

Activity 2

Describing Bivariate Data (Two Quantitative Variables)

Several types of x - y plots will demonstrate the relationship between two quantitative variables. By using different symbols, relationships for several categories can be compared on the same plot. The correlation coefficient will be calculated to measure the strength and direction of the linear relationship between the two variables.

Topic 7—Scatter Plots

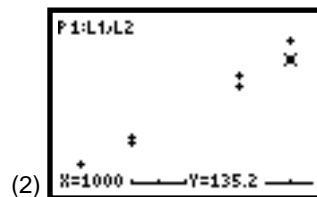
Some World Indoor Track records (as of Oct. 1, 1995) are given in the table below and stored in L_1 and L_2 .

	Men				Women			
L1: meters	200	400	800	1000	200	400	800	1000
L2: seconds	20.3	45.0	104.8	135.2	21.8	49.5	116.4	154.8

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- Press $\boxed{2nd}$ [STAT PLOT] **1:Plot1**, and set up the plot for a **Scatter** plot (the first type), as shown in screen 1.
- With $Xscl = 200$ under **WINDOW**, press \boxed{ZOOM} **9:ZoomStat** \boxed{TRACE} , and then a few $\boxed{\blacktriangleright}$ for the plot in screen 2.

You see two different times for each race distance except the 200-meter race. The relatively small difference between the times does not show on the plot because they turn on the same pixel.



Note: \boxed{ZOOM} **9:ZoomStat** will result in a **DIM MISMATCH** Error if your $Xlist$ and $Ylist$ are of unequal length and a **WINDOW RANGE** Error if your $Xlist$ or $Ylist$ are all the same value. In the first case, correct your list so that only pairs of x,y values have been entered. In the second case, if you still wish to plot, you must set your window by hand so $Xmin \neq Xmax$ and $Ymin \neq Ymax$.

Activity 2, Describing Bivariate Data (Two Quantitative Variables) (cont.)

Adding Categories

(Gender indicated by **Mark** type)

1. Store distances in **L1**, men's times in **L2**, and women's times in **L3** (see screen 3).
2. Leave **Plot1** on as above, and turn on **Plot2** with a different **Mark** type (see screen 4).
3. Press **TRACE** and a few **▶** for screen 5 with a square for women and a cross for men.

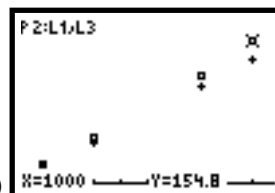
L1	L2	L3	1
200	20.3	21.8	
400	45	49.5	
800	104.8	116.4	
1000	135.2	154.8	

L1(5)=

(3)

Plot1	Plot2	Plot3
On	Off	
Type: []	[]	[]
Xlist: L1		
Ylist: L3		
Mark: []	[]	[]

(4)



(5)

Note: In general, the Xlist need not be the same for the two plots.

Topic 8—Correlation and Linearity

You will measure the strength of a linear relationship in this section and then save fitting a straight line to the data for Topics 11 and 15.

Plotting the Data

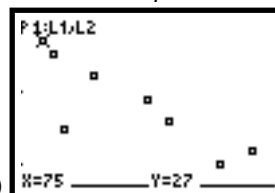
1. Store the following automobile gas mileage data into **L1** and **L2**.

Xlist in **L1**: (horsepower) 75 80 85 100 125 135 160 175

Ylist in **L2**: (miles/gal) 27 25 15 22 19 16 10 12

2. Plot the scatter plot for the above data as shown in Topic 7 with results like that in screen 6.

There is an inverse relationship in that as horsepower increases, the gas mileage decreases. If you fit a straight line through the data, it would have a negative slope and thus a negative correlation coefficient.



(6)

Turning on the Diagnostic Flag

If you have have not turned on the diagnostic flag since your TI-83 was reset, do the following.

1. Press **2nd** [CATALOG] (above the numeral zero) to display screen 7, which is in alpha mode (note **A** in the upper-right corner).
2. Press **D** and use **▼** to move the pointer to **DiagnosticOn**, as shown in screen 8.
3. Press **ENTER** to paste **DiagnosticOn** to the home screen, and then press **ENTER** for **Done** (see the first two lines in screen 9).

CATALOG	A
abs(
and	
angle(
ANOVA(
Ans	
augment(
AxesOff	

(7)

CATALOG	
Degree	
DelVar	
DependAsk	
DependAuto	
det(
DiagnosticOff	
DiagnosticOn	

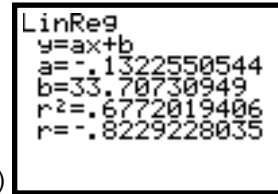
(8)

DiagnosticOn	Done
LinReg(ax+b)	L1,
L2	

(9)

Obtaining the Correlation Coefficient

1. Press **[STAT]** **<CALC>** **4:LinReg(ax+b)** **L1** **,** **L2** for the third and fourth lines of screen 9.
2. Press **[ENTER]** for screen 10 with a correlation coefficient of $r = -.8229$.



(10)

Note: If r^2 and r do not show on your screen, then the diagnostic flag is off and must be turned on as explained on the previous page.

More Scatter

1. Return to the tall building data originally found in Do This First and stored in list **PHILY** in the order of the year in which the buildings were completed. Those years are given below in the same order. Put these values in a list called **YRPHI**.

1901 1927 1928 1929 1930 1930 1930
 1931 1931 1932 1968 1970 1970 1972
 1973 1973 1973 1974 1982 1983 1987
 1987 1989 1989 1990 1990 1991 1992

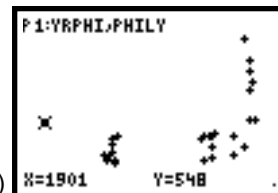
2. Plot the **Scatter** plot as shown in Topic 7 and in screens 11 through 12.

Notice that the City Hall (at 548 feet) was completed in 1901 (the oldest building) and that no building topped that height until 1987. In 1992, five buildings stood taller than City Hall. Also note that after City Hall, no other tall buildings were built until a cluster of nine around 1930 and another cluster around 1970.

The scatter is not very linear as you can see from the scatter and the low value of $r = .523$ and $r^2 = .273$.



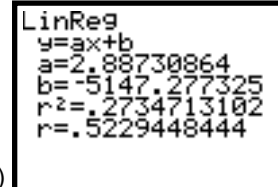
(11)



(12)



(13)



(14)

Topic 9—Time Plots

You will see how a variable changes with time by plotting time on the x-axis and the variable of interest on the y-axis. Points are usually joined by lines, and thus you will use the TI-83 **xyLine** plots.

The following data is men's Olympic Marathon times.

Year in L1:	1900	1920	1936	1960	1980
Hours in L2:	2.996	2.543	2.489	2.255	2.184

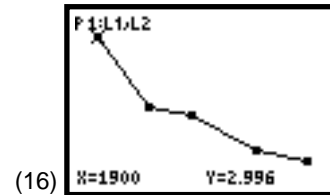
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Activity 2, Describing Bivariate Data (Two Quantitative Variables) (cont.)

Plotting the Data

1. Press **2nd** [STAT PLOT] **1:Plot1**, and set up for an **xyLine** plot (the second plot type), **as shown in screen 15**.
2. Press **ZOOM** **9:ZoomStat** **TRACE** for the plot in screen 16.

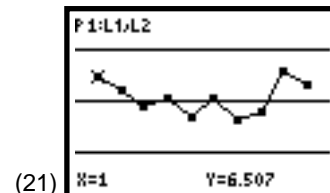
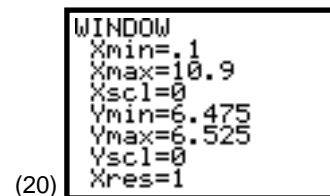
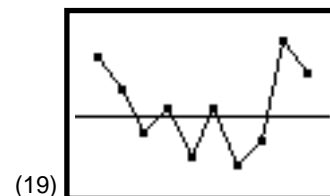
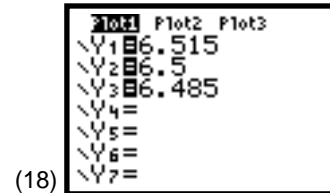
Notice that the time it takes to run the marathon is decreasing but at a decreasing rate.



Topic 10—Control Charts

Given the following sample means with UCL = 6.515, Center Line = 6.500, and LCL = 6.485, you will plot the X-bar control chart. Other control charts can be plotted similarly.

Sample Num	Sample Mean
L1	L2
1	6.507
2	6.503
3	6.498
4	6.501
5	6.495
6	6.501
7	6.494
8	6.497
9	6.509
10	6.505



Plotting the Data

1. Set up **Plot1** for an **xyLine** plot as shown in Topic 9 and as shown in screen 17.
2. Press **Y=** and set up the editor as shown in screen 18. (Note that **Plot1** must be on).
3. Press **ZOOM** **9:ZoomStat** for screen 19, which includes all points but not the control limits.

Adjust the window as shown in screen 20, and press **TRACE** for the complete control chart shown in screen 21.