

## Chapter 2 Exploring Data with Graphs and Numerical Summaries

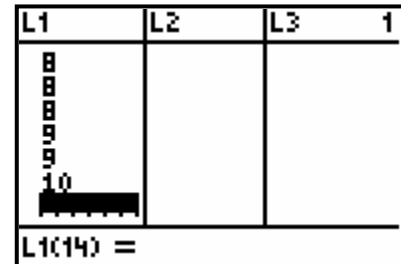
### Constructing a Histogram on the TI-83

Suppose we have a small class with the following scores on a quiz:

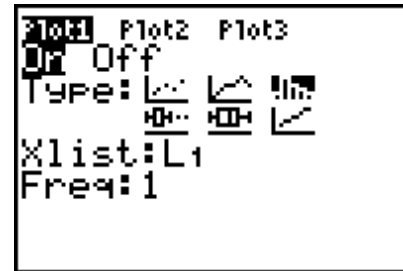
4.5, 5, 5, 6, 6, 7, 8, 8, 8, 8, 9, 9, 10.

To construct a histogram of this data set we will first enter the data in a list, then set up the histogram, and finally adjust the bar width and data ranges. These three things are done in three different windows.

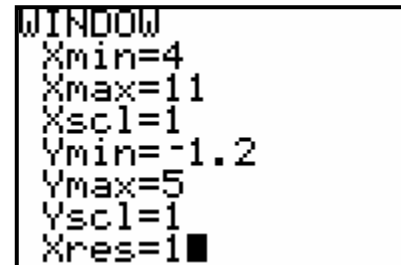
- **Step 1: Enter the data.** Press [STAT] [1] to get to the Stat Edit screen and enter the numbers in L1. [Hint: If there are numbers already in L1, move the cursor onto the label L1 at top of first column then press [CLEAR][ENTER] to erase the list.]



- **Step 2: Program a histogram on the STAT PLOT screen.** Press [2nd][Y=][1]. As shown to the right, move the cursor so the plot is turned on, the histogram icon is turned on, the Xlist is L1, and the frequency (Freq:) is 1. [Hint: Before you graph anything, make sure all the other plots and graphs are turned off.]



- **Step 3: Specify bar width and data ranges on the Window screen.** For this set of data, we want our histogram to go from 4 to 11 (Xmin and Xmax) horizontally and each bar to have a width of 1 (Xsc1). For the vertical distance we just need to make sure we can see the top of the bar and there is space under the graph to display information.



- **Step 4: Display the graph.** Press [GRAPH] to see the graph. By pressing [TRACE] and [←] or [→] you can move along the graph and see the range of each bar and how many are in each group.



- Making a histogram from a frequency distribution.** Another way to enter data is to use two lists. One list is used for the numbers you want to graph and the other is used for the frequency of these occurring. We set L1 to be the scores on our quiz from the earlier example and L1 to be the frequency. You can see we have one 4.5, two 5s, two 6s, and so on. Once the data is entered we do everything as before except put L2 in for the frequency in the STAT PLOT screen.

L1	L2	L3	2
4.5	1	-----	
5	2		
6	2		
7	1		
8	1		
9	1		
10	1		

L2(?) = 1

Plot1	Plot2	Plot3
Off	Off	Off
Type:		
Xlist: L1		
Freq: L2		

### Constructing a Time Plot on the TI-83

The following table gives the monthly cost (in dollars) for natural gas at a house for one year. We want to make a time plot (or  $xy$ -line) of these data.

Month	1	2	3	4	5	6	7	8	9	10	11	12
Cost	75.87	75.29	72.73	45.44	32.15	16.48	12.92	12.42	12.92	15.49	29.34	57.57

- Step 1: Enter the data.** Press [STAT] [1] to get to the Stat Edit screen and enter the month numbers in L1 and the costs in L2.

L1	L2	L3	2
7	12.92		
8	12.42		
9	12.92		
10	15.49		
11	29.34		
12	57.57		
-----			

L2(13) =

- Step 2: Program a time plot on the STAT PLOT screen.** Press [2nd] [Y=] [1]. Move the cursor so the plot is turned on, the time plot icon is turned on, the Xlist is L1, and the Ylist is L2.

Plot1	Plot2	Plot3
On	Off	Off
Type:		
Xlist: L1		
Ylist: L2		
Mark:		

- Step 3: Display the graph.** Press [ZOOM] [9] to set up the appropriate viewing window to see the graph. By pressing [TRACE] and [left] or [right] you can move along the graph and see the values of the points.



The first two columns of table give the average price of a gallon of regular unleaded gasoline in the United States for the years 1980 to 2003.

<b>Year</b>	<b>Gasoline</b>	<b>Wendy's</b>
1980	124.5	47
1981	137.8	50
1982	129.6	31
1983	124.1	175
1984	121.2	65
1985	120.2	68
1986	92.7	87
1987	94.8	114
1988	94.6	135
1989	102.1	116
1990	116.4	125
1991	114.0	130
1992	112.7	127
1993	110.8	150
1994	111.2	50
1995	114.7	52
1996	123.1	226
1997	123.4	34
1998	105.9	45
1999	116.5	85
2000	151.0	130
2001	146.1	102
2002	135.8	108
2003	159.1	58
		63
		84
		80

The last column gives the time (in seconds) for people to go through the drive thru at Wendy's from the time of ordering until they exited the pick-up window. These were collected by Hope students on December 1, 2003 during lunchtime on the north side of Holland.

1. On your calculator, construct histograms of the Wendy's data. Do this three times, once with a class width of 10, once with 20, and once with 30.
  - a) Which one, would you say, best displays the data?
  - b) Are there any outliers in the data?
  - c) Describe the data in terms of shape, center, and spread.
2. Construct a time plot on your calculator for the average price of gasoline from 1980 to 2003.
  - a) Describe how gasoline has changed in price during these years.

b) What year gave the highest price (and what was that price)?

c) What year gave the lowest price (and what was that price)?

The following are weights of 16 fun size Payday candy bars in grams.

21.2, 23.3, 23.3, 22.7, 22.8, 23.3, 23.1, 22.6, 20.2, 19.8, 19.5, 22.2, 22.2, 22.8, 20.1, 22.4

We will use these weights to find some descriptive statistics and construct a boxplot.

### Calculating Descriptive Statistics on a TI-83

- **Step 1: Enter the data.** Press [STAT] [1] and enter the data in L1.
- **Step 2: Calculating descriptive statistics.** To activate the one-variable statistics function on the calculate menu of in statistics press [STAT] [2] [1]. You should now see **1-Var Stats** on the home screen of your calculator. Press [ENTER] to find the descriptive statistics of the data in L1. The screen should now read **1-Var Stats L1**. By pressing [ENTER], you should see the mean, sum of the weights, sum of the squares, the sample and population standard deviations, sample size, and (by toggling down) the five-number summary. [Hint: If the data are in a column other than L1 then you also have to select the column after the **1-Var Stats** appears. For example, if the data are in L2 press [2nd] [2] to activate L2.]

L1	L2	L3	1
19.5			
22.2			
22.2			
22.8			
20.1			
22.4			
.....			
L1(17) =			

```

1-Var Stats
x̄=21.96875
Σx=351.5
Σx²=7749.23
Sx=1.346956446
σx=1.304184971
↓n=16

```

### Constructing a Boxplot on a TI-83

- **Step 1: Setting up the plot.** Once the data are entered in L1, press [2nd] [Y=] to go to the Stat Plot window. Under **Type:**, the boxplot that is shaded in on the right will show the outliers as points, the other one will extend the whiskers out to the min and max even if there are outliers.
- **Step 2: Setting up the viewing window.** To set up an appropriate viewing window simply press [ZOOM] [9]. By pressing [TRACE] you can see the minimum and maximum values, the first and third quartile, and the median.

```

Plot1 Plot2 Plot3
Off Off Off
Type: [ ] [ ] [ ]
      [ ] [ ] [ ]
Xlist:L1
Freq:1
Mark: [ ] + .

```



3. On your calculator, find the mean and standard deviation for 1, 2, 3, 4, 5.
4. On your calculator, find the mean and standard deviation for 11, 12, 13, 14, 15.
5. Without your calculator, find the mean and standard deviation for 1001, 1002, 1003, 1004, 1005.
6. What do you think the standard deviation is of 10, 20, 30, 40, 50?
7. What does a standard deviation of 0 tell you?
8. The ages of students are as follows. What is the median age?

Age	18	19	20	21	22	23	24	25	32
Number of students	14	120	200	200	90	30	10	2	1

9. The following histogram is the distribution of dates (since 1900) of pennies. Is the mean date of the pennies higher or lower than the median date?

