Notes for the TI-83, 83+, 84 Calculator

To adjust the contrast: 2nd (hold) or 2nd ^ (hold)

ALPHA to get one capital letter

2nd ALPHA All keys pressed will be capital

To get back to top key value, press ALPHA once.

represents the keys

[ ] represents yellow command or green letter behind a key

< > represents screen menu items

If you hit a wrong button, just hit CLEAR and start again.

Scientific Notation:

\[ 4.321 \times 10^4 \]

\[ 4.321 \times 10^{-4} \]

To transfer programs or equations from one calculator to another:

Both calculators: insert cable; press in cable completely. 2nd [LINK]

Calculator receiving information: <RECEIVE> Press right arrow to receive.

Calculator sending information: ENTER Press appropriate number or letter. Use up and down arrows to access appropriate item.

ENTER To select item to transfer.

<TRANSMIT> Press right arrow to access transmit.

ENTER NOTE: ERROR 35 LINK generally means that the cables have not been inserted far enough.

Both calculators: 2nd [QUIT] To exit when done.

LET’S START.

Given:

<table>
<thead>
<tr>
<th>Data</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>10</td>
</tr>
<tr>
<td>-1</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
</tr>
</tbody>
</table>

(We are manipulating 1 variable statistics.)

Note: These directions are for entering data with the built-in statistical program.

<table>
<thead>
<tr>
<th>Press Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON Turns on the calculator.</td>
</tr>
<tr>
<td>STAT Access statistics mode.</td>
</tr>
</tbody>
</table>

press down arrow 3 times Arrow down to <4:ClrList> to clear data from lists, if desired.

(Or, press 4.)
2nd \[L1\] ENTER Enter list L1 to be cleared.
Displays last instruction.

2nd [ENTRY] Continue clearing remaining lists in the same fashion, if desired.
Access statistics mode.

< 2nd [L2] ENTER STAT Enter list L2 to be cleared.

Enter Select <1:Edit . . .> Enter data. Data values go into L1.
You may need to arrow over to L1.
Type in a data value, press ENTER
Continue in the same manner until all data values are entered.
(For negative numbers, use the (-) key at the bottom of the keypad.)

> In L2, enter the frequencies for each data value in L1.
Type in a frequency, press ENTER
If a data value appears only once, the frequency is "1".

STAT Access statistics mode.

> To access <CALC> (perform calculations on the data)

2nd [L1] ENTER 2nd [L2] ENTER To access 1 variable statistics with the data in L1
and the frequencies in L2.

\[ \begin{align*}
x &= .2 \quad \text{(sample mean)} \\
\Sigma x &= 6 \\
\Sigma x^2 &= 120 \\
S x &= 2.023994003 \quad \text{(sample standard deviation)} \\
\sigma x &= 1.989974874 \quad \text{(population standard deviation)} \\
v n &= 30 \quad \text{(sample size)}
\end{align*} \]

V Arrow down to get remaining statistics. Repeat as necessary.
The calculator displays:

minX = -2 \quad \text{(minimum data value)}
Q_1 = -2 \quad \text{(first quartile)}
Med = 0 \quad \text{(median)}
Q_3 = 3 \quad \text{(third quartile)}
maxX = 3 \quad \text{(maximum data value)}
To draw histograms:

We will assume that the data is already entered.
We will construct 2 histograms with the built-in "STATPLOT".
The first way will use the default ZOOM.
The second way will involve customizing the graph.

<table>
<thead>
<tr>
<th>Press</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd [STAT PLOT] ENTER</td>
<td>To access graphing mode.</td>
</tr>
<tr>
<td>&lt;ON&gt; ENTER</td>
<td>Select &lt;1:plot 1&gt; To access plotting - first graph. Use the arrows to go to &lt;ON&gt; to turn on Plot 1.</td>
</tr>
<tr>
<td>ENTER</td>
<td>Use the arrows to go to the histogram picture. Select the histogram.</td>
</tr>
<tr>
<td>2nd [L2] ENTER</td>
<td>Use the arrows to go to &quot;Xlist&quot;. If &quot;L1&quot; is not selected, press 2nd [L1] to select it. States that the data values are in L1.</td>
</tr>
<tr>
<td>2nd [STAT PLOT]</td>
<td>Use the arrows to go to &quot;Freq&quot;. States that the frequencies are in L2. Go back to access other graphs. Use the arrows to turn off the remaining plots.</td>
</tr>
</tbody>
</table>

Be sure to deselect or clear all equations before graphing.
To deselect equations:
If any equations appear, arrow over so = is covered. Then, press ENTER to deselect the equation. Continue, until all equations are deselected.

To clear equations:
If any equations appear, arrow over to the right of each = Then, press clear until all equations are deleted.

To draw default histogram:

Arrow down to <9:ZoomStat> or press the number 9. The histogram will show with a window automatically set.

To draw custom histogram:

To access WINDOW to set the graph parameters.
  \[
  \begin{align*}
    X_{\text{min}} &= -2.5 \\
    X_{\text{max}} &= 3.5 \\
    X_{\text{scl}} &= 1 \quad (\text{width of bars}) \\
    Y_{\text{min}} &= 0 \\
    Y_{\text{max}} &= 10 \\
    Y_{\text{scl}} &= 1 \quad (\text{spacing of tick marks on y-axis}) \\
    X_{\text{res}} &= 1
  \end{align*}
  \]

 Histogram should appear.
To draw box plots:

2nd [STAT PLOT]

To access graphing mode.

Select <1:Plot 1> To access plotting - first graph.

<ON> ENTER

Use the arrows to go to <ON> to turn on Plot 1.

Use the arrows to go to the box plot picture.

Select the box plot.

Use the arrows to go to "Xlist"

If "L1" is not selected, press 2nd [L1] to select it.
States that the data values are in L1.

ENTER

Use the arrows to go to "Freq".
States that the frequencies are in L2.
Go back to access other graphs.
Use the arrows to turn off the remaining plots.

Be sure to deselect or clear all equations before graphing.

To deselect equations:

Y = If any equations appear, arrow over so = is covered. Then, press ENTER to deselect the equation. Continue, until all equations are deselected.

To clear equations:

Y = If any equations appear, arrow over to the right of each = Then, press clear until all equations are deleted.

GRAPH

Box plot should appear.
Linear Regression

Given: The following data is real. The percent of declared ethnic minority students at De Anza College for selected years from 1970 - 1995 was:

<table>
<thead>
<tr>
<th>Year</th>
<th>Student Ethnic Minority Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>14.13</td>
</tr>
<tr>
<td>1973</td>
<td>12.27</td>
</tr>
<tr>
<td>1976</td>
<td>14.08</td>
</tr>
<tr>
<td>1979</td>
<td>18.16</td>
</tr>
<tr>
<td>1982</td>
<td>27.64</td>
</tr>
<tr>
<td>1983</td>
<td>28.72</td>
</tr>
<tr>
<td>1986</td>
<td>31.86</td>
</tr>
<tr>
<td>1989</td>
<td>33.14</td>
</tr>
<tr>
<td>1992</td>
<td>45.37</td>
</tr>
<tr>
<td>1995</td>
<td>53.1</td>
</tr>
</tbody>
</table>

Independent Variable: Year (x-values)
Dependent Variable: Student Ethnic Minority Percent (y-values)

By hand, verify the scatterplot below:

To enter data and do linear regression:

Note: The TI-83 has a built-in linear regression feature, which allows the data to be edited. The x-values will be in L1; the y-values in L2.

<table>
<thead>
<tr>
<th>Press</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2nd</th>
<th>[STAT PLOT]</th>
<th>To access graphing mode.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>ENTER</td>
<td>To turn off all plots.</td>
</tr>
</tbody>
</table>
Round to 3 decimal places. To do so:

Arrow down to "Float" and then to the right to "3".

All numbers will be rounded to 3 decimal places until changed.

Enter statistics mode and clear lists L1 and L2.

Enter editing mode to insert values for \(x\) and \(y\).

Enter each value. Press arrows or ENTER to continue.

(You may need to use the arrow keys to go to L1.)

After the data has been entered:

By default, the correlation coefficient is not displayed.

To display the correlation coefficient:

Arrow down until "DiagnosticOn".

\(r\) and \(r^2\) will be displayed during regression calculations.

Access linear regression in the form of

\[ \hat{y} = a + bx \]

The display shows:

\[
\text{LinReg} \\
y = a + bx \\
a = -3176.909 \\
b = 1.617 \\
r^2 = .924 \\
r = .961
\]

This means the Line of Best Fit (Least Squares Line) is:

\[
\hat{y} = -3176.909 + 1.617x \\
\text{Percent} = -3176.909 + (1.617)(\text{year #})
\]

The correlation coefficient \(r = .961\)
To see the scatter plot:

1. Press \[\text{2nd} \ \text{[STAT PLOT]}\] to access graphing mode.
2. Select \(<1:plot \ 1>\) to access plotting - first graph.
3. Use the arrows to go to \(<\text{ON}>\) to turn on Plot 1.
4. Use the arrows to go to the first picture.
5. Select the scatter plot.
6. Use the arrows to go to "Xlist"
   - If "L1" is not selected, press \[\text{2nd} \ [L1]\] to select it.
   - States that the data values are in L1.
7. Use the arrows to go to "Ylist"
   - \[\text{2nd} \ [L2]\] ENTER States that the frequencies are in L2.
   - Go back to access other graphs.
   - Use the arrows to turn off the remaining plots.
8. To access WINDOW to set the graph parameters.
   - \(X_{\text{min}} = 1970\)
   - \(X_{\text{max}} = 2000\)
   - \(X_{\text{scl}} = 10\) (spacing of tick marks on x-axis)
   - \(Y_{\text{min}} = -0.05\)
   - \(Y_{\text{max}} = 60\)
   - \(Y_{\text{scl}} = 10\) (spacing of tick marks on y-axis)
   - \(X_{\text{res}} = 1\)
9. Be sure to deselect or clear all equations before graphing.
   - To deselect equations:
     - If any equations appear, arrow over so \(= \) covered.
     - Then, press ENTER to deselect the equation.
     - Continue, until all equations are deselected.
   - To clear equations:
     - If any equations appear, arrow over to the right of each \(= \)
     - Then, press clear until all equations are deleted.
10. Scatter plot should appear.

To see the regression graph:

1. Regression equation will be put into Y1.
2. Go to "5: Statistics".
3. Arrow over to "EQ".
4. \("1: \text{RegEQ}\) contains the regression equation which will be entered in Y1.
5. Regression line will be superimposed over scatter plot.
To see the residuals and use them to calculate the critical point for an outlier:

2nd [LIST]  
ENTER ENTER

The list of residuals will be displayed. Use the arrows to view them.

The critical point for an outlier is:  \(1.9 \cdot \sqrt{\frac{\text{SSE}}{n - 2}}\),
where:  
\(n = \) number of pairs of data and
\(\text{SSE} = \) sum of the squared errors
\(\text{SSE} = \sum (\text{residual})^2\)

STO > 2nd [L3] ENTER

Residuals are now in L3.

2nd [L3] x²
/
8
STO > 2nd [L4] ENTER

\(n = 10\) pairs, in this example. So, \(n - 2 = 8\).

L4 now contains each: \((\text{residual})^2 / (n - 2)\).

1.9 x 2nd [v ] 2nd [LIST]
>
>
5
2nd [L4]

Calculator displays: \(7.642669563\).
This is the critical value.
Compare the absolute value of each residual value in L3 to 7.64.
If the absolute value is greater than 7.64, then the \((x, y)\) corresponding point is an outlier. In this case, none of the points is an outlier.

To obtain estimates of \(y\) for various \(x\)-values:

There are various ways to determine estimates for "y".
One way is to substitute values for "\(x\)" in the equation.
Another way is to use the TRACE on the graph of the regression line.