

## Calculating the Correlation

The following is the yield of Corn in bushels and the number days of significant rainfall.

Rainfall in Days, x	30	25	20	21	19	15	12	13	18	15
Yield in Bushels, y	240	210	190	185	180	170	140	145	170	180

Enter your data by pushing the **STAT** button and then **1**. You will be entering the data into L<sub>1</sub> and L<sub>2</sub>.

L1	L2	L3	Z
30 25 20 21 19 15 12	240 210 190 185 180 170 140	-----	
L2(1)=240			

L1	L2	L3	Z
19 15 12 13 18 15	180 170 140 145 170 180		
L2(11) =			

To graph the scatter plot first press **2nd** then **STAT PLOT/Y=** to get the screen to the right that gives access to the 3 Stat Plots.

```

STAT PLOTS
1:Plot1...On
  L1 L2
2:Plot2...Off
  L1 L2
3:Plot3...Off
  L1 L2
4:PlotsOff
    
```

Then press **1** to get to the Stat Plot #1. Your screen should look like the following.

```

Plot1 Plot2 Plot3
Off Off Off
Type: [ ] [ ] [ ]
      [ ] [ ] [ ]
Xlist:L1
Ylist:L2
Mark: [ ] + .
    
```

You can change the different features by highlighting the appropriate part. Turn a feature on by moving the cursor to it and then hitting **ENTER**. The Plot needs to be "On". The Type needs to be set to the first one which is the Scatter Plot (Notice there are also choices for Histogram, Box Plot, and Modified Box Plot). The Xlist needs to be L<sub>1</sub> and the Ylist needs to be L<sub>2</sub>. The Xlist and Ylist could be changed if the data was put in a different list. These can be changed by moving the cursor down and using the **2nd** and the number keys to get the appropriate numbered lists. Then the Mark can be set to any of the three choices. The box mark makes the points easier to see, but if you have several points then you might opt to use the dot mark.

To graph the Scatter Plot push the **GRAPH** key then the **ZOOM** key.

```

ZOOM MEMORY
4:ZDecimal
5:ZSquare
6:ZStandard
7:ZTrig
8:ZInteger
9:ZoomStat
0:ZoomFit
    
```

Type 9 for ZoomStat, or cursor down and hit **ENTER** at the 9:ZoomStat option. The Scatter Plot below will appear.



To calculate the correlation,  $r$ , hit the **STAT** key then the **CALC** option. You can then either use option 4:LinReg(ax+b) or option 8:LinReg(a+bx).

```
EDIT [2nd] TESTS
2:2-Var Stats
3:Med-Med
4:LinReg(ax+b)
5:QuadReg
6:CubicReg
7:QuartReg
8:LinReg(a+bx)
```

Type 4 or 8 or cursor down and hit **ENTER**. You will have one of the following two screens.

```
LinReg
y=ax+b
a=5.014306152
b=86.73104435
r2=.9201645582
r=.9592520827
```

```
LinReg
y=a+bx
a=86.73104435
b=5.014306152
r2=.9201645582
r=.9592520827
```

The screen on the left has “a” as the coefficient of the x while the screen on the right has “b” as the coefficient on the x. They are the same value. The book uses the  $y=a+bx$  form.

NOTE: If the  $r$  and  $r^2$  does not appear then you need to turn on the diagnostics. Push **2nd** followed by the **CATALOG/0** key. Cursor down to DiagnosticON

```
CATALOG [2nd]
DependAsk
DependAuto
det(
DiagnosticOff
▶DiagnosticOn
dim(
Disp
```

Press **ENTER** twice and then repeat the LinReg command. The  $r$  should be visible.

## Graphing the Regression Line

The LinReg command also calculates the Least-Squares Regression Line. To graph this line push **Y=** and **CLEAR** out anything in the Y's. Move back to Y1.

```

Plot1 Plot2 Plot3
\Y1=
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=
    
```

Push **VARΣ**.

```

VARΣ Y-VARS
1:Window...
2:Zoom...
3:GDB...
4:Picture...
5:Statistics...
6:Table...
7:String...
    
```

Choose the 5:Statistics option.

```

Σ EQ TEST PTS
1:n
2:x̄
3:sx
4:gx
5:gx
6:Sy
7:σy
    
```

Cursor right to the EQ Option.

```

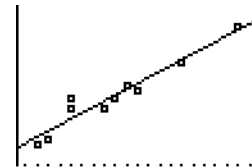
XY Σ EQ TEST PTS
1:RegEQ
2:a
3:b
4:c
5:d
6:e
7:↓r
    
```

Choose the 1:RegEQ option which will take you back to the Y= menu.

```

Plot1 Plot2 Plot3
\Y1=86.731044349
\Y2=07+5.01430615164
52X
\Y3=
\Y4=
\Y5=
    
```

Now push the **GRAPH** button to show the Regression Line on the Scatter Plot.



## Estimating using the Regression Line

There are two ways to estimate using the Regression Line. Using the previous Regression Line estimate the number of Bushels of corn for 25 days of rain.

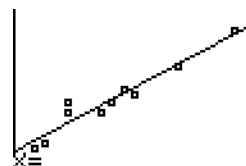
### First Way

Once the Regression Line is on the graph, push **2nd** **CALC**/**TRACE**.

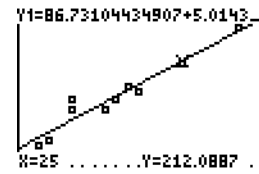
```

2nd TRACE
1:value
2:zero
3:minimum
4:maximum
5:intersect
6:dy/dx
7:∫f(x)dx
    
```

Choose the 1:value option.



Enter the x value for which you want the estimate of y and push **ENTER**.  
 (This example x = 25)



The result for y is shown at the bottom of the screen. The yield would be estimated to be about 212.1 bushels of corn if 25 days of rain occurred.

### Second Way

Get out of the graph and push **VAR**, then cursor over to Y-Vars. Choose the option 1:Function followed by the option 1:Y1.

<b>VAR</b> Y-VARS	<b>VAR</b> Y-VARS	<b>FUNCTION</b>
1:Window...	1:Function...	1:Y1
2:Zoom...	2:Parametric...	2:Y2
3:GDB...	3:Polar...	3:Y3
4:Picture...	4:On/Off...	4:Y4
5:Statistics...		5:Y5
6:Table...		6:Y6
7:String...		7:Y7

This will put Y1 on the screen. Next type **( 25 ) ENTER**.

```
Y1(25)
212.0886981
█
```

This method does not have any problems estimating for x's outside the range of the data. You can also just push **2nd** then **ENTER** to recall the last command. Then you only have to change the number. For x = 50 days of rain we get 337.4 bushels of corn.

```
Y1(25)
212.0886981
Y1(50)
337.4463519
█
```