upper class boundary and the Xscl at our desired cell width 100. Since this is raw data, we usually do not know enough at this point to set the parameters for the Y axis, so we will keep the ones we have for now.
- Press **TRACE** for screen (23). We cannot see the top of one of the bars, but we can use **◀** and **▶** to read the frequencies.
- Now that we know the modal class has frequency 14, we can set the window as in screen (24).

SMKRS	L1	L2	1
0	49.5	11	
131	149.5	12	
173	249.5	14	
265	349.5	1	
210	449.5	2	
44	-----	-----	

(18) SMKRS(1)=1

(19)

Plot1	Plot2	Plot3
Off	Off	Off
Type: ▾	▾	▾
Xlist: SMKRS		
Freq: 1		

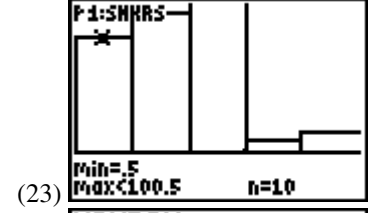


(21)

WINDOW
Xmin=0
Xmax=572.83333...
Xscl=81.833333...
Ymin=-3.30759
Ymax=12.87
Yscl=0
Xres=1

(22)

WINDOW
Xmin=-.5
Xmax=499.5
Xscl=100
Ymin=-3.30759
Ymax=12.87
Yscl=0
Xres=1

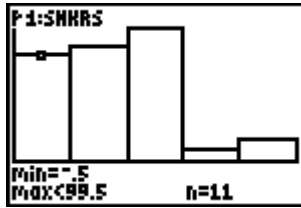


(24)

WINDOW
Xmin=-.5
Xmax=499.5
Xscl=100
Ymin=-4
Ymax=16
Yscl=0
Xres=1

8. Press **TRACE** again for the histogram in screen (25). This is the histogram for the frequency table on the right.

Class Limits Cotinine levels	L1 Midpts.	L2 Freq
0-99	49.5	11
100-199	149.5	12
200-299	249.5	14
300-399	349.5	1
400-499	449.5	2



(25)

## DOTPLOTS AND STEM-AND-LEAF PLOTS

Dotplots and stem-and-leaf plots are not Plot Types on the TI-83 Plus. These plots are not very difficult to do by-hand if the data set is not very large. The TI-83 Plus can aid in the process by ordering the data set for you.

**FIGURE 2-5:** Construct a dotplot for the movie lengths which are part of Data Set 7 in Appendix B. The movie lengths are given as integers. There are 50 values in the set.

### 1. Sorting Data in Ascending Order.

In the Statistics Editor type the 50 movie length values into L1. (or import them from the Data Apps) See Screen (26).

- (a) Press **STAT** **2** for SortA(. Press **2nd** **1** to specify list L1. Then press **ENTER** to see “Done” as in the top of Screen (27).

- (b) To see the sorted list, press **2nd** **STO** **2nd** **1** to “recall” the newly sorted list L1 to the main screen. See screen (27). Press **ENTER** for Screen (28). You can see that all of the 50 values do not fit in this display, but you can use the arrow keys to move the cursor to see them all. You could also go back to your Statistics Editor with **STAT** **1** to view L1 as in screen (29).

2. You can use either view to count the frequency of each data value in the set. This information is used as explained in your text to obtain a dotplot and stem-and-leaf plots.

L1	L2	L3	1
82	-----	-----	
88			
120			
64			
69			
71			
76			
L1(1)=83			

(26)

SortA(L1	Done
Rc1 L1	

(27)

4, 74, 74, 74, 75, 75
, 75, 75, 75, 75, 76,
76, 76, 77, 77, 78, 7
8, 79, 79, 80, 80, 81
, 81, 81, 82, 82, 82,
83, 83, 83, 84, 86, 8
8, 89, 89, 90, 90, 92
, 94, 120) █

(28)

L1	L2	L3	1
64	-----	-----	
69			
76			
71			
71			
71			
L1(1)=64			

(29)

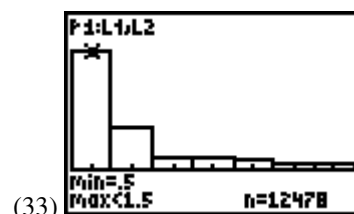
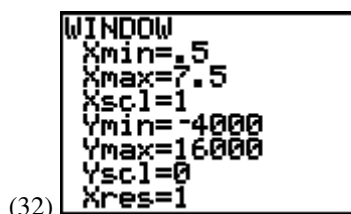
## PARETO CHARTS

**Figure 2-6:** The table at the right shows the results of recent research done by the FCC, categorizing the types of complaints received against U.S. phone carriers.

Complaint	Frequency
Slamming	12478
Rates	4473
Cramming	1214
Marketing	1007
Interntl. Calling	766
Access charges	614
Operators	534

- Put the values 1, 2, 3, 4, 5, 6, 7 in L1.
- Put the number of each of the seven types of complaints received into L2. See Screen (30).  
**Note:** Since a pareto chart displays data in descending order by frequency, the values in L2 must be in descending order.
- Set up Plot1 as a histogram as in screen (31). Set the Window as in screen (32). Press **TRACE** for the pareto chart displayed in screen (33).

L1	L2	L3	2
1	12478	-----	
2	4473		
3	1214		
4	1007		
5	766		
6	614		
7	534		
L2(7) = 534			



## PIE CHARTS

**FIGURE 2-7:** Pie charts are not among the statistical plot types for the TI-83 Plus. However, the calculator can aid in the making of these plots by calculating the degree measure of the center angle for the pie wedge representing each category. We illustrate this using the data set of phone company complaints.

- With the data on frequency of each complaint type already in L2, highlight L3, as in screen (34). Type  $100L2 \div \text{sum}(L2)$  as in the bottom of the same screen with “sum(“ being pasted in by pressing **2nd** **[STAT]** **[>]** **[>]** **[5]** (It is the fifth choice on the Math Lists menu).
- Press **ENTER**. This will give the percentage of each complaint type as seen in screen (35). Highlight L4 at the top and type  $360L2 / \text{sum}(L2)$  as in the bottom of the same screen.

L1	L2	L3	3
1	12478	-----	
2	4473		
3	1214		
4	1007		
5	766		
6	614		
7	534		
L3 = 100L2 / sum(L2)			

L2	L3	L4	4
12478	59.177	-----	
4473	21.213		
1214	5.7574		
1007	4.757		
766	3.8227		
614	2.9119		
534	2.5225		
L4 = 360L2 / sum(L2)			

- Press **ENTER**. This gives the center angle (in degrees) for the pie wedge representing each accident type. See screen (36).

For example, we can see that the first row in screen (36) shows us that complaints for slamming comprised 59% of all complaints. The pie wedge for this category would have a center angle of  $213^\circ$ .

L2	L3	L4	4
12478	59.177	86.804	
4473	21.213	76.367	
1214	5.7574	20.727	
1007	4.7757	17.192	
766	3.6327	13.078	
614	2.9119	10.483	
534	2.5325	9.1169	

(36) L4C0=213.0361377...

## SCATTER DIAGRAMS and TIME SERIES GRAPHS

The instructions for use of the TI-83 Plus to create scatter diagrams can be found at the beginning of Chapter 9. Time series graphs are special types of scatter diagrams.

## MEASURES OF CENTER

**EXAMPLE Monitoring Lead in Air:** Listed below are 6 measurements of the lead in the air (measured in  $\mu\text{g}/\text{m}^3$ ) taken on 6 different days after Sept. 11, 2001 at Building 5 World Trade Center.

5.40 1.10 0.42 0.73 0.48 1.10

### Mean and Median from Raw Data

- Enter the data in L1. Press **STAT**  $\blacktriangleright$  **1** **2nd** **1**. This gives you the display in screen (37).

**Note:** You have gone into the Statistics Calculations menu and chosen the first option which is 1:1-Var Stats. You have also specified that you want the statistics for the data which is stored in list L1.

- Press **ENTER** for the first output screen (38).
- To reveal the second output screen (39), hold down the  $\blacktriangledown$  key. You will find the mean =

$$\bar{x} = \sum \frac{x}{n} = 1.538$$

on the first output screen and the median = Med = .915 on the second output screen. Many of the other statistics displayed on the two screens will be discussed later.

(37)

1-Var Stats L1
----------------

(38)

1-Var Stats
$\bar{x}=1.538333333$
$\Sigma x=9.23$
$\Sigma x^2=32.5197$
$Sx=1.914203925$
$\sigma x=1.747421116$
$\downarrow n=6$

(39)

1-Var Stats
$\uparrow n=6$
minX=.42
Q1=.48
Med=.915
Q3=1.1
maxX=5.4

## Mode

The TI-83 Plus does not automatically calculate the mode of a data set. Ordering the data and counting the frequency of each value, as discussed in the section on dotplots, will aid in finding the mode (if one exists). The modal class can be found by looking for the class with the highest frequency in a frequency table. Frequency tables were discussed earlier in this chapter.

## Midrange

**EXAMPLE Monitoring Lead in Air:** Find the midrange of the six data values

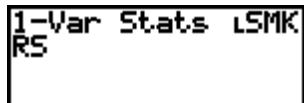
5.40 1.10 0.42 0.73 0.48 1.10

Two of the values on the second output screen are **Min** and **Max**. These are the lowest and highest values in the data set. We can use

the output on screen (39) to calculate midrange =  $\frac{\text{Max} + \text{Min}}{2} = \frac{5.4 + 0.42}{2} = 2.910$ .

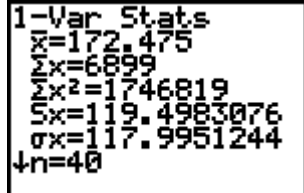
**EXAMPLE Cotinine Levels of Smokers :** We previously created list SMKRS or brought it in from the Data Apps. We will now find the mean, median and midrange for this data set.

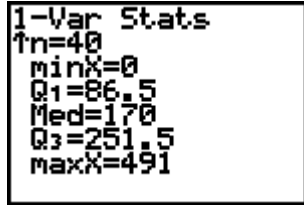
1. Press  $\boxed{\text{STAT}}$   $\boxed{\blacktriangleright}$   $\boxed{1}$  to get the display “1-Var Stats” on your main screen as in screen (40). You must then choose your list SMKRS from the Lists menu. Do this by pressing  $\boxed{2\text{nd}}$   $\boxed{\text{STAT}}$  to pull up the Lists menu and then look down the menu for SMKRS. Take the cursor down to highlight the number by the list then  $\boxed{\text{ENTER}}$ . At this point you should see screen (40).

(40) 

2. Press  $\boxed{\text{ENTER}}$  for screen (41) and move the cursor down for screen (42). We see the mean cotinine level is 172.5. The median is 170. The midrange is

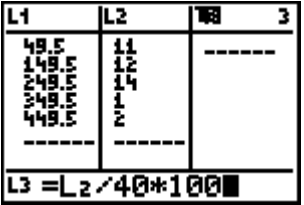
$$\frac{\text{Max} + \text{Min}}{2} = \frac{491 + 0}{2} = 245.5.$$

(41) 

(42) 

## Mean from a Frequency Distribution


**TABLE 2-9:** The frequency table of the cotinine levels of smokers is repeated from page 1. Class midpoints will be stored in L1 and frequencies in L2 as was done earlier in Screen (1).

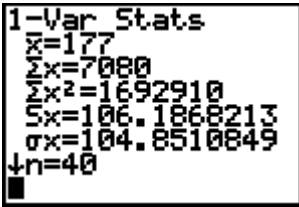
(1) 

1. Press  $\boxed{\text{STAT}} \rightarrow \boxed{1} \boxed{2\text{nd}} \boxed{1} \boxed{,} \boxed{2\text{nd}} \boxed{2}$  to get screen (43).

**Note:** You have asked for the 1 Var Stats as before, but this time you specified two lists separated by a comma. The TI-83 Plus is programmed to treat the second list as frequencies. The  $\boxed{.}$  key is located above the  $\boxed{7}$ .

2. Press  $\boxed{\text{ENTER}}$  for screen (44). We see that the mean value calculated from the frequency table is 177.0 which is slightly larger than the true mean of the data, 172.5.

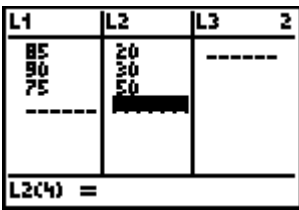
(43) 

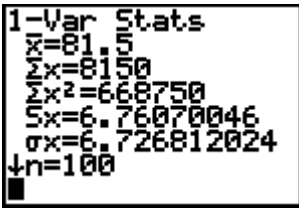
(44) 

### Weighted Mean

**EXAMPLE:** Find the mean of three tests scores (85, 90, 75) if the first tests counts 20%, the second counts 30%, and the third test counts for 50% of the final grade.

Put the scores in L1 and the weights in L2, as in screen (45). Press  $\boxed{\text{STAT}} \rightarrow \boxed{1} \boxed{2\text{nd}} \boxed{1} \boxed{,} \boxed{2\text{nd}} \boxed{2}$  as in screen (43). Press  $\boxed{\text{ENTER}}$  for screen (46). We see that the weighted mean is  $\bar{x} = 81.5$ .

(45) 

(46) 

## MEASURES OF VARIATION


**EXAMPLE :** The waiting times (in minutes) of three Mulberry Bank customers are 1, 3, and 14. Find the range, standard deviation and variance of this data.

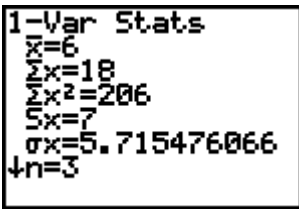
### 1. Standard Deviation

With the data in L1, press  $\boxed{\text{STAT}} \rightarrow \boxed{1} \boxed{2\text{nd}} \boxed{1} \boxed{\text{ENTER}}$ . This sequence gives screens (47), (48) and (49). The standard deviation is  $Sx = 7$  minutes.

### 2. Variance

The variance is not among the statistics given by the 1-Var Stats display, but it is easy to calculate since it is the square of the standard deviation. In this case,  $\text{Variance} = Sx^2 = 7^2 = 49 \text{ min}^2$ .

(47) 

(48) 

(49) 

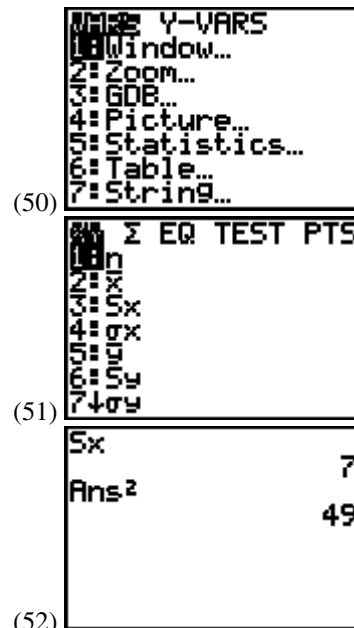
### 3. Range

The range is given by  $\max X - \min X = 14 - 1 = 13$  minutes.

### 4. Vars 5: Statistics Menu for Pasting in Sx

- (a) Press **[VARS]** for the VARS menu screen (50)
- (b) Press **[5]** for the Statistics sub menu screen (51)
- (c) Press **[3]** and Sx is pasted onto your main screen.
- (d) Press **[ENTER]** to see that Sx is 7 as in the top of screen (52)
- (e) Press **[x<sup>2</sup>]** and then **[ENTER]** to again see variance = 49.

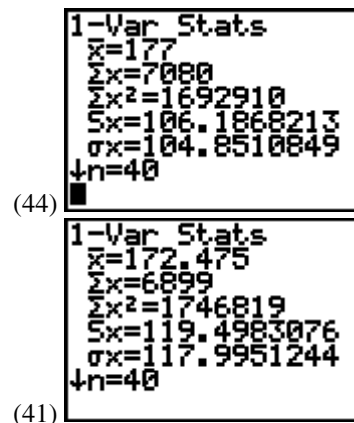
**Note:** This option would save the effort of typing in all the digits of Sx (not a difficult task in this example). It is important to know that you can only paste Sx (or any other statistic) after you have performed 1-Var Stats on your current data set, otherwise the statistics stored will be from some past calculation.



### Standard Deviation from a Frequency Distribution

**EXAMPLE: Cotinine Levels of Smokers:** Find the standard deviation of the 40 cotinine level values summarized in the Table at the beginning of this chapter.

This is done using the same procedure used to find the *mean* from a frequency table. In fact, if we look at the output on screen (44), we see that  $Sx = 106.1868213$ . We can look at the output from screen (41) to see the standard deviation calculated using all the data values is  $Sx = 119.4983076$ .



## MEASURES OF RELATIVE STANDING

### Quartiles and Percentiles

**EXAMPLE Cotinine Levels of Smokers:** We again examine the data set which was earlier stored in a list called SMKRS.

To begin, we must have the data sorted in ascending order. Press **[STAT]** **[2]** for SortA. Press **[2nd]** **[STAT]** to get the menu of all lists. Look down it for SMKRS. Cursor down until the number next to SMKRS is highlighted

then press **ENTER** Press **ENTER** again, and you should see screen (53).



1. Find the percentile corresponding to the cotinine level of 112.

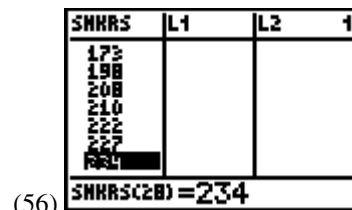
(a) Press **STAT** **1** then highlight on SMKRS and Use the **▼** key to move down list SMKRS to the entry 112. See screen (54). We note that 112 is the 13<sup>th</sup> entry, so there are 12 values less than 112.



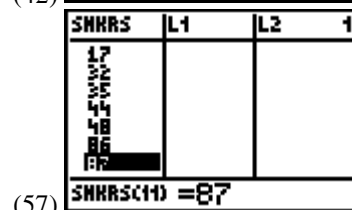
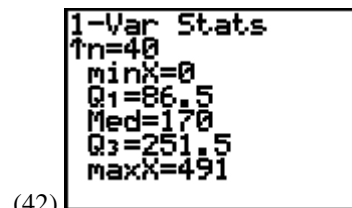
(b) We calculate  $(12/40) * 100 = 30$ . Thus 112 is the 30<sup>th</sup> percentile. See screen (55)



2. Find the value of the 68<sup>th</sup> percentile or  $P_{68}$ .  $(68/100) * 40 = 27.2$ . Since this is not a whole number, we round up to the nearest whole number which is 28. Thus the 68<sup>th</sup> percentile is the 28<sup>th</sup> value in our sorted list. We find this value to be a cotinine level of 234, screen (56).



3. Find the first quartile  $Q_1$ .  
 If we look back at the TI-83 Plus'  $Q_1$  statistic displayed in the 1-Var Stats calculations for SMKRS in screen (42), we see that the value is  $Q_1=86.5$ . Alternatively, since  $Q_1 = P_{25}$ , we could proceed as in the previous example. We find  $(25/100) * 40 = 10$ . Since 10 is a whole number, our algorithm would then require us to find the value midway between the 10<sup>th</sup> and 11<sup>th</sup> data values. These values are 86 and 87 as seen in screen (57). Thus  $Q_1 = (86+87)/2 = 86.5$ . In this case, our method has yielded the same result as that of the TI-83 Plus.



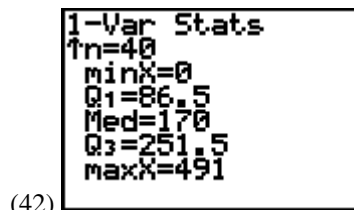
## BOXPLOTS AND FIVE-NUMBER SUMMARY

### EXAMPLE Cotinine Levels of Smokers

Use the data set containing 40 values of cotinine levels of smokers to

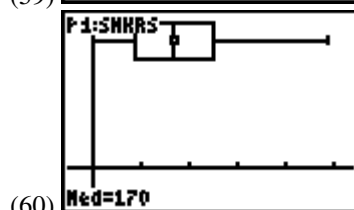
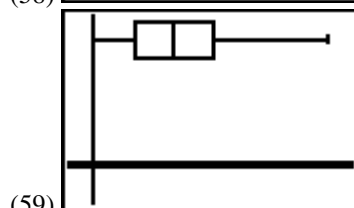
- Find the values of the five-number summary.
- Construct a boxplot.

- (a) We have seen the five-number summary for this data set already. It is on the second screen of output for the 1-Var Stats for our SMKRS list. This was screen (42). The five-number summary is  $\min X=0$ ,  $Q_1=86.5$ ,  $Med=170$ ,  $Q_3=251.5$ , and  $\max X=491$ .



(b) **Boxplot (or Box and Whisker Diagram)**

- Press  $\boxed{2nd} \boxed{Y=}$  to get the Stat Plots menu and then  $\boxed{1}$  to get the set-up for Stat Plot1. Set up Stat Plot1 as in screen (58). We choose the fifth plot type. This is the *skeletal* boxplot which is described in your text. **Note:** The fourth plot type is a *modified* boxplot which is a slightly more complex variation on the skeletal boxplot presented in the text.
- Press  $\boxed{ZOOM} \boxed{9}$  for the boxplot of Screen (59)
- Press  $\boxed{TRACE}$  then use the  $\boxed{\leftarrow}$  and  $\boxed{\rightarrow}$  keys to display the **five-number summary**. This gives a display like screen (60).

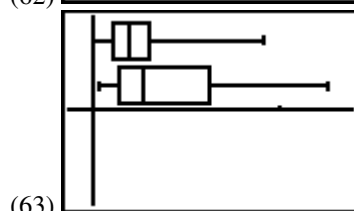


**Comparing Data Sets with Side-by-Side Boxplots**

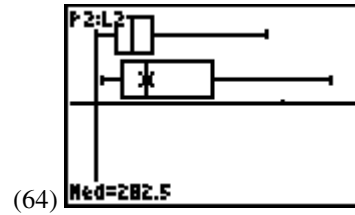
**EXAMPLE Cholesterol Levels of Men and Women:**

We compare the cholesterol levels of 40 females and 40 males as seen in Data Set 1 in Appendix B. We have stored the females' cholesterol levels in L1 and the males' cholesterol levels in L2.

- Press  $\boxed{2nd} \boxed{Y=}$  to get the Stat Plots menu and then  $\boxed{1}$  to get the set-up for Stat Plot1. Set up Stat Plot1 as in screen (61).
- Press  $\boxed{2nd} \boxed{Y=}$  to get the Stat Plots menu and then  $\boxed{2}$  to get the set-up for Stat Plot2. Set up Stat Plot2 as in screen (62).
- Press  $\boxed{ZOOM} \boxed{9}$  to see the two boxplots of screen (63).



4. Press **TRACE** then use the **◀** and **▶** keys to display the five-number summary. This gives a display like screen (64). You can use the **▲** and **▼** keys to toggle between the upper plot which is that of the females and the lower plot which is for the males. These side-by-side plots clearly indicate that males, in general, have higher cholesterol levels than females and that the cholesterol levels of males tend to be more variable than those of females.



**Note:** Since the TI-83 Plus has three StatPlots, it can be used to plot box and whisker plots for three different data sets on the same graph.