Calculating the Correlation

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

<table>
<thead>
<tr>
<th>Rainfall in Days, x</th>
<th>30</th>
<th>25</th>
<th>20</th>
<th>21</th>
<th>19</th>
<th>15</th>
<th>12</th>
<th>13</th>
<th>18</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield in Bushels, y</td>
<td>240</td>
<td>210</td>
<td>190</td>
<td>185</td>
<td>180</td>
<td>170</td>
<td>140</td>
<td>145</td>
<td>170</td>
<td>180</td>
</tr>
</tbody>
</table>

Enter your data by pushing the STAT button and then \[ \text{L} \]. You will be entering the data into \[ L_1 \] and \[ L_2 \].

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.

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

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 \[ L_1 \] and the Ylist needs to be \[ L_2 \]. 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.

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).

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

<table>
<thead>
<tr>
<th>LinReg (y=ax+b)</th>
<th>LinReg (y=atbx)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a=5.04396152</td>
<td>a=86.73104435</td>
</tr>
<tr>
<td>b=86.73104436</td>
<td>b=5.04396152</td>
</tr>
<tr>
<td>r^2=.9201645582</td>
<td>r^2=.9201645582</td>
</tr>
<tr>
<td>r=.9592520827</td>
<td>r=.9592520827</td>
</tr>
</tbody>
</table>

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
  DefendAsk
  DefendAuto
det
DiagnosticOff
  DiagnosticOn
  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 \( \text{CLEAR} \) out anything in the Y’s. Move back to Y1.

Push \( VARS \). Choose the 5:Statistics option. Cursor right to the EQ Option. Choose the 1:RegEQ option which will take you back to the Y= menu.

Now push the \( \text{GRAPH} \) 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 \( \text{2nd} \) \( \text{CALC} / \text{TRACE} \).

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 **VARS**, then cursor over to Y-Vars. Choose the option 1:Function followed by the option 1:Y1.

![Menu](image)

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

![Example](image)

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.