Chapter 2

Descriptive Analysis and Presentation of Single-Variable Data

2.1 Graphic Presentation of Data

A **circle graph**, or **pie diagram**, is used to summarize qualitative or categorical data. The circle graph is commonly used in business settings, newspapers, and magazines to illustrate parts of a whole. A circle is divided to show the amount of data that belong to each category as a proportional part of a circle. The calculator program CIRCLE[1] may be used to construct a circle graph.

Example 2-1: The following table lists the number of cases of each type of operation performed at General Hospital last year. Display this data using a circle graph.

	Type of Operation	Number of Cases
1	Thoracic	20
2	Bones and joints	45
3	Eye, ear, nose, and throat	58
4	General	98
5	Abdominal	115
6	Urologic	74
7	Proctologic	65
8	Neurosurgery	23

[1] Program by Chuck Vonder Embse, *Eightysomething*, Volume 3, Number 2, Spring 1994

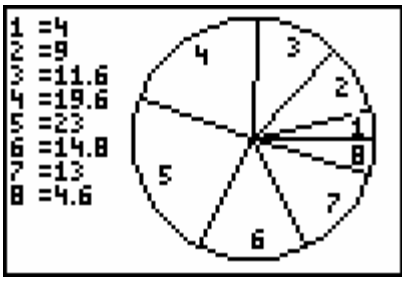
Step 1: Press STAT ENTER

Step 2: Enter the number of cases into list L_1

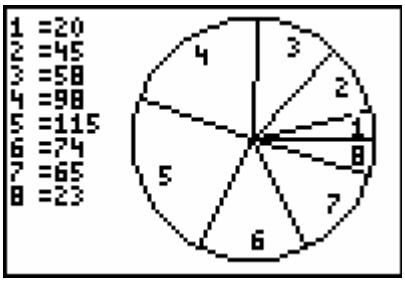
Step 3: Press PRGM ▼ (down arrow) to select CIRCLE. Press ENTER

Step 4: Press 2nd 1 (L_1) ENTER

Step 5: You will be prompted for 1: PERCENTAGES or 2: DATA. Since 1: PERCENTAGES is highlighted, press ENTER. The calculator returns the following pie chart



The numbers at the left indicate the percentage of the total for each type of operation. You can also select 2: DATA in Step 5. This yields the following..



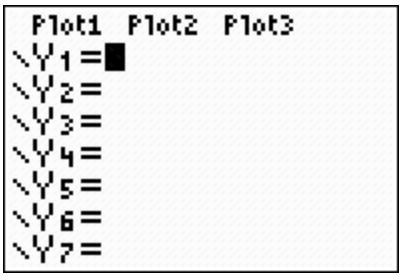
Here the numbers at the left are the frequency counts of each type of operation.

ASSIGNMENT: Do exercises 2.3, 2.4, 2.5 in your text

A **bar graph** is also used to graphically summarize categorical or attribute data. A rectangle is drawn corresponding to each category, or class, with height determined by the frequency. Bar charts are sometimes constructed so that the bars extend horizontally to the right. However, the TI-84+ displays bar charts with vertical bars.

Example 2-2: Using the Operations Data in the table above, let's construct a bar graph

Step 1: Press Y= . Your screen should look like this..



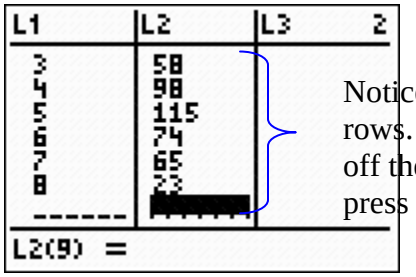
If there are are any functions in Y_1 through Y_7 use (down arrow) and press CLEAR to delete them.

Note: The TI-84+ will graph all of the functions that are listed in the [Y=] menu. Since we don't want to confuse the graph of the bar chart it is best to omit them.

Step 2: Clear the lists L_1 and L_2. Press [▲] [CLEAR] [▼] to clear L_1. Use the right arrow to move over to L_2 and repeat to clear L_2.

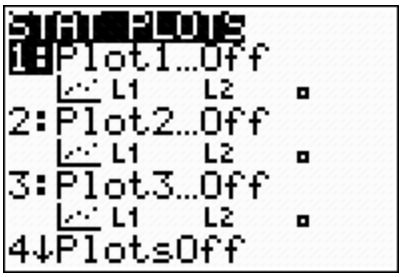
Note: Do not press Delete when the list name is highlighted. This command deletes the list from the stat list editor

Step 3: Press [STAT] [ENTER] enter the Operations Data into L_1 and L_2. (Refer to Chapter 1 for review if necessary) Your screen should look like this.

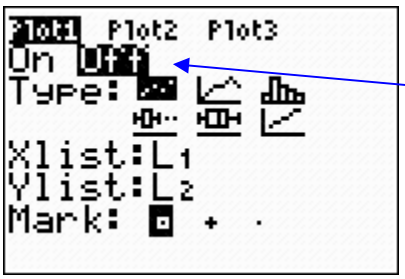


Notice that the list only displays 7 rows. Rows 1 and 2 have scrolled off the page. To view these rows, press the up arrow key

Step 4: Press [2nd] [Y=] (STAT PLOT). This brings you to the following screen



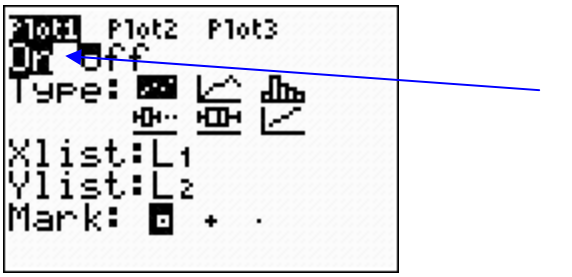
Step 5: Press [ENTER] to access the Plot 1 setup menu.



If **Off** is highlighted, this means that the plot is not turned On and will not graph

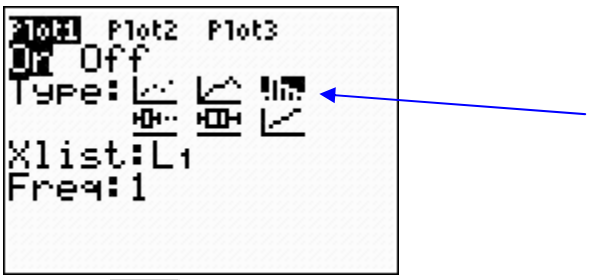
If Off is highlighted, this means that the plot is not turned On.

To turn it on press ◄ ENTER. This toggles Plot 1 to **On** as shown in the next screen..



This shows Plot 1 is **On**

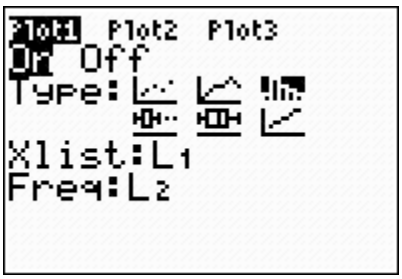
Step 6: Press ▼ to select the Type then press ► to select the bar chart and then press ENTER. Now the bar chart should be highlighted as in the following screen.



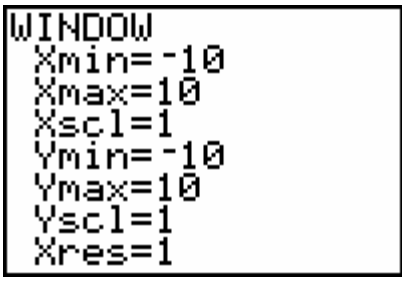
Bar Chart Plot is selected

Step 7: Press ▼ to select Xlist: If the Xlist is L_1, then go to step 8. Otherwise, press 2nd 1 (L_1).

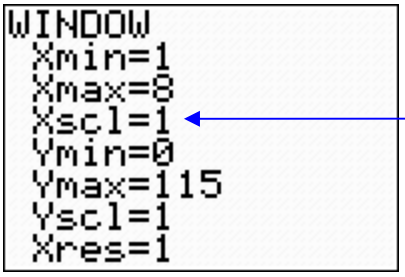
Step 8: Press ▼ to select Freq: Press 2nd 2 (L_2). Plot 1 is now set up. Your screen should look like this..



Step 9: Press WINDOW to bring you to the following screen..



Using  , change each of the settings to match the Operations Data. Your Window should look like this when you finish



The Xscl determines the width of each bar of the chart

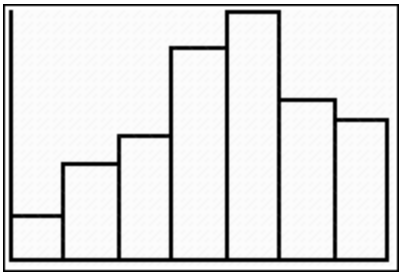
The Xmin represents the smallest data value in L_1 and Xmax is the largest value in L_1.

The Ymin is the minimum data value in L_2 and Ymax is the largest value in L_2

The Yscl doesn't really make a difference in the bar chart.

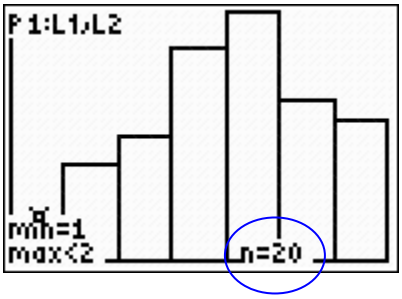
Step 10: Press 

. Your calculator will return the following bar graph.



To read the frequencies of each of the bars press 

. This will show you a frequency for the 1st bar corresponding to Thoracic Operations.



Use the appropriate right or left arrow keys to view the frequencies of each bar.

ASSIGNMENT: Do exercises 2.6 - 2.11 in your text

A **Pareto Diagram** is a bar graph with the bars arranged from the most numerous category to the least numerous category. The diagram includes a line graph displaying the cumulative percentages and counts for the bars. The Pareto diagram is used often in quality-control applications to identify the numbers and types of defects that happen within a product or service.

The calculator program PARETO may be used to display a Pareto diagram.

Example 2-3: The final daily inspection defect report for an assembly line at a local manufacturer is given in the table below. Construct a Pareto diagram for this defect report. Management has given the production line the goal of reducing their defects by 50%. What two defects should they give special attention to in working toward this goal?

Defect	Number
Dent	8
Bend	12
Blemish	56
Chip	23
Scratch	45
Others	6
Total	**150**

Step 1: Press STAT ENTER and clear lists L_1 and L_2

Step 2: Enter the data into list L_1

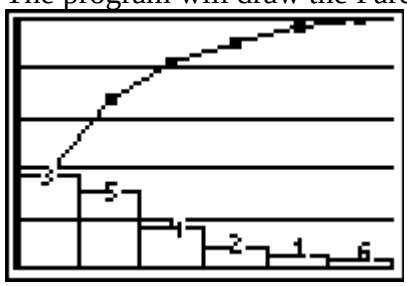
Step 3: Press PRGM and select PARETO

Step 4: When prompted for the list, press 2nd 1 ENTER

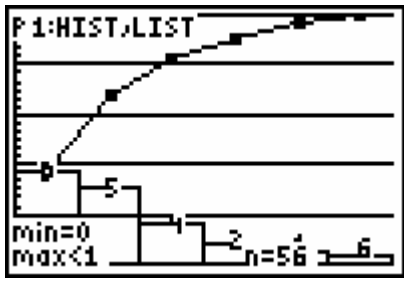
Step 5: When prompted for the Ymax: enter the Total # of Defects, in this case 150

Step 6: When prompted for the Yscl: you can enter any number and it doesn't change the appearance of the graph from the screen below. Each of the horizontal lines represents that scale. However, it is better to use TRACE to read the bar heights or cumulative frequencies on the line graph.

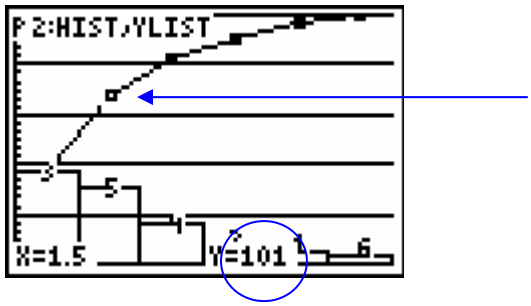
The program will draw the Pareto diagram as shown below



Press TRACE. The calculator displays this screen



The cursor is currently displaying the frequency in the first class - or the height of the first bar of the bar graph. Since the line is cumulative, press (Up Arrow) then (Right Arrow) to begin tracing the line.



Since the Pareto Graph displays the Blemishes and Scratches in the first two bars, this is all we need to consider in answering the question. The cumulative total of the first two classes or bars corresponding to Blemishes and Scratches is 101/150 ≈.673 . Thus 67.3% of the reported defects are due to blemishes and scratches. The assembly line crew should work to reduce these two defects in order to reach their goal.

ASSIGNMENT: Do exercises 2.12-2.16 in your text

A **dotplot** is another type of graph used to display the distribution of a data set. The display represents each piece of data with a dot positioned along a measurement scale. The measurement scale may be horizontal or vertical. The frequency of values is represented along the other scale. The calculator program DOTPLOT may be used to construct a dotplot.

Example 2-4: A random sample of 19 exam scores was selected from a large introductory statistics class. Construct a dotplot for the data given in the following table.

Exam Scores

76	74	82	96	66	76	78	72	52	68
86	84	62	76	78	92	82	74	88	

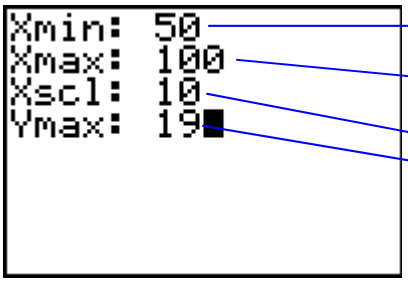
Step 1: Press STAT ENTER and input the 19 exam scores into list L_1

Step 2: Press PRGM and arrow down to select DOTPLOT, then press ENTER

Step 3: When prompted for LIST: Press 2nd 1 (L_1) and then press ENTER

Step 4: You will be prompted for Xmin, Xmax, Xscl, and Ymax as shown on the next screen.

Each time input the value and press ENTER



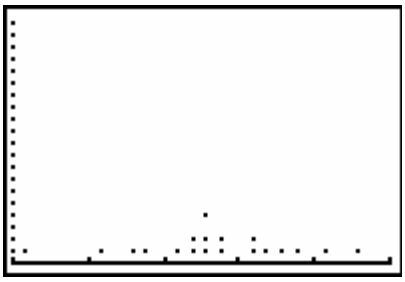
Input a Number less than smallest in data set

Input a Number greater than largest in data set

See Note Below

Note: The Xscl is set to 10 and this represents the width of each class or column of the dotplot. The Ymax should be set to the largest frequency in any one column of the dotplot. As the total frequency of all exam scores in the plot is 19, this is an effective lower bound. We will adjust these settings by trial and error once we have run the program and know what to expect as far as output.

After inputting the Ymax of 19 and pressing ENTER, the following screen displays..



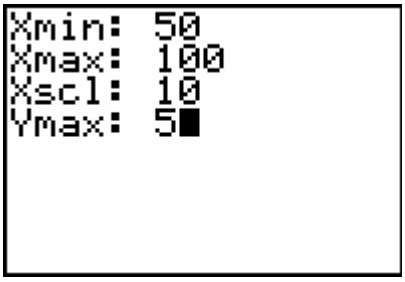
The Xscl of 10 seems appropriate, however, the Ymax setting should be changed.

Step 5: Press PRGM and arrow down to select DOTPLOT, then press ENTER.

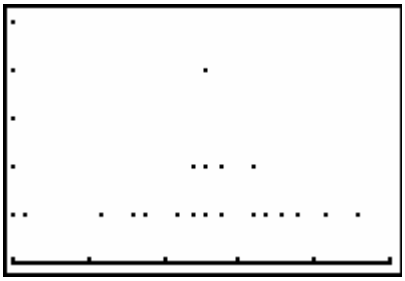
Step 6: When prompted for LIST: Press 2nd 1 (L_1) and then press ENTER

Step 7: You will be prompted for Xmin, Xmax, Xscl, and Ymax as shown on the next screen.

Each time input the value and press ENTER



DOTPLOT will now return the following screen..



Note: You will have to run DOTPLOT several times to get the settings so that the window displays the data appropriately.

ASSIGNMENT: Do exercises 2.17-2.22 in your text

A **frequency distribution** is a table or graph that summarizes data by classes or class intervals. In a typical *grouped* frequency distribution, there are anywhere from 5 to 20 classes of equal width. The table may contain columns for class number, class interval, tally (if constructing by hand), frequency, relative frequency, cumulative relative frequency, and class mark. In an

ungrouped frequency distribution each class consists of a single value.

The TI-84 is capable of constructing frequency distributions and graphing frequency histograms. Typically we graph the histogram and use TRACE to construct the frequency distribution.

Example 2-5: The hemoglobin *A* test, a blood test given to diabetics during their periodic checkups, indicates the level of control of blood sugar during the past two to three months. The data in the following table was obtained from 40 different diabetics at a university clinic treating diabetic patients.

Blood Test Results

6.5	5.0	5.6	7.6	4.8	8.0	7.5	7.9	8.0	9.2
6.4	6.0	5.6	6.0	5.7	9.2	8.1	8.0	6.5	6.6
5.0	8.0	6.5	6.1	6.4	6.6	7.2	5.9	4.0	5.7
7.9	6.0	5.6	6.0	6.2	7.7	6.7	7.7	8.2	9.0

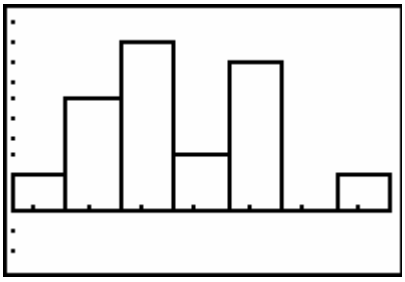
Step 1: Press STAT ENTER and input the blood test data into list L_1

Step 2: Press 2nd Y= (STAT PLOT) and then press ENTER to access the Plot 1

Step 3: Adjust the menu settings so that your screen looks like this

Step 4: We have two options for setting the window.

The first option is to let the calculator select the window and graph the histogram. Press ZOOM 9 (ZOOM STAT). The calculator will display the following histogram..

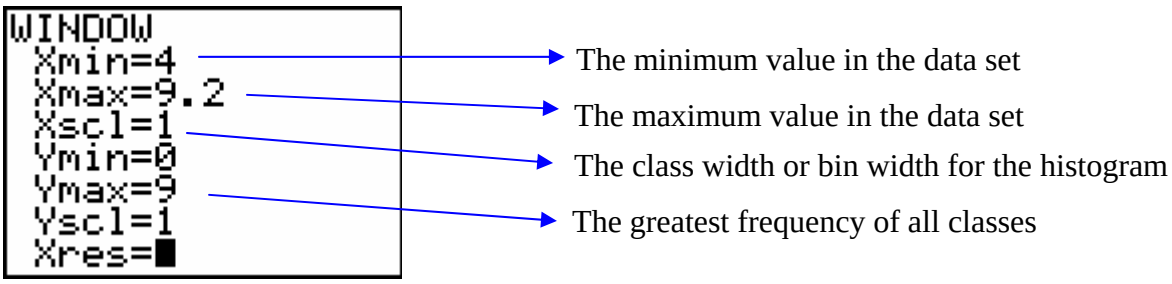


Notice that there are 7 classes of equal width. If this is acceptable then we can use TRACE to construct the classes and to find the frequency in each class.

OR,

The second option is to set the window manually.

Press WINDOW and adjust the settings so that the screen looks like this

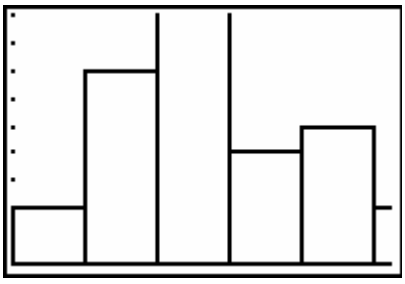


Note: To determine the Xscl or class width, find the range = Xmax - Xmin which is 5.2 in this case. Then decide on the number of classes and divide into the range. Finally, round this number up to get the Xscl. For this example. I choose six bars in the histogram or 6 classes.

Dividing $6\overline{)\,5.2}$ $\approx .9167$. Rounding up yields a Xscl of 1.

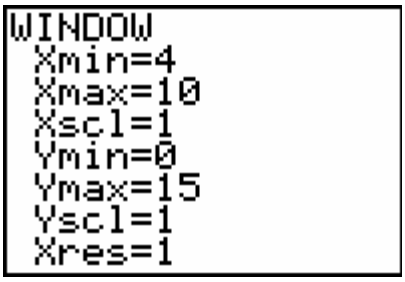
The Ymax is the highest frequency and is not known until the frequency histogram is graphed. Since there were 30 measurements in the original data set, this would be an effective upper bound for Ymax. However, since there will be 6 classes displayed, I chose 20 as a guess. This can be corrected quickly if the guess is too large or small.

Step 5: Press GRAPH to display the histogram as shown below

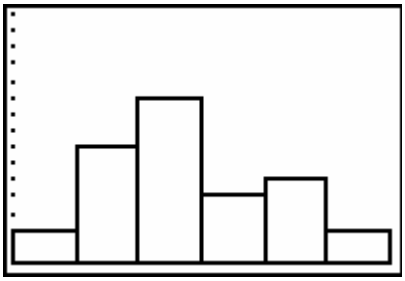


Step 6: In this example, the Ymax setting is set too low and should be adjusted to a larger value.

Similarly, the Xmax setting needs to be adjusted also. Press WINDOW and make the following corrections..

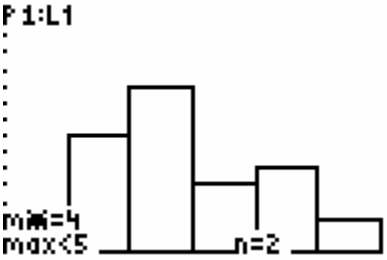


Step 7: Press GRAPH to display the histogram as shown below



To construct the grouped frequency distribution, continue with the following steps..

Step 8: Press TRACE . Your screen should look like this..



Step 9: Press) (Right Arrow) to view the rest of the classes and the corresponding frequencies in each class. Complete the table as below.

Classes	Frequencies
4-5	2
5-6	7
6-7	10
7-8	4
8-9	5
9-10	2
Total	30

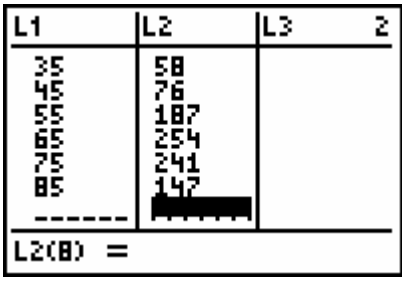
ASSIGNMENT: Do exercises 2.29-2.23 in your text

Example 2-6: Data from a recent survey of Roman Catholic nuns summarizes their ages as follows.

Class Midpoints	Age Classes	Frequencies
25	20 up to 30	34
35	30 up to 40	58
45	40 up to 50	76
55	50 up to 60	187
65	60 up to 70	254
75	70 up to 80	241
85	80 up to 90	147

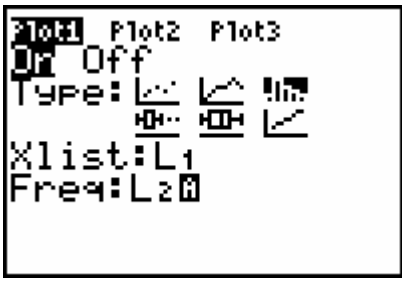
Construct a histogram for this data.

Step 1: Press STAT ENTER and input the class midpoints in list L_1 and corresponding frequencies in list L_2. Your screen will look like this..

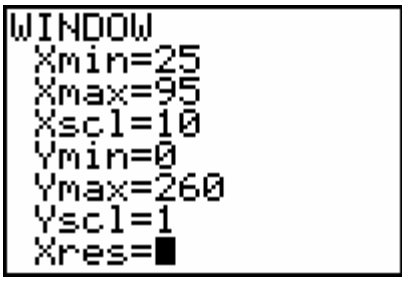


Step 2: Press 2nd Y= (STAT PLOT) and then press ENTER to access the Plot 1

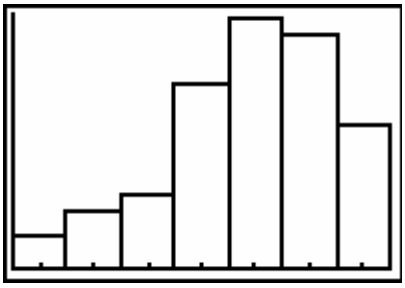
Step 3: Adjust the menu settings so that your screen looks like this



Step 4: Press WINDOW and adjust the settings so that the screen looks like this..



Step 5: Press GRAPH to display the histogram



ASSIGNMENT: Do exercises 2.39, 2.41 in your text

An **ogive** is a plot of cumulative frequency or cumulative relative frequency versus class limit. A horizontal scale identifies the upper class boundaries. Every ogive starts on the left with a relative frequency or frequency of zero at the lower class boundary of the first class and ends on the right with a cumulative relative frequency of 1, or cumulative frequency of *n* (the number of observations in the data set).

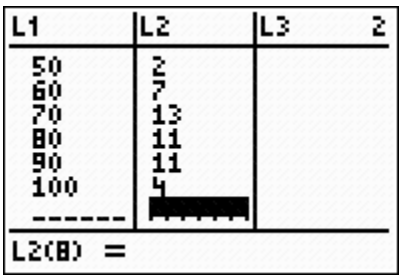
Example 2-7: The final exam scores of 50 elementary statistics students were selected and the following grouped frequency distribution was obtained.

Classes	Frequencies	Cumulative Frequency
35-45	2	
45-55	2	
55-65	7	
65-75	13	
75-85	11	
85-95	11	
95-105	4	
Total	50	

Construct the cumulative frequency histogram or ogive for this distribution.

Step 1: Press STAT ENTER, input the class midpoints into list L_1 and frequencies into list L_2

Your screen should look like this

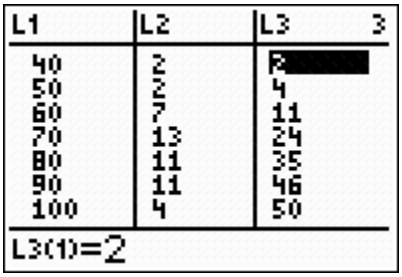


Step 2: Press 2nd MODE (QUIT) CLEAR to get to a blank home screen

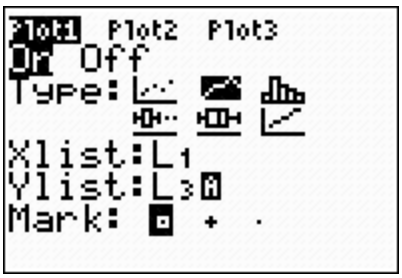
Step 3: Press 2nd STAT, select OPS and then select **6: cumSum** and press ENTER

Step 4: Press 2nd 2 (L_2) STO▶ 2nd 3 (L_3) to compute the cumulative frequencies in list L_3.

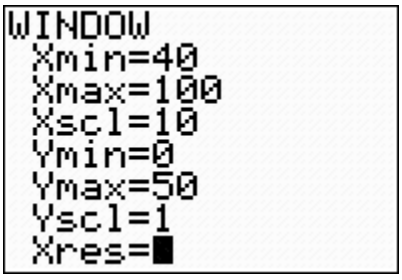
To view these cumulative frequencies press STAT ENTER. Check your screen matches this..



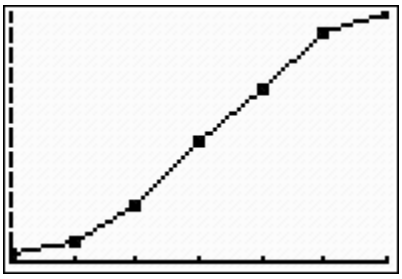
Step 5: Press 2nd Y= ENTER and change your settings of the Plot 1 Menu accordingly



Step 6: We need to adjust the windows settings. Press WINDOW and adjust the settings so that the screen looks like this..



Step 7: Finally, Press GRAPH to obtain the following ogive



ASSIGNMENT: Do exercises 2.51, 2.53 in your text

Measures of Central Tendency

The Mean - The mean is the arithmetic average of the values of the data set. It is used to represent the "average" or center of the data as a representative value. There are several ways to find the mean on the TI-84. Consider the following example;

Example 2-8: A set of data consists of 6, 3, 8, 6 and 4. Find the mean

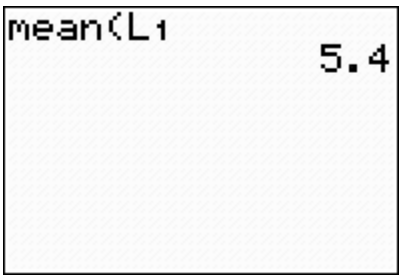
Method 1

Step 1: Press STAT ENTER and input the data values into list L_1

Step 2: Press 2nd MODE CLEAR to get to a blank home screen

Step 3: Press 2nd STAT (LIST), select M**ATH**, select **3: mean** and press ENTER

Step 4: Press 2nd 1 (L_1) and press ENTER. The calculator returns the answer..



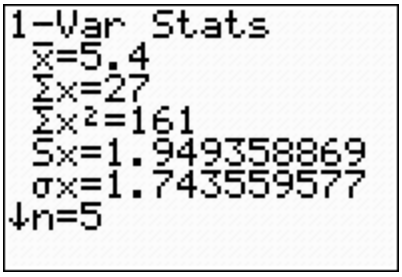
Method 2

Step 1: Step 1: Press STAT ENTER and input the data values into list L_1

Step 2: Press 2nd MODE CLEAR to get to a blank home screen

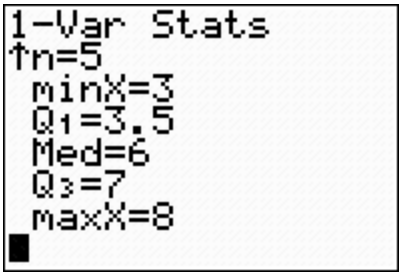
Step 3: Press STAT, select **CALC**, select **1: 1-Var Stats** and press ENTER

Step 4: Press 2nd 1 (L_1) and press ENTER. The calculator returns the answer..



This second approach shows the mean, $\bar{x}$ = 5.4. It also displays other measures as well. Notice S_x which represents the sample standard deviation, σ_x which represents the population standard deviation are also found on the same page.

Also note the down arrow in the bottom left hand part of the view screen. By pressing the down arrow a few times we obtain the rest of the 1-Var Stats summary..



The Quartiles, Median and minimum and maximum values are all displayed

* We will use Method 2 for most of our calculations throughout the rest of this manual.

ASSIGNMENT: Do exercises 2.58, 2.60, 2.61 in your text

The Median - When the data set is sorted, the "middle" value is termed the median. In a data set with an odd number of values, there is a middle value. In a data set with an even number of values, the average of the two "middle-most" values is the median. The TI-84 displays the median in the 1-Var Stats summary.

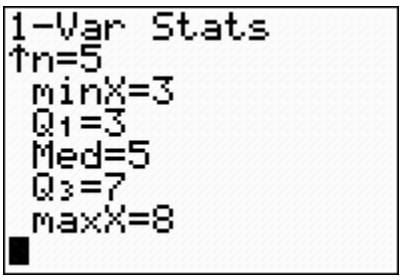
Example 2-9: Find the median for the data set 6, 3, 8, 5, 3

Step 1: Press STAT ENTER and input the data values into list L_1

Step 2: Press 2nd MODE CLEAR to get to a blank home screen

Step 3: STAT ▶ ENTER 2nd 1 ENTER

Step 4: Press ▼ repeatedly to scroll down to the median. The calculator returns the value



ASSIGNMENT: Do exercises 2.62, 2.63, 2.67 in your text

Mode & Midrange

The Mode & Midrange can be found using the program CENTRAL

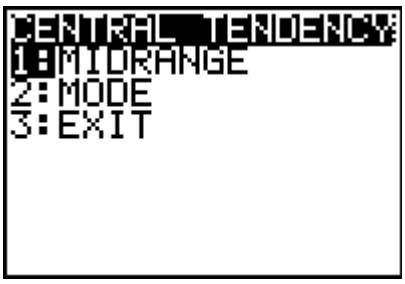
Example 2-10: Find the Mode & Midrange of the data set 3,3,5,6,8

Step 1: Press STAT ENTER and input the data values into list L_1

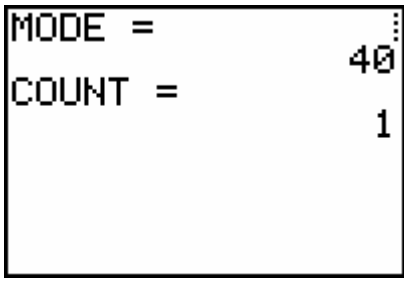
Step 2: Press PRGM, and then press ▼ to select CENTRAL, then press ENTER

Step 3: When prompted for LIST, press 2nd 1 (L_1)

Step 4: Select 1: MIDRANGE, 2: MODE or 3: Exit as shown on the following screen



Depending on your selection, the calculator returns the following screens



ASSIGNMENT: Do exercises 2.65-2.67 in your text

Example 2-11: Recruits for a police academy were required to undergo a test that measures exercise capacity. Exercise capacity (in minutes) was obtained for each of 20 recruits and is given in the following table. Find the mean, median, mode and the midrange of the data.

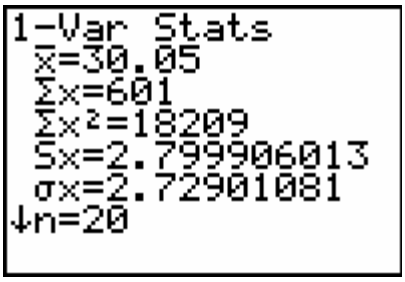
Exercise Capacity									
25	27	30	33	30	32	30	34	30	27
26	25	29	31	31	32	34	32	33	30

First, to find the mean and median use the 1-Var Stats summary

Step 1: Press STAT ENTER and input the Exercise Capacity values into list L_1

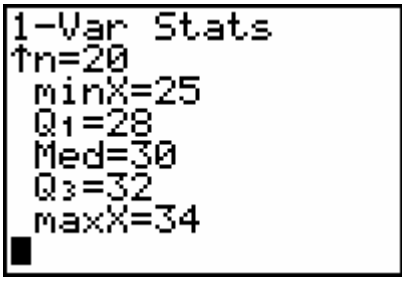
Step 2: Press 2nd MODE CLEAR to get to a blank home screen

Step 3: STAT) ENTER 2nd 1 ENTER. The following screen will be returned



Thus the mean is $\bar{x} = 30.05$

Step 4: Press  several times to display the median



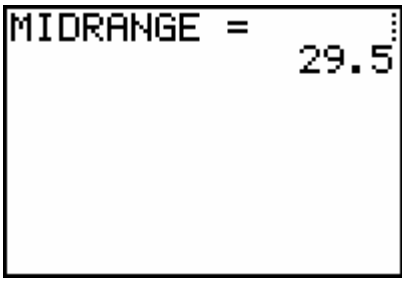
So, the median is 30

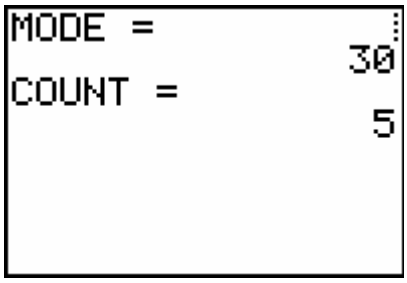
To find the midrange and mode use the CENTRAL Program

Step 1: Press  , and then press  to select CENTRAL, then press 

Step 2: When prompted for LIST, press  (L_1)

Step 3: Select 1: MIDRANGE, 2: MODE or 3: Exit as shown on the following screens





ASSIGNMENT: Do exercises 2.67-2.74 in your text

Measures of Dispersion

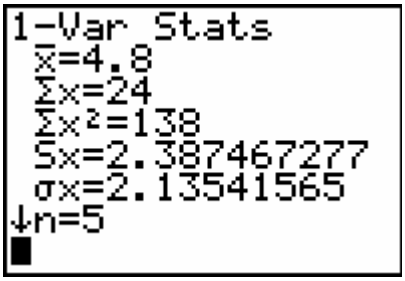
These measures indicate spread or variation of data. Data sets with identical means and medians can have different measures of spread. We will learn how to compute the range, standard deviation and variance on the TI-84+

Example 2-12: Find the range, standard deviation and variance for the data set 6, 3, 8, 5, 2

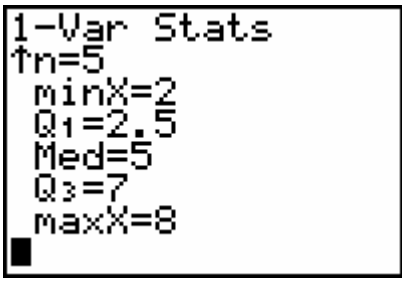
Step 1: Press [STAT] [ENTER] and input the data values into list L_1

Step 2: Press [2nd] [MODE] [CLEAR] to get to a blank home screen

Step 3: [STAT] [▶] [ENTER] [2nd] [1] [ENTER]. The following screen will be returned



The sample standard deviation, denoted s = 2.387. The sample variance is the square of the standard deviation or $s^2 = (2.387)^2 = 5.698$. Finally, the range of data set is the difference of the maximum and minimum. Press [▼] repeatedly, the calculator will return the following screen.



Thus, the range is 8 - 2 = 6

ASSIGNMENT: Do exercises 2.85, 2.89-2.94 in your text

We may compute the estimated mean, standard deviation and variance of a grouped frequency distribution

Example 2-13: A farmer conducted an experiment in order to judge the value of a new diet for his animals. Using the weight gain (in grams) for chicks fed on a high-protein diet given in the

following table, find the mean, variance, and standard deviation.

Weight Gain	Frequency
12.5	2
12.7	6
13.0	22
13.1	29
13.2	12
13.8	4

Step 1: Press 

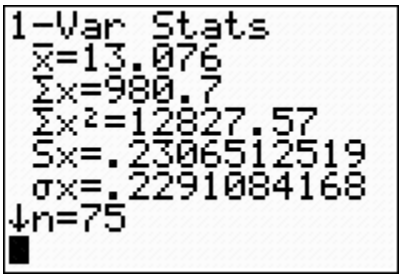
and input the Weight Gain data into list L_1 and the corresponding frequencies into list L_2

Step 2: Press 

to get to a blank home screen

Step 3: Press 

to obtain the following screen.



The mean, $\bar{x} = 13.076$

The sample standard deviation, s = .231

The sample variance is $s^2 = .231^2 = .053$

Measures of Position on the TI-84+

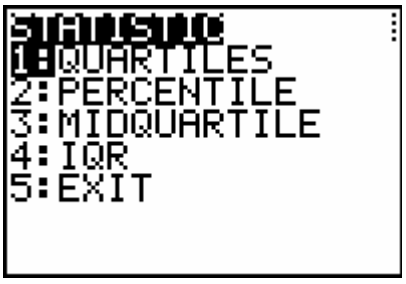
There are four measures of position that we will compute using the POSITION Program on the TI-84+. These are the quartiles, percentiles, midquartiles and innerquartile range (IQR).

Example 2-14: An experiment was conducted in order to test how quickly certain fabrics ignite when exposed to a flame. The following table lists the ignition times for a certain type of synthetic fabric. Find the quartiles, the midquartile, the interquartile range, and the 88th percentile.

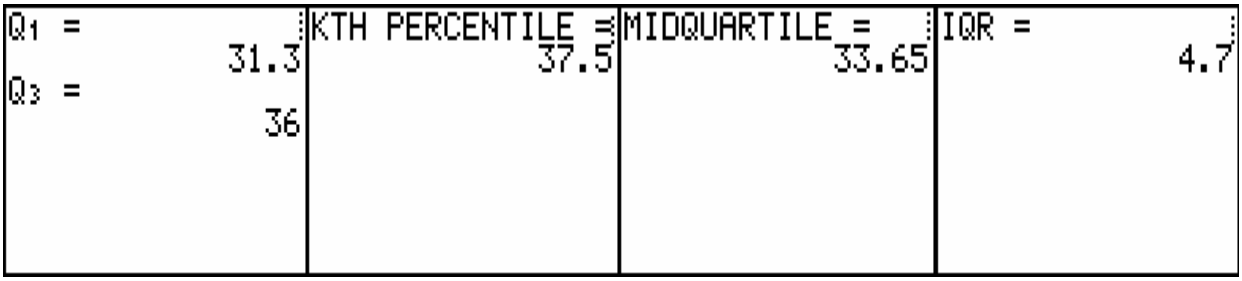
Ignition Times								
30.1	31.5	34.0	37.5	30.1	31.6	34.5	37.5	30.2
31.6	34.5	37.6	30.5	32.0	35.0	38.0	31.0	32.4
35.0	39.5	31.1	32.5	35.6	31.2	33.0	36.0	31.3
33.0	36.5	31.3	33.0	36.9	31.4	33.5	37.0	

Step 1: Press STAT ENTER and input the Ignition Times data into list L_1

Step 2: Press PRGM and then select POSITION and press ENTER. You should have the following screen



Step 3: Select the option you want to compute and press ENTER. The 4 screens are shown below.



ASSIGNMENT: Do exercises 2.105 - 2.109 in your text

A **5-number summary** is sometimes used to describe a set of data and is composed of:

(1) Min, the smallest value in the data set,
(2) Q_1, the first quartile (also called P_{25} , or the 25^{th} percentile),
(3) Med, the median, Q_2 or 50^{th} percentile
(4) Q_3, the third quartile (also called P_{75} , or the 75^{th} percentile), and
(5) Max, the largest value in the data set.

The 5-number summary is displayed with the other measures of central tendency on the 1-Var Stat summary.

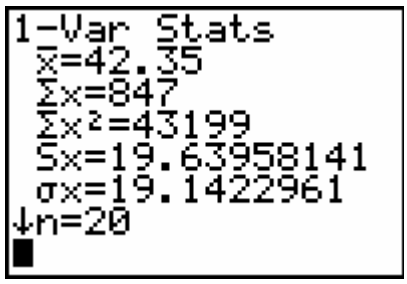
Example 2-15: A manual dexterity test was given to 20 intoxicated individuals. The times (in minutes) to complete the test are listed in the table below. Compute the 5-number summary for the data

21	30	51	28	34
44	47	33	32	33
42	65	35	10	55
49	99	34	33	72

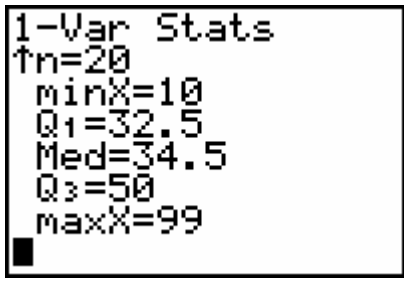
Step 1: Press STAT ENTER and input the minutes data into list L_1

Step 2: Press 2nd MODE CLEAR to get to a blank home screen

Step 3: STAT ▶ ENTER 2nd 1 ENTER. The following screen will be returned



Step 4: Press ▼ repeatedly to obtain the screen



ASSIGNMENT: Do exercise 2.111 in your text

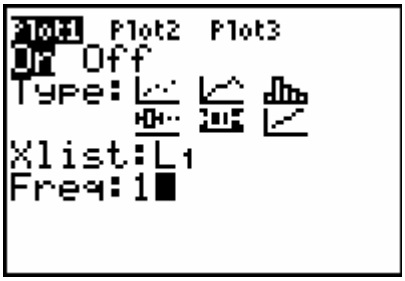
A **box-and-whisker display**, or boxplot, is a graphic representation of the 5-number summary. The five numerical values (Min, Q_1, Med, Q_3, Max) are located on a horizontal scale. A box is drawn with edges at the quartiles and a line is drawn at the median. A line segment (whisker) is drawn from Q_1 to the smallest value, and another line segment is drawn from $Q_3$to the largest value. This regular box-and-whisker display is a built-in statistical plot.

Example 2-16: Using the Minutes data from the previous example construct a boxplot of the data.

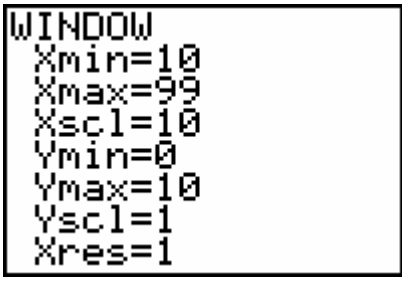
Step 1: Press STAT ENTER and input the minutes data into list L_1.

Step 2. Press 2nd Y= (STAT PLOT) and press ENTER to access the Plot1 menu.

Step 3: Set the menu as shown below

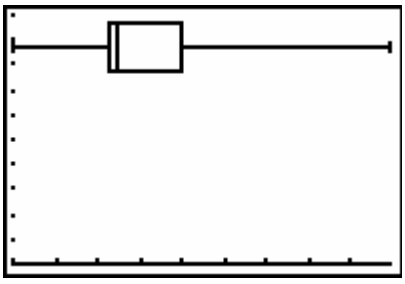


Step 4: Set the window. Press WINDOW and adjust the settings to look like the following..



Notice the Xmin is the minimum value and Xmax is the maximum value in the data set. The Xscl can be set at any convenient value for reading the boxplot. Boxplots only measure in the horizontal direction, thus you can always set Ymin = 0, Ymax = 10 and Yscl = 1

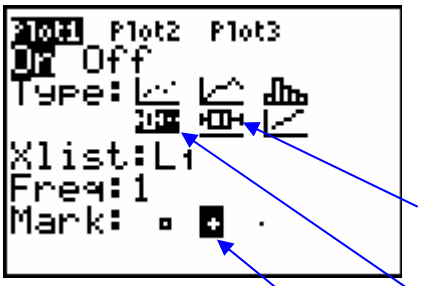
Step 4: Press GRAPH to obtain the following screen



The TI-84+ Plus will also display a modified boxplot showing potential outliers.

Step 1: Press 2nd Y= ENTER to enter the Plot 1 menu

Step 2: Adjust your screen to the following

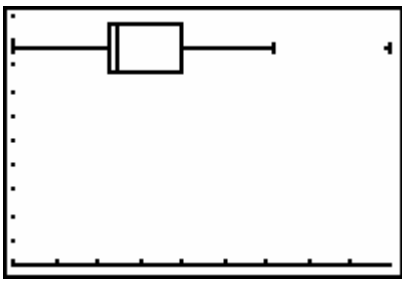


Regular Boxplot

Modified Boxplot

Marks Outliers

Step 3: Press GRAPH to display the modified boxplot



Notice + sign indicates potential outlier

Step 4: Press TRACE, then press) to list the five number summary and to find the outlier.

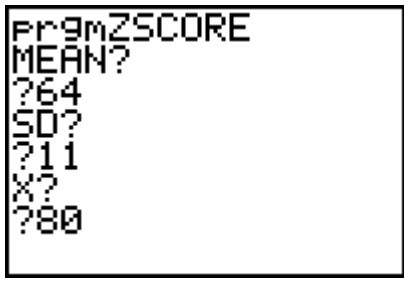
ASSIGNMENT: Do exercises 2.111, 2.112, 2.114, 2.115, 2.118 in your text

The **z-score**, or **standard score,** for a specific value is a measure of relative standing in terms of the mean and standard deviation. The program ZSCORE on the TI-84 will convert X (raw scores) into Z scores.

Example 2-17: The mean score on a calculus midterm was 64 with a standard deviation of 11. Sally scored 80. What was her z-score? i.e. how many standard deviations above the mean did Sally score on her midterm?

Step 1: Press PRGM select **:ZSCORE** and press ENTER

Step 2: The calculator will prompt you for the mean, standard deviation and raw score X. Input the values 64, 11 and 80 respectively as shown below..



Step 3: Press ENTER to obtain the following z-score rounded to two decimal places

Note: To obtain additional z-scores press ENTER and ZSCORE automatically begins again.

ASSIGNMENT: Do exercises 2.119-2.123, 2.125, 2.127-2.128 in your text

Chebyshev's Theorem on the TI-84+

The Program **CHEBY** can be used to find intervals and percentages using Chebyshev's Theorem.

Example 2-18: A certain brand of shoes have a mean cost of $58 with a standard deviation of $6. What minimum percentage is guaranteed by Chebyshev's Theorem to lie within $42.52 to $73.48?

Solution:

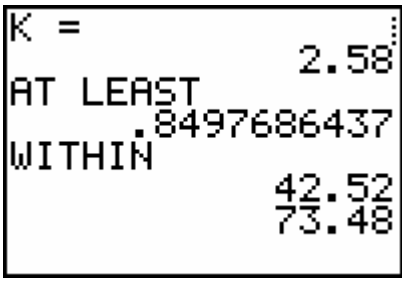
Step 1: First determine if this interval is symmetric with respect to the mean of 58. Since 73.48 - 58 = 15.48 and 58 - 42.52 = 15.48, there is symmetry.

Step 2: We need to determine the value k. k = 15.48/6 = 2.58

Step 3: Press PRGM ▼ to select CHEBY and press ENTER twice. This brings you to the next screen.

Step 4: Press ▼ to select 2: STATS and press ENTER

Step 5: Input the appropriate values for the mean, standard deviation and k. The calculator returns the following..



Thus, at least 85% of this brand of shoe will lie in the price range ($42.52 , $73.48)

ASSIGNMENT: Do exercises 2.192, 2.205, 2.206 in your text

Example 2-19: A sample of earnings per share data for 30 fortune 500 companies is listed below.

1.97	.60	4.02	3.20	1.15	6.06
4.44	2.02	3.37	3.65	1.74	2.75
3.81	9.70	8.29	5.63	5.21	4.55
7.60	3.16	3.77	5.36	1.06	1.71
2.47	4.25	1.93	5.15	2.06	1.65

Using Chebyshev's Theorem, calculate the range of the data that is within k = 2.5 standard deviations of the mean.

Solution:

Step 1: Press STAT ENTER and input the earnings data into list L_1

Step 2: Press 

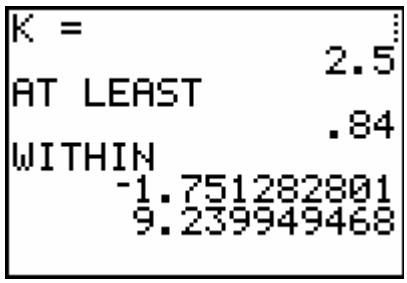
Step 3: Press  to select CHEBY and press  twice. This brings you to the next screen.

Step 4: Press  to select 1: LIST

Step5: When prompted for LIST: press  . This brings you to the next screen..

Step 6: Since this data represents a sample, press 

Step 7: When prompted for the value of k, press  . The calculator returns the following..



Thus, the interval in which at least 84% of the data lies based on this sample is (-1.75, 9.24)

ASSIGNMENT: Do exercises 2.207-2.208 in your text

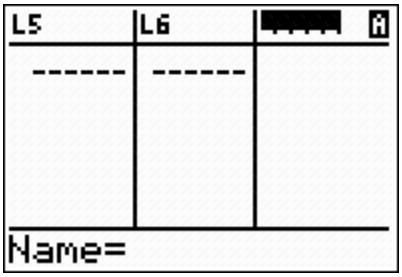
Using the TI-84+ to Test Data for Normality

Example 2-20: The final exam scores for an elementary statistics exam are listed in the table below. Test the data for normality.

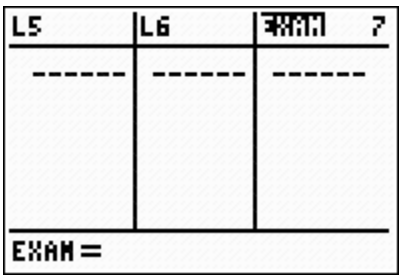
60	47	82	95	88	72	67	66	68	98
90	77	86	58	64	95	74	72	88	74
77	39	90	63	68	97	70	64	70	70
58	78	89	44	55	85	82	83	72	77
72	86	50	94	92	80	91	75	76	78

Step 1: Press STAT ENTER

Step 2: Press ▲ to highlight listname L_1 and then press ▶ repeatedly until you come to a blank column as shown in the screen below.



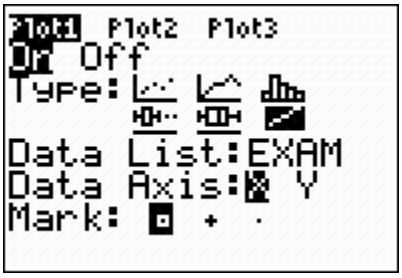
Step 3: Notice the Alpha Character is locked (A in upper right corner). Thus we can type the list name EXAM using the green alpha keys and then press ENTER your screen should look like this..



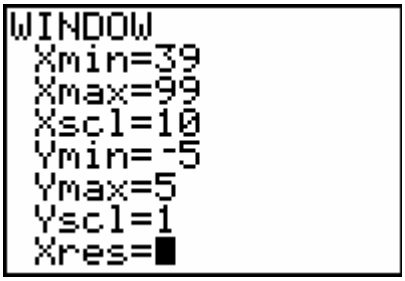
Step 4: Press ▼ and input the exam scores into the list EXAM.

Step 5: Press 2nd MODE (Quit) CLEAR to get to a blank homescreen and to exit the edit mode.

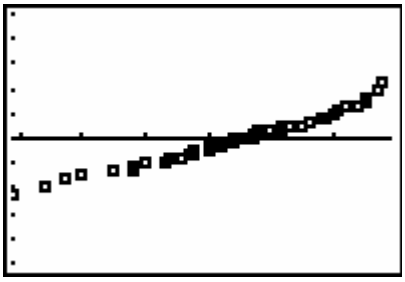
Step 6: Press 2nd Y= ENTER and adjust the Plot 1 settings accordingly



Step 7: Press WINDOW and adjust your window settings to match those below



Step 8: Press GRAPH to obtain the following plot



When the data appears to be linear, this indicates that the data is approximately normal.

ASSIGNMENT: Do exercise 2.207 in your text

Using the TI-84+ to generate random data

The program SAMPLE can be used to generate random numbers between two bounds with or without replacement.

Example 2-21: The California State Lottery Super Jackpot Plus® is a game in which players choose or let the computer randomly generate 5 numbers between 1-47. This random generation is sometimes called a "Quick-Pick". Simulate the random draw of a "Quick-Pick"

Step 1: Press PRGM, select **:Random** and press ENTER

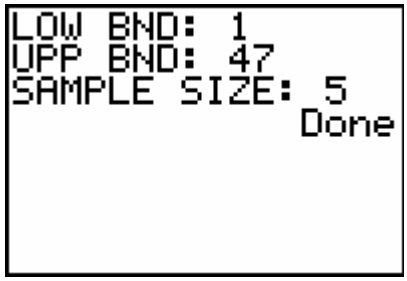
Step 2: When prompted for LOW BND: input 1 and press ENTER

Step 3: When prompted for UP BND: input 47 and press ENTER

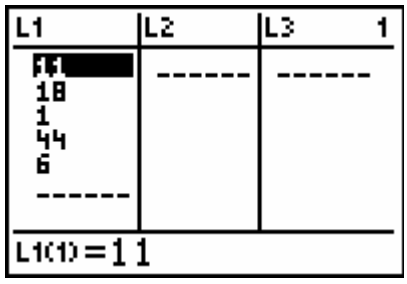
Step 4: When prompted for SAMPLE SIZE: input 5 and press ENTER

The calculator will prompt you to select sampling with or without replacement

Step 5: Since 1: W/OUT REPLACE is highlighted, select ENTER. The following screen is obtained..



Step 6: Press STAT ENTER to see the list. Since the numbers are randomly generated, the list that is obtained each time will be different.



ASSIGNMENT: Do exercises 2.213-2.216 in your text