

# CASIO CFX-9850G/9950G

## Introduction

In this tutorial, you will learn how to input 1-dimensional data into the Casio CFX-9850G. You will also learn how to calculate mean and standard deviations, retrieve intermediary calculations, and edit, change, and delete this 1-dimensional data. Along with this, you will learn how to input 2-dimensional data. From this data you will be able to retrieve regressions in linear and non-linear forms, retrieve intermediary sums, plot the regression line, and edit, change and delete data values.

## 1-Dimensional Data

### 1. Input data values

- Turn the calculator on by pressing the “AC/ON” button
- The main menu should come up giving you a list of programs. Use the right cursor button to scroll to the program named “STAT” and then press “EXE”
- This will pull up a screen that displays a table. The first space in ‘List 1’ should be highlighted. Enter your first number in this spot by entering the number and pressing “EXE”. The cursor should move to the next space.
- Continue entering data in this fashion until you have entered all your data values.

### 2. Calculate Mean, Standard Deviation, and intermediary calculations

- After you have entered all your data, along the bottom of the screen you will see the words ‘GRPH’, ‘CALC’, and an arrow. If you do not see these, press the “EXIT” button until you do. If “EXIT” doesn’t work, press “F6”. When you see these words, you need to press the button that is under the word ‘CALC’. In this case it is the “F2” button.
- This will bring up a screen with the words ‘1VAR’, ‘2VAR’, ‘REG’, and ‘SET’. Press the button that corresponds to ‘1VAR’. In this case it is “F1”.
- This will bring up a screen that will give you much information. Using your cursor to scroll through this screen, you will find in this order: mean, sum of  $x$  ( $\Sigma x$ ), sum of  $x^2$  ( $\Sigma x^2$ ), population standard deviation ( $\sigma$ ), sample standard deviation ( $\sigma_{n-1}$ ), the number of data points ( $n$ ), minimum ( $\min x$ ), first quartile ( $Q_1$ ), median ( $\text{med}$ ), third quartile ( $Q_3$ ), mean-population standard deviation, mean+population standard deviation, maximum ( $\max x$ ), and mode ( $\text{mod}$ ).

### 3. Changing or Deleting Data Values

#### Changing Data Values

- After entering your data, press “EXIT” until you see the screen that displays your data values. Along the bottom of the screen you should see the words ‘GRPH’, ‘CALC’, and an arrow. If “EXIT” doesn’t work, press “F6”.
- Use the cursor to highlight the data value you want to change.
- Type in the new data value and press “EXE”
- Your new data value will be saved.

#### Deleting a Single Data Value

- Go to the screen that displays your data points by pressing “EXIT” until the words ‘GRPH’, ‘CALC’, and an arrow appear along the bottom. If “EXIT” doesn’t work, press “F6”.
- Use your cursor to highlight the data value you wish to delete.
- Press the button that corresponds to the arrow on your screen. In this case it is “F6”.
- This will bring up a new line of words along the bottom of the screen. Press the button that corresponds with the word ‘DEL’ (“F3”)
- Your value has been deleted.

#### Deleting All Data Values

- Go to the screen that displays you data points by pressing “EXIT” until the words ‘GRPH’, ‘CALC’, and an arrow appear along the bottom. If “EXIT” doesn’t work, press “F6”.
- Use your cursor to highlight any data value in the list you wish to delete.
- Press the button that corresponds to the arrow on you screen. In this case it is “F6”.
- This will bring up a new line of words along the bottom of the screen. Press the button that corresponds with the word ‘DEL-A’ (“F4”)
- Now press the button the corresponds to the word ‘YES’ (“F1”)
- Your data has been deleted.

**Example One:** The students in the lab ran an experiment and they came up with the following data for the absorbance of an unknown substance:

.232, .243, .234, .222, .233, .232, .234, .236, .225, .233, .236, .240, .238, .237

Find the mean and standard deviation of their results using your CASIO calculator. Disregard significant figures for the moments.

Mean: \_\_\_\_\_

Standard Deviation: \_\_\_\_\_

Number of data points: \_\_\_\_\_

You may also want to find the following information:

$\sum x$ : \_\_\_\_\_

$\sum x^2$ : \_\_\_\_\_

Answers:

Mean= 0.23392857

Standard Deviation=  $5.4414 \cdot 10^{-3}$

Number of data points= 14

$\sum x$ = 3.275

$\sum x^2$ = 0.766501

## 2-Dimensional Data/ Linear Regression

### 1. Input Data Values

- Turn the calculator on by pressing the “AC/ON” button
- The main menu should come up giving you a list of programs. Use the right cursor button to scroll to the program named “STAT” and then press “EXE”
- This will pull up a screen that displays a table. The first space in ‘List 1’ should be highlighted.
- You will enter you x values in ‘List 1’ and your y values in ‘List 2’
- Enter your first number in ‘List 1’ by entering the number and pressing “EXE”. The cursor should move to the next space.
- Continue entering data in this fashion until you have entered all your x values.
- After entering the x values, use the right cursor to move the highlighted area to ‘List 2’. The cursor should automatically move to the first space.

- Enter your y values in the same fashion as you entered the x values.

## 2. Retrieve Regressions of linear and nonlinear forms

- After you have entered all your data, along the bottom of the screen you will see the words 'GRPH', 'CALC', and an arrow. If you do not see these, press the "EXIT" button until you do. If "EXIT" doesn't work, press "F6". When you see these words, you need to press the button that is under the word 'GRPH'. In this case it is the "F1" button.
- Along the bottom of the screen you will see the words 'GPH1', 'GPH2', 'GPH3', 'SEL', and 'SET'. Press the button that corresponds to 'GPH1' ("F1")
- This will show you the data points plotted on a graph with options of viewing different types of graphs for this data including: x, Med,  $x^2$ ,  $x^3$ ,  $x^4$ . Pressing the button that corresponds to each of these ("F1" – "F5") will give you the regressions of this data in that form. Pressing the button that corresponds to the arrow ("F6") will give you more graphing options such as log, exp, and pwr.

## 3. Plotting the regression line

- After you have entered all your data, along the bottom of the screen you will see the words 'GRPH', 'CALC', and an arrow. If you do not see these, press the "EXIT" button until you do. If "EXIT" doesn't work, press "F6". When you see these words, you need to press the button that is under the word 'GRPH'. In this case it is the "F1" button.
- Along the bottom of the screen you will see the words 'GPH1', 'GPH2', 'GPH3', 'SEL', and 'SET'. Press the button that corresponds to 'GPH1' ("F1")
- This will show you the data points plotted on a graph with options of viewing different types of graphs for this data including: x, Med,  $x^2$ ,  $x^3$ ,  $x^4$ . Pressing the button that corresponds to the arrow ("F6") will give you more graphing options such as log, exp, and pwr. Pressing the button that corresponds to each of these ("F1" – "F5") will give you the regressions of this data in that form.
- Along the bottom of this screen, you will be given the option to 'DRAW'. Press the button that corresponds to 'DRAW' ("F6") and watch the calculator draw your graph.

## 4. Retrieve Intermediary Sums

- After you have entered all your data, along the bottom of the screen you will see the words 'GRPH', 'CALC', and an arrow. If you do not see these, press the "EXIT" button until you do. If "EXIT" doesn't work, press "F6". When you see these words, you need to press the button that is under the word 'CALC'. In this case it is the "F2" button.
- This will bring up a screen with the words '1VAR', '2VAR', 'REG', and 'SET'. Press the button that corresponds to '2VAR'. In this case it is "F2".
- This will bring up a screen that will give you much information. Using your cursor to scroll thorough this screen, you will find in this order: mean of x, sum of x ( $\sum x$ ), sum of  $x^2$  ( $\sum x^2$ ), population standard deviation of x ( $x\sigma n$ ), sample standard deviation of x ( $x\sigma n-1$ ), the number of data points (n), mean of y, sum of y ( $\sum y$ ), sum of  $y^2$  ( $\sum y^2$ ), population standard deviation of y ( $y\sigma n$ ), standard deviation of y ( $y\sigma n-1$ ), sum of xy ( $\sum xy$ ), minimum x (minx), maximum x (maxX), minimum y (miny), maximum y (maxY).

## 5. Changing and Deleting Data Values

### Changing Data Values

- After entering your data, press "EXIT" until you see the screen that displays your data values. Along the bottom of the screen you should see the words 'GRPH', 'CALC', and an arrow.
- Use the cursor to highlight the data value you want to change.
- Type in the new data value and press "EXE"
- Your new data value will be saved.

### Deleting a Single Data Value

- Go to the screen that displays your data points by pressing “EXIT” until the words ‘GRPH’, ‘CALC’, and an arrow appear along the bottom. If “EXIT” doesn’t work, press “F6”.
- Use your cursor to highlight the data value you wish to delete.
- Press the button that corresponds to the arrow on you screen. In this case it is “F6”.
- This will bring up a new line of words along the bottom of the screen. Press the button that corresponds with the word ‘DEL’ (“F3”)
- Your value has been deleted.

**Deleting All Data Values**

- Go to the screen that displays you data points by pressing “EXIT” until the words ‘GRPH’, ‘CALC’, and an arrow appear along the bottom. If “EXIT” doesn’t work, press “F6”.
- Use your cursor to highlight any data value in the list you wish to delete.
- Press the button that corresponds to the arrow on you screen. In this case it is “F6”.
- This will bring up a new line of words along the bottom of the screen. Press the button that corresponds with the word ‘DEL-A’ (“F4”)
- Now press the button the corresponds to the word ‘YES’ (“F1”)
- Your data has been deleted.

**Example Two:** Perform a linear regression on the following data:

**y=mx+b**

y-axis	x-axis
5.636	5.555
6.259	7.240
7.321	10.112
8.554	13.403
9.722	16.540
10.366	18.271
11.826	22.190

Find the following information using your CASIO calculator. Disregard significant figures for the moment:

Slope: \_\_\_\_\_

Intercept: \_\_\_\_\_

Correlation Coefficient: \_\_\_\_\_

$\Sigma x$ : \_\_\_\_\_

$\Sigma y$ : \_\_\_\_\_

$\Sigma x^2$ : \_\_\_\_\_

$\Sigma y^2$ : \_\_\_\_\_

$\Sigma xy$ : \_\_\_\_\_

Number of data points: \_\_\_\_\_

Answers:

Slope= 0.3723106

Intercept= 3.56333219

Correlation Coefficient= 0.9999988

$\Sigma x$ = 13.3301428

$\Sigma y$ = 59.684

$\Sigma x^2$ = 1464.96571

$\Sigma y^2$ =539.53305

$\Sigma xy$ = 877.92036

Number of data points= 7

## TI-83

When I pulled out my instruction manual and looked up linear regression, I think it was written in Greek. After my classmates and I spent hours trying to figure out our calculators, I decided to write a simple step-by-step instruction manual of my own.

### *Entering Data*

Use the following sets of data to calculate the best-fit line.

X	Y
0.405	0.20863
0.415	0.20162
0.425	0.20851
0.435	0.22876
0.445	0.23145
0.455	0.2291
0.465	0.23756
0.475	0.25061
0.485	0.24003
0.495	0.24413

Step 1: Push the STAT button and a screen showing EDIT CALC TESTS comes up. Push enter when EDIT is highlighted. Now a screen will come up showing rows L1 and L2 to enter data.

L1	L2

To enter the data, simply type the numbers you desire and press enter after each entry. **NOTE:** If data is already in, use the up arrow to highlight L1 or L2 hit the clear button and then the down arrow and all the current data should delete. To delete only one number highlight that number and push CLEAR and only that number will erase. You may either type in a new value or leave the space empty.

L1	L2
0.405	0.20863
0.415	0.20162
0.425	0.20851
0.435	0.22876
0.445	0.23145
0.455	0.2291
0.465	0.23756
0.475	0.25061
0.485	0.24003
0.495	0.24413

### *Calculating Linear Regression*

After all the data is entered, hit the 2<sup>nd</sup> function and the MODE (QUIT) button. Now go back to STAT and this time instead of selecting EDIT, choose CALC and use the down arrow to 4: LinReg (ax+b). Hit enter twice and the slope (a) and intercept (b) values will be displayed.

```
LinReg
y=ax+b
a= .4987393939
b= .0036072727
```

### *Calculating the Correlation Coefficient (r)*

Once the slope and intercept are displayed, push the VARS button. Use the down arrow to 5: Statistics, and hit enter. A screen with the options: XY,  $\Sigma$ , EQ, TEST, PTS will come up. Use the right arrow to highlight EQ. Arrow down to 7:  $\downarrow$ r and hit enter twice and the value for (r) will appear at the bottom of the screen.

```
LinReg
y=ax+b
a= .4987393939
b= .0036072727

r=.911
```

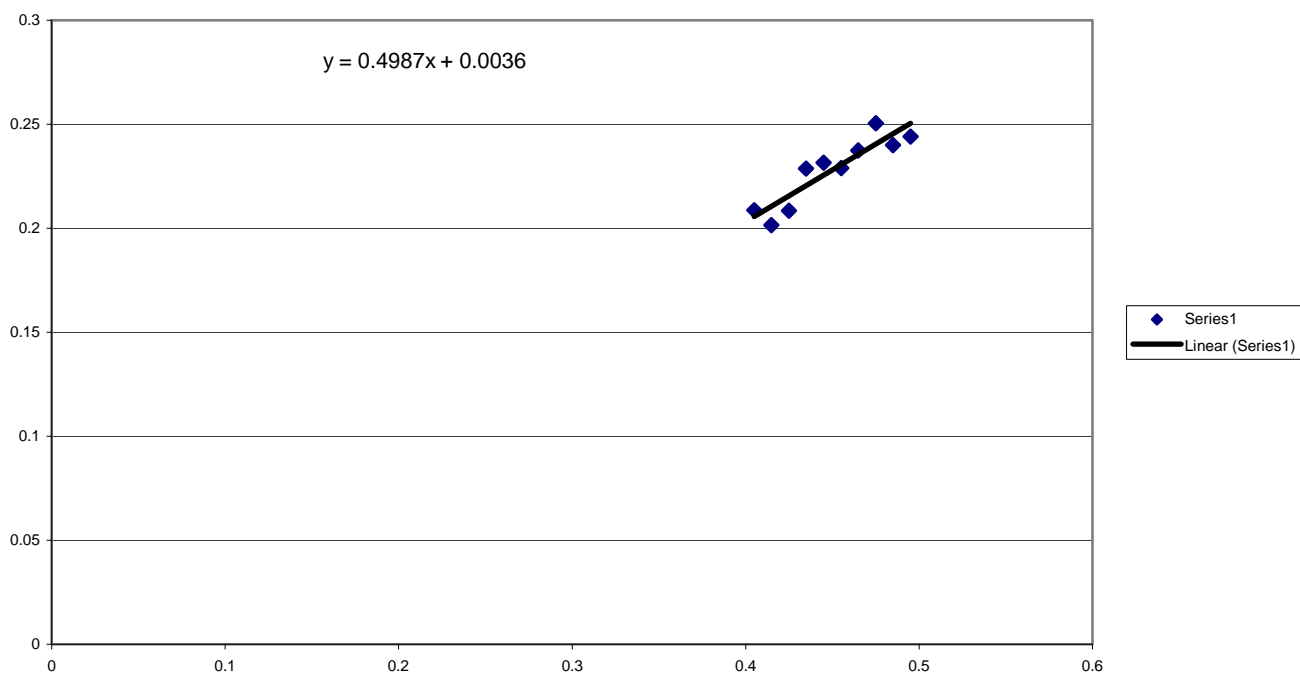
### *Calculating the mean and standard deviation*

To find the mean and standard deviation, simply push STAT then arrow over to CALC then down to 2-Var Stats. Hit enter twice and a series of numbers will come up. The  $\bar{x}$ = mean and the  $S_x$ = standard deviation.

```
2-Var Stats
x= .45
Sx= .0302765035
```

### *Graphing the Data*

To graph the data, first make sure the plots are on. Go to 2<sup>nd</sup> function Y= (STAT PLOT). If the plots are off simply highlight the number of the plot and hit enter twice and the plots will turn on. Next, go to WINDOW to set up the range for your data. For this set, make the x-min .400, x-max .550, y-min .200 and y-max .250. Now hit the GRAPH button and the points will show up. To find the best-fit line, go to STAT, CALC then linear regression. Once the values come up go to VARS, STAT, EQ, and then 1: RegEQ. This will automatically put the value into Y=1. Last push GRAPH again and the best-fit line will go through the points.



Any of the calculations can easily be retrieved by following the steps used the first time until you erase the values in L1 and L2. To delete them go to STAT then EDIT and hit enter. Your values should come up. Highlight L1, hit clear, then arrow down. This will clear the values for only L1. To erase L2 follow the same steps. To change the graph just change the entered values.

Now for more practice, calculate the slope, intercept, correlation coefficient, mean and standard deviation with the following data sets.

737	8.07377
747	8.07509
757	8.07522
767	8.07675
777	8.0775
787	8.07887
797	8.08007
807	8.08057
817	8.08071

The answers are:  $a = 9.34 \times 10^{-5}$   $b = 8.00$   $r = 0.988$   $\bar{x} = 777$   $S_x = 27.3861$   
 Good Luck!!!

## ***Linear Regression for the TI-83 Plus***

### Getting started:

1. Prepare your data for the linear regression by deciding which data will be your x-axis and which will be your y-axis.
2. Locate on your calculator these buttons for easy reference:
  - **STAT**
  - **VARS**
  - **ENTER**
  - **CLEAR**
  - Directional buttons: **▲▶▼◀**
3. Turn your calculator on.

### Entering your data:

1. Press the **STAT** button to bring up a screen with these words at the top: **EDIT CALC TESTS**
2. With **EDIT** on the top row highlighted pick **1:EDIT** and press **ENTER**.
3. Enter your x-axis data into column **L1**, pressing **ENTER** after each individual set of data. Ex – 12.2 then ENTER
4. Then press the **▶** button to move the cursor to highlight the row labeled **L2** and enter your y-axis data into this row, pressing **ENTER** after each individual set of data. Ex – 12.2 then ENTER
5. To clear your data: highlight the top of the row you want to delete. It will be labeled **L1**, **L2**, etc... and press the **CLEAR** button. The columns should be clear of data now, if so press the **ENTER** button to complete the task.

### Processing your data:

1. When all of your x-axis and y-axis data has been entered press the **STAT** button and then press the **▶** button to highlight the **CALC** on the top row of the screen.
2. Press the **▼** button to lower the cursor down until the **4:LinReg(ax+b)** is highlighted and press **ENTER**.
3. The screen should show **LinReg(ax+b)** with the cursor flashing at the end, press **ENTER**.
4. The screen should now show **LinReg** with a **y = ?????**, **a = ?????**, and **b = ?????**. The **y =** is your actual y value while the **a =** is your slope value, and the **b =** is your y-intercept value.

### Obtaining your “r” value:

1. Press the **VARS** button. The screen should show **VARS Y-VARS** across the top of the screen
2. With **VARS** highlighted on the top row press the **▼** button until the cursor highlights **5: Statistics...** and press **ENTER**.
3. Across the top of the screen should be: **XY Σ EQ TEST PTS**, press the **▶** button until the **EQ** is highlighted.
4. Press the **▼** button until the **7↓r** is highlighted and press **ENTER**.
5. The screen should show: **r**, press **ENTER**. The value shown is your r-value.

### Practice linear regression:

1. Enter the data points 0, .025, .075, .100, .170 For your x axis
2. Enter the data points 0, 20, 45, 85, 165 For your y axis
3. Calculate Linear Regression

You should get  $y=ax+b$   $a=940$   $b=-7.5$  and  $r=.9863275538$

## CALCULATING MEAN AND STANDARD DEVIATIONS FOR THE TI-83 PLUS

### Getting started:

1. Prepare your data for calculating the mean and standard deviation by deciding which data points you want to calculate.
2. Locate on your calculator these buttons for easy reference:

*STAT*

**ENTER**

DIRECTIONAL BUTTONS ▲▶▼◀

3. Turn your calculator on.

### Entering your data:

1. Press the **STAT** button to bring up a screen with these words at the top.

## EDIT CALC TESTS

2. With **EDIT** on the top row highlighted pick **1:EDIT** and press **ENTER**.
3. Enter your data points into column **L1**, pressing **ENTER** after each individual set of data.
4. After all data points are entered in column **L1**, press the **2<sup>nd</sup>** button and then the **MODE** button.

## Processing your data:

1. Next press the **STAT** button and then press the **▶** button to highlight the **CALC** on the top row of the screen.
2. Press the **▼** button to lower the cursor down until the **1: 1-VAR STATS** is highlighted and press **ENTER**.
3. The screen should show **1: 1-VAR STATS** with the cursor flashing at the end, press **ENTER**.
4. The screen should now show **1-VAR STATS** with  $x=????$   $\sum x=???$ ,  $\sum x^2=????^2$ ,  $sx=???$ ,  $ax=????$ . The  $x=$  is your mean,  $\sum x=$  is your total,  $\sum x^2=$  is each data point squared then added together,  $sx=$  is your standard deviation that you want to use,  $ax=$  is another standard deviation and  $n=$  the number of data points that were calculated.

### Edit of changing data values:

1. Press the **STAT** button to bring up a screen with these words at the top.

## EDIT CALC TESTS

2. With **EDIT** on the top row highlighted pick **1:EDIT** and press **ENTER**.
3. Press **▼** button until you get to the data point you want change.
4. If you want to change the data point, then press the new number and then press **ENTER**.
5. If you want to delete the point then press the **DEL** button and the data point will be deleted.
6. Then go to Step 1 in processing your data.
7. To delete the entire set of data points, then start cursor on the top of the column and press **DEL** button until all data points are deleted.

### Practice:

1. Enter the data points. 1,2,3,4,5
2. Calculate the mean and standard deviation.
3. You should get:  
 $X=3$   $\sum x=15$   $\sum x^2=55$   $Sx=1.58113883$   $ax=1.414213562$   $n=5$

## Ti-86

### Step-by-Step Instructions for Linear Regression and Standard Deviation on the TI-86.

Following is an indepth tutorial for the TI-86 calculator. We will show you how to do linear regression of data, standard deviation, summations of data, and graphing. Please be patient, read, learn, and most of all ENJOY!!!!!!!!!!!!!!!!!!!!!!

#### *Linear Regression*

First, you must input your data into the calculator. Hit the 2<sup>nd</sup> button and then the STAT button (this is located above the + button) and a choice of options appears at the bottom of the screen. You need to select the EDIT option, or the F2 button, and a new screen will appear in which you may enter data. There are 3 columns available in which to enter data into. These are labeled xStat, yStat, and fStat. For linear regression you will enter data into both the xStat and yStat columns. The data you enter in to the xStat column will be the data across the x-axis of a graph, and the yStat values will be your y-axis values. Such as in plotting absorbencies vs. concentrations, your absorbencies will be your yStat values, and the concentrations will be your xStat values. Move your cursor into the xStat column and punch in a number. Then hit ENTER. This automatically places the value in and moves the cursor down for the second number. Once the xStat #'s are entered, the move the cursor to the yStat column and enter your #'s there.

(If there is already some data in the columns, move the cursor up so that it highlights the xStat name, and punch the CLEAR button and then move the cursor back down into the column and the #'s will disappear. Do the same for the yStat column. Do not worry about the fStat column.)

Once all of your data is entered, hit the EXIT button, and the screen goes blank, or back to whatever your last calculations were. Punch the 2<sup>nd</sup> button again and STAT, and from the options on the screen pick CALC this time. A second set of options then appears, and you will choose LinR, or F3, for linear regression. LinR will then appear at the top of the screen. Punch 2<sup>nd</sup> again, and this time instead of the STAT button, punch the button for LIST. This is the - (minus) button. A choice of options appears, pick NAMES. Another choice of options appears. For linear regression you want to plot both sets of data (xStat and yStat), so you will choose xStat, hit the comma button (located above the STO button on the left), and then choose yStat. At the top of your screen you should now see:

LinR xStat, yStat

Now, hit ENTER, and a new list of data appears:

```
LinReg
y=a+bx
a=#####
b=#####
corr=.#####
n=#
```

If you just punch the EXIT button then the list of options at the bottom of the screen will disappear leaving all of the linear regression data available to see. The “a” is the y-intercept of the line equation, “b” is the slope, “corr” is the correlation coefficient, or  $R^2$ , and “n” is the number of data points. Here are some data sets for you to enter and calculate linear regression:

Data set 1:

x	y
0.405	0.20863
0.415	0.20162
0.425	0.20851
0.435	0.22876
0.445	0.23145
0.455	0.2291
0.465	0.23756
0.474	0.25061
0.485	0.24003
0.495	0.24413

$$y=a+bx$$

$$a=.003607273$$

$$b=.498739394$$

$$\text{corr}=.911096135$$

$$n=10$$

(Remember that for this calculator the “b” is the slope, and “a” is the intercept.)

Data set 2:

x	y
737	8.07377
747	8.07504
757	8.07522
767	8.07675
777	8.0775
787	8.07887
797	8.08007
807	8.08057
817	8.08071
827	8.0829

$$y=a+bx$$

$$a=8.00500828$$

$$b=9.34485E-5$$

$$\text{corr}=.991325541$$

$$n=10$$

### Standard Deviation

Punch the 2<sup>nd</sup> button and the STAT button. Select the EDIT option and input your data. Most likely you will only have one set of data for standard deviation. Once you have your data entered the EXIT. Hit 2<sup>nd</sup>, STAT, and select the CALC option. A second set of options appears, this time select OneVa. Then, punch 2<sup>nd</sup>, LIST, and NAMES. Select the name of the column in which you input your data (most likely xStat). You will see this at the top of the screen:

OneVar xStat

Hit ENTER, and a new set of data appears:

```
1-Var Stats
x#####
Σx#####
Σx2#####
Sx#####
σx#####
n=#
```

The “x” is the average of your data, “Sx” is the standard deviation, and again “n” is the number of data points. “Σx” is the summation of all the x’s, and “Σx<sup>2</sup>” is the summation of all the x’s squared and then added together.

### Finding Summations

These are Σx, Σy, Σx<sup>2</sup>, Σxy, and Σy<sup>2</sup>.

Hit the 2<sup>nd</sup>, STAT, and choose the CALC option. From the second set of options choose TwoVa. Punch 2<sup>nd</sup>, LIST, and NAMES. Select xStat, punch the comma, and select yStat. You should see this at the top of the screen:

TwoVar xStat, yStat

Hit ENTER, and all the summations will appear. Again, punch EXIT a couple of times and all the options at the bottom of the screen will disappear and then you can use your up and down arrow button to scroll through the new data obtained.

“Σx” is the summation of all x’s

“Σy” is the summation of all y’s

“Σx<sup>2</sup>” is the summation of all x’s squared, then added.

“Σxy” is the summation of all the x’s times the y’s, then added.

“Σy<sup>2</sup>” is the summation of all the y’s squared, then added.

Here are the results from using Data set 2 from above:

```
Σx =7820
Σx2=6123490
Σxy =63171.3957
Σy =80.78085
Σy2 =652.554646
```

Other information available in this screen is the standard deviation of “x” and “y.”

## *Graphing Linear Regression*

You must first carry out a linear regression of the data in order for the calculator to plot the data. Once you have that calculated, return to the 2<sup>nd</sup> STAT menu. The third option at the bottom of the screen is PLOT. Select PLOT, and the plot menu appears. You will see three plots available, and you just need to pick one of them. So, select F1, or Plot 1 from the menu at the bottom of the screen. Highlight the ON and press ENTER. This turns the plot function on. Then, use your arrow keys to arrow down to the "Type=" and select SCAT from the menu at the bottom of the screen. This tells the calculator that you want to graph the data in a scatter plot. Continue to arrow down to "Xlist Name=" and from the bottom of the screen select xStat from the menu. Do the same for "Ylist Name=" and select yStat. Arrow down to "Mark=" and from the menu select the symbol that you want to use to indicate your points on the graph. The little box symbol is good because it is big and stands out against the graph. Then, press the GRAPH button on your calculator, and from the menu, select graph. You may not see the points plotted, but DO NOT panic. You will need to reset your window to fit the data points. To do this you need to select zoom from the menu, press MORE, and select ZDATA from the menu at the bottom of the screen. This will reset your window automatically to fit the data points and will draw a "least squares" linear regression line through your data points. Once you have your line, you may immediately start using your arrow keys and this will place a "+" sign on your graph. You can use the arrows to adjust an "x" or "y" value as needed to obtain data from your graph. For example, if you want to find out what "y" is for a certain "x" you use your arrows to set the "x" and this gives you the "y" value automatically at the bottom of the screen. Also, you can select TRACE from the graph menu and this also places a small "+" on the graph. Using the up/down arrow you can select either the data points, or the least squares line to trace, use the right/left arrows to do the tracing. Again, you will see that it gives you the "x" and "y" values at the bottom of the screen as you trace along in the graph.

## **Editing Data**

To edit your data, simply return to the data screen and you can use your arrows to highlight any data that you want to change, or delete. Just type in your new data and hit enter. If you change data that you have done a linear regression on and made a graph, you must re-calculate your data and re-graph it.

We hope that this tutorial was helpful, and wish you the best of luck using your TI-86 calculator. Who knew it could be such fun?!!!!!!!!!!

## TI-89 Users Guide

### Instructions for 1 dimensional data:

1. Entering a list of values:

- First you press the *APPS* button which will bring you to a menu, where you will then choose 6 to get to the *Data/Matrix Editor*, next you press 3, *New*, in order to start a new data table.
- Once you are in the New file you choose a variable to save the data under. (It must be a one letter, one digit number.) Next press *Enter*.
- You will now be at a table that has 3 columns, C1, C2, and C3. However you will only need the first column. Now you are able to input your list of values.

2. Calculating mean and standard deviations and retrieving intermediary calculations:

- After entering your values you press *F5 (Calc)*, you then use the right arrow key to choose a *calculation type*, in this case, *One Var*. Next you identify your X as *C1*. Then press *Enter*.
- You will now be at a list entitled *Stat Vars*, this displays values such as mean ( $\bar{x}$ ), standard deviation ( $Sx$ ), the sum of the x values ( $\sum x$ ), the sum of the  $x^2$  values ( $\sum x^2$ ), etc.

3. If you need to edit or delete any value on your list, you simply press *Esc* to get out of the *Stat Vars* list, which will bring you back to your original table, so that you are able to make changes.

### Example #1:

1. > APPS > 6 > 3 > H2 > ENTER > .25 > ENTER > .5 > ENTER > .75 > ENTER > 1.0 > ENTER > 1.25 > ENTER.

2. > F5 > ⇒ > ENTER > ↓ > C1 > ENTER

3. Your *Stat Vars* should now display the following values:

x	.75
$\sum x$	3.75
$\sum x^2$	3.4375
$Sx$	.395285
nStat	5.0
minX	.25
q1	.375
medStat	.75

### Instructions for 2 dimensional data:

1. Entering a list of two variable data values:

- First you press the *APPS* button which will bring you to a menu, where you will then choose 6 to get to the *Data/Matrix Editor*, next you press 3, *New*, in order to start a new data table.
- Once you are in the New file you choose a variable to save the data under. (It must be a one letter, one digit number.) Next press *Enter*.
- You will now be at a table that has 3 columns, C1, C2, and C3. However you will only need two of these columns. Now you are able to input your list of values. Your X values should go under the C1 column and your Y values under the C2 column.

2. Retrieving linear regressions and intermediary sums used in statistical calculations:

- After entering your values you press *F5 (Calc)*, you then use the right arrow key to choose a *calculation type*, in this case, *LinReg*. Next you identify your X as C1 and your Y as C2. Then press *Enter*.
- You will now be at a list entitled *Stat Vars*, this displays values such as slope (*a*), Y-intercept (*b*), correlation coefficient (*corr*), and coefficient of determination ( $R^2$ ).
- To then view the intermediary sums used in the calculations you press *ESC*, in order to return to the data table. Next press *F5 (Calc)*, you then use the right arrow key to choose a *calculation type*, which will now be *Two Var*. Then press *ENTER*.
- You will now be at another list also entitled *Stat Vars*, that shows values such as, the mean of X and Y,  $(\bar{x}), (\bar{y})$ , the sum of the X values ( $\sum x$ ), the sum of the X<sup>2</sup> values ( $\sum x^2$ ), the sum of the Y values ( $\sum y$ ), the sum of the Y<sup>2</sup> values ( $\sum y^2$ ), the standard deviation (*Sx*), etc.

3. Retrieving regressions of nonlinear forms:

- You can retrieve regressions of your data in nonlinear forms by pressing *F5 (Calc)*, and then using the right arrow key to choose a *calculation type*, you have the option of choosing *Cubic Regression*, *Exponential Regression*, *Logarithmic Regression*, *Logistic Regression*, *Power Regression*, *Quadratic Regression*, *Quartic Regression*, or finally *Sinusoidal Regression*. Each of these (after pushing *ENTER*) will bring you to yet another *Stat Vars* list of corresponding values.

4. Plotting the data simultaneously with the regression line:

- Starting from the data table you press *F2 (Plot Setup)*, Next push *F1 (Define)*. You then use your arrow keys to select a plot type, (*xy line*) and to identify your X values as C1 and your Y values as C2. Push *ENTER* and then *F2 (Copy)* in the blank for plot one. Finally press the *graph* button. You can press *F3* at any time during the graphing procedure to edit or delete individual values.

**Example #2:**

1. > APPS > 6 > 3 > H3 > ENTER (under C1) > .25 > ENTER > .5 > ENTER > .75 > ENTER > 1.0 > ENTER > 1.25 > ENTER > (under C2) > 50 > ENTER > 125 > ENTER > 200 > ENTER > 325 > ENTER > 390 > ENTER

2. > F5 > ⇒ (to choose LinReg) > ENTER > ↓ > C1 > ENTER > ↓ > C2 > ENTER

3. Your *Stat Vars* table should now display the following values:

a	352
b	-46
corr	.994938
R <sup>2</sup>	.98902

4. > ESC > F5 > ⇒ (to choose TwoVar) > ENTER > ↓ > C1 > ENTER > ↓ > C2 > ENTER.

Your *Stat Vars* table should now display the following values:

x	.75
y	218
$\sum x$	3.75
$\sum y$	1090
$\sum x^2$	3.4375
$\sum y^2$	315850
$\sum xy$	1037.5
Sx	.395285

# Plotting Data with Microsoft Excel

## Introduction

This paper is to help guide you through the instructions of using Excel to calculate the following: 1-dimensional data: input data points, calculate mean and standard deviations, and edit to change or delete individual or all data values. 2-dimensional data: input data points, retrieve regressions of data in linear and any non-linear forms provided on the spreadsheet, plot the raw data simultaneously with the regression line on the graph using chart wizard, edit to change or delete individual or all data values, and edit graphical results.

## Running Excel

Click Start, click all programs, and click on Microsoft Excel.

### 1-Dimensional Data:

#### ❖ **Input data values:**

❖ To input your x values type x value #1 into cell A1, type x value #2 into cell A2, and so on. To input your y values type y value #1 into B1, type y-value #2 into B2 and so on.

#### ❖ **Calculate the mean:**

❖ To calculate the mean first click on an empty cell and label that cell **mean**.

❖ Then click the cell right below the newly labeled cell and type:  $=\$A\$1:\$A\$8$ . The = means this is a sum of something and the \$ stand for the value of, the A indicates what column you want to calculate, and 1 indicates what row you want to calculate, and the: represents thru. So  $=\$A\$1:\$A\$8$  means to calculate the values of cell  $A1+A2+A3+A4+A5+A5+A6+A7+A8 \div$  the number of values.

#### ❖ **Calculate the standard deviation:**

❖ In an empty cell type  $=STDEV(A1:A8)$  meaning the sum of the standard deviation of values A1 thru A8.

#### ❖ **Edit to change or delete individual or all data values.**

❖ To delete a value if typed by accident, just click on that cell and hit the delete bottom.

❖ If you are trying to throw out value click on that cell and hit delete. Now this will only remove the numbers not the cell.

❖ To remove the cell click on the outside of the row (on the row number) notice that the entire row is highlighted. Now click on edit locate on the top toolbar, click delete, and then click entire row.

❖ If you have data in that same row and need to continue to use that data. Click on the row right below the newly empty cell and highlight the all data values below and drag the point up one cell.

### 2-Dimensional Data:

#### ❖ **Input data values**

❖ To input your x values type x value #1 into cell A1, type x value #2 into cell A2, and so on. To input your y values type y value #1 into B1, type y-value #2 into B2 and so on.

#### ❖ **Retrieve regression of data in linear and any non-linear forms provided on the spreadsheet:**

❖ First highlight the data values you typed in columns A and B, or whatever columns your data values are located.

❖ Click on the **chart wizard icon**, then click on the XY(scatter) icon

❖ Click on the chart sub-types: scattered points with no lines (compares pairs of values.)

- ❖ Click **next** you will get the chart source data to verify your data values on the graph.
- ❖ Click **next**, here you can label your graph and XY axes, remove your XY axes, increase/decrease the number of gridlines on your graph, relocate your series box, and label each data point.
- ❖ Click **next** here you can open the chart/graph as a new sheet or open on the same page as the sheet you are working on.
- ❖ Now you can your graph
  
- ❖ **Plot the raw data simultaneously with the regression line on spreadsheet.**
- ❖ So now you have a graph displaying all of your points. **Right click** on one of your points, click on **add trendline** there will be different options of trendline click **linear** and click **OK**.
  
- ❖ **Display Equation on graph: Slope, Y-intercept, and coefficient**
- ❖ Right click on the trendline and then click on options by placing a check mark in front of display equation on chart and display R-squared value on chart.
- ❖ There will be an equation displayed on the graph  $y = mx + b$ . ( $m = \text{slope}$ ,  $b = \text{y-intercept}$ ) there will also be  $R^2$  ( $R^2 = \text{coefficient}$ ).
  
- ❖ **Edit to change or delete individual or all data values.** To delete a value if typed by accident, just click on that cell and hit the delete bottom.
- ❖ If you are trying to throw out value click on that cell and hit delete. Now this will only remove the numbers not the cell.
- ❖ To remove the cell click on the outside of the row (on the row number) notice that the entire row is highlighted. Now click on edit locate on the top toolbar, click delete, and then click entire row.
- ❖ If you have data in that same row and need to continue to use that data. Click on the row right below the newly empty cell and highlight the all data values below and drag the point up one cell.
  
- ❖ **Edit graphical results**
- ❖ Click on series, if you wish to change your X and/or Y values that are located in a different column.

**Example:**

x	y		A	B
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8

