

Pre-IB AP Statistics –Summer Assignment Getting to Know Your TI-84+ Calculator

Due: First Day of Class

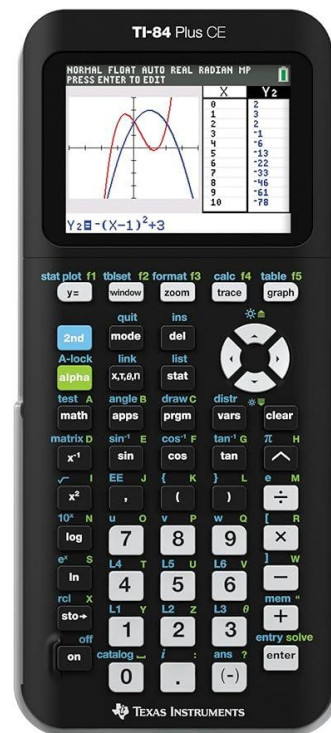
Welcome to the World of Statistics!

AP Statistics uses the TI graphing calculator a lot. In fact, you can use your calculator on the entire AP Statistics exam. Because of this, students are expected to know the basics of their graphing calculators when entering the course. This assignment will guide you through the basics and ask you to practice a variety of calculator skills.

Directions: Read and practice the calculator keystrokes as you follow along with the instructions given. Answer the questions when a response is requested. This will count as a 10 point Assignment grade in the 1st quarter.

Contents:

- Entering a Data Set
- Summary Statistics
- Clearing Data from Your Lists
- **Practice 1**
- Constructing a Scatterplot
- Determining the Line of Best Fit: Linear Regression
- Adding a Regression Line to a Scatterplot
- **Practice 2**
- How to Construct a Histogram
- How to Construct a Boxplot
- **Practice 3**
- How to Construct a Histogram and Boxplot on the Same Screen
- **Practice 4**



ENTERING A DATA SET: In statistics, we use data. Here is how to store lists of data into your calculator.

Here is a random sample of End-of-Year Bonus amounts given by a certain technology company in 2014. The steps below will show you how to enter this information into your calculator.

2,300
1,000
5,655
3,485
1,455
2,545
1,000
2,295
2,050
1,845

1. Press **STAT**, then select **EDIT** by pressing **ENTER** or **1**.

```

3000 CALC TESTS
1:Edit...
2:SortA(
3:SortD(
4:ClrList
5:SetUpEditor

```

L1	L2	L3	1
████████	-----	-----	
L1() =			

2. Enter the data set into L1 (List 1) and pressing **ENTER** after each number.

L1	L2	L3	1
1455			
2545			
1000			
2295			
2050			
1845			
.....			
L1(1) =			

The data is now stored into the calculator.

Here is a random sample of End-of-Year Bonus amounts given by a certain airline company in 2014.

5,300
6,000
3,500
4,650
6,550
7,500
4,050
6,750

Follow the previous steps to enter the data into L2 (List 2).

L1	L2	L3	2
5655	3500		
3485	4650		
1455	6550		
2545	7500		
1000	4050		
2295	6750		
2050			
L2(9) =			

3. The data is now stored in your calculator. Return to Home Screen by pressing **2ND MODE (QUIT)**.

SUMMARY STATISTICS: Find the mean, median and standard deviation of a data set.

Now let's compare the mean, median, and standard deviation of bonuses from each employer.

1. From the Home Screen, press **STAT**.
2. Next, press the right arrow to highlight **CALC**.

```
EDIT [2ND] TESTS
1:1-Var Stats
2:2-Var Stats
3:Med-Med
4:LinReg(ax+b)
5:QuadReg
6:CubicReg
7↓QuartReg
```

3. Select **1-Var Stats** by highlighting it and pressing **ENTER** or **1**.

```
1-Var Stats
List:L1
FreqList:
Calculate
```

By default, the calculator will find the summary statistics for L_1 .

4. Press **ENTER** and see the summary statistics displayed. These are the summary statistics of the bonuses for the technology company.

```
1-Var Stats
x̄=2363
Σx=23630
Σx²=72881850
Sx=1376.152446
σx=1305.532841
↓n=10
```

Scroll down (pressing down arrow key) to see more summary data.

```
1-Var Stats
↑n=10
minX=1000
Q1=1455
Med=2172.5
Q3=2545
maxX=5655
█
```

Now identify the mean, median, and standard deviations.

To do this, you need to learn some notation:

$\bar{x}$ = sample mean "x-bar"
s_x = sample standard deviation
Med = median

Next, let's get the summary statistics for the airline bonuses in List 2.

- Press **STAT**, highlight **CALC**, then select **1-Var Stats** by highlighting it and pressing **ENTER** or **1**.

Change L_1 to L_2 . To get L_2 , press **2nd** then the number **2** (L_2).

```

1-Var Stats
List:L2
FreqList:
Calculate
    
```

Press **ENTER** and see the results.

```

1-Var Stats
x̄=5537.5
Σx=44300
Σx²=259080000
Sx=1402.485039
σx=1311.904627
↓n=8
    
```

Summarize the results by completing the table below:

	Technology Co. Bonus	Airline Co. Bonus
Sample Mean		
Median		
Sample Standard Deviation		

CLEARING DATA FROM YOUR LISTS: There are many ways to remove old data from your calculator. The method we will use in class is described below.

- Go into your lists by pressing **STAT**, **EDIT**.
- Press the **arrow up key** to highlight L_1 .

L1	L2	L3	1
2300	5300	-----	
1000	6000		
5655	3500		
3485	4650		
1455	6550		
2545	7500		
1000	4050		
L1 = {2300, 1000, 5...			

- Press **CLEAR** then the **arrow down key** and the data will be cleared.

L1	L2	L3	1
-----	5300	-----	
	6000		
	3500		
	4650		
	6550		
	7500		
	4050		
L1() =			

4. Now **CLEAR** L₂.

L1	L2	L3	2
-----	██████	-----	
L2(1)=			



Special note about **DEL** in a list. If you press **DEL** instead of **CLEAR**, the list will *disappear* from your screen, but not from your calculator's memory. To get it back, you need to highlight the top row, press **2nd DEL (INS)**, then put the list you want back, e.g. **2nd L₁ ENTER**.

Practice 1 Entering a Data Set and Finding Summary Statistics

Below are two tables showing candy bars that contain nuts and those that do not.

Candies with Nuts

	Calories	Fat
Hershey Mr. Good Bar	280	18
Hershey Choc. w/ Almonds	230	14
Almond Joy	180	10
Reese's Cup	240	14
Nutrageous	250	15
Snickers	280	14
Baby Ruth	280	12

Candies without Nuts

	Calories	Fat
Hershey Chocolate Bar	230	13
Rolo	230	12
Kit Kat	220	12
York Peppermint Patty	170	4
Heath Bar	210	13
Twix	280	14
Milky Way	280	11
3 Musketeers	260	8
100 Grand	200	8
Butterfinger	200	8

Your task: Determine if there is a difference in mean calories and mean fat for candies with and without nuts.



Helpful Hint: It is possible to enter all these data sets into L₁, L₂, L₃, and L₄ as long as you remember which list has which data set.

	Mean Calories	Mean Fat Content
Candies with Nuts		
Candies without Nuts		

What do these numbers tell you about candies with nuts and candies without nuts?

CONSTRUCTING A SCATTERPLOT: In statistics, we often want to know if there is a linear relationship between two variables.

Here is a data set comparing forearm length in inches to height in inches. We want to determine if there is a relationship between forearm length and height.

Person	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Forearm (in)	11.25	12	12	12.5	12.5	11	10	11.5	11	12	11.75	9.5	10	9.75	10.5
Height (in)	69	70	75	72	70	68	67	68	68	69	73	59	61	62	68

1. Enter forearm data into L1 and height into L2. (Notice that person number is not a data value of interest to us, so we do not enter it into the calculator.)

L1	L2	L3	2
12	69		
11.75	73		
9.5	59		
10	61		
9.75	62		
10.5	68		

L2(16) =			

In this example, we will use forearm length as our x-axis data and height as our y-axis data.

2. Set up the scatterplot. Press **2ND** and **Y=** (STAT PLOT).

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

This screen shows you can create up to three plots at once.

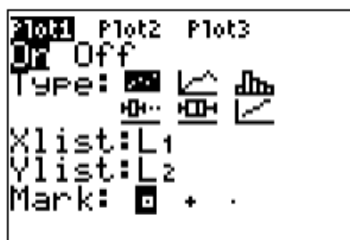
3. Select **Plot 1** by pressing **ENTER** or **1**.

Plot1 Plot2 Plot3
On Off
Type: [Scatter] [Line] [Bar]
Xlist:L1
Ylist:L2
Mark: [Square] [Plus] [Dot]

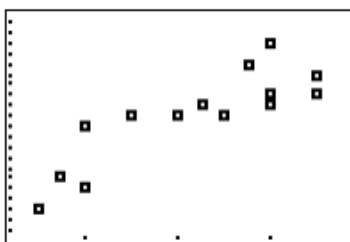
4. Select **On** by pressing **ENTER**.

Plot1 Plot2 Plot3
On Off
Type: [Scatter] [Line] [Bar]
Xlist:L1
Ylist:L2
Mark: [Square] [Plus] [Dot]

- For **Type**, select a scatterplot, this is the choice on the first row all the way on the left as highlighted below.



- Now tell the calculator where the data for the x-axis is located and where y-axis data is located. If Xlist data is stored in any place other than L1 change it. Do the same with Ylist.
- Now get back to the Home Screen, press **2ND QUIT**.
- Final Step: Press **ZOOM** and select **ZoomStat** or press **9**.

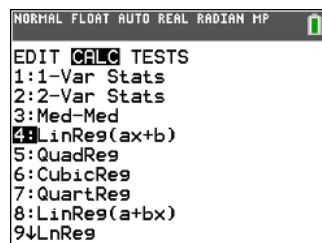


Note: try pressing **TRACE** and move the arrows to the left and right and notice what the screen shows.

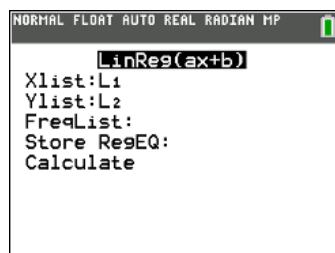
DETERMINING THE LINE OF BEST FIT: LINEAR REGRESSION

Using the data already in your lists, find the line that best fits the scatterplot,

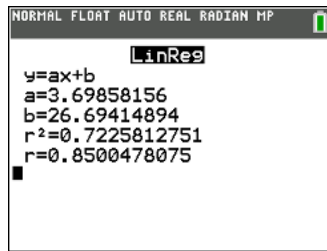
- Press **STAT** and press the right arrow key to highlight **CALC**.
- Select choice **4:LinReg(ax+b)** by either pressing **ENTER** or **4**.



- Now make sure the calculator knows where the x data set is located and where the y set is located, changing the lists shown, if needed.



4. Highlight **Calculate** and press **ENTER**.



From this calculator display,
the equation of the best fit line
is $y = 3.70x + 26.7$

Your values for a and b should match what you see above.

a = the slope (how much y changes per x unit)

b = the y -intercept (initial value)



If you do not have values for **r** and **r²**, follow these steps:

Press **MODE** and scroll down to **STATS DIAGNOSTICS**.

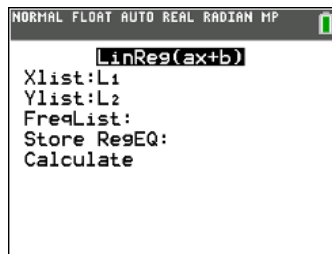
Highlight **ON** and press **ENTER**

You will have to redo the steps for finding the best fit line, but your calculator will now have **r** and **r²**.

ADDING A REGRESSION LINE TO A SCATTERPLOT:

Using the same data as above, we want to sketch both the scatterplot and lines of best fit together.

1. Press **STAT, CALC, 4:LinReg(ax+b)**



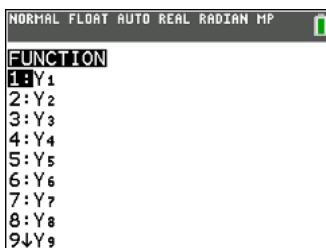
2. Now we need to tell the calculator where to store the best fit line by adding **Y₁** as the RegEQ.

Step 1: Scroll down to **Store RegEQ**

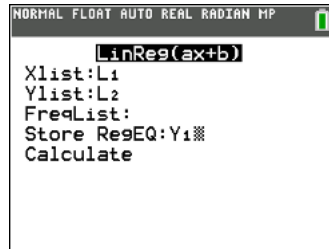
Step 2: Press **VAR**. Scroll over to **Y-VARS** and select **1:Function**.



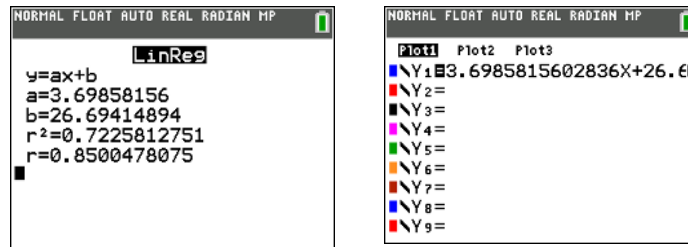
Step 3: Select **Y₁**. This will tell the calculator to store the equation in **Y₁**. If you want it store in a different place location, select the appropriate one.



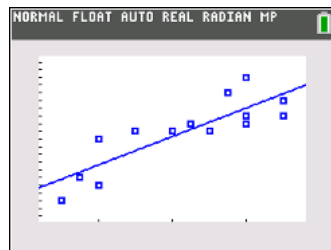
Step 4: Your screen should now look like this. Scroll down to **CALCULATE** and press **ENTER**.



The screen below again appears, but this time the equation for the best fit line has also been stored in Y_1 . To see the equation press $Y=$



3. Press **GRAPH** or **ZOOM** and **9:ZoomStat** to see the best fit line drawn.



Try pressing **TRACE** and move the arrows left and right as well as up and down to see what happens.

Practice 2 Constructing a Scatterplot and Best Fit Line

One can determine how old a tree is by counting its rings, but the requires cutting the tree down. Can we estimate the age simply from its diameter?

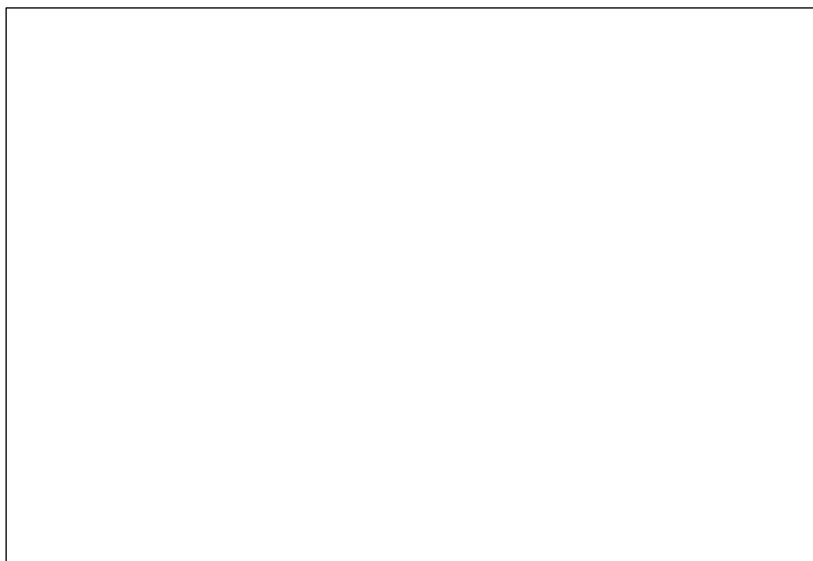
A forester measured the diameters of 27 trees of the same species that had been cut down and counted the rings to determine the ages of the trees. The data is shown in the table below.

Diameter (in.)	Age (yr.)	Diameter (in.)	Age (yr.)
1.8	4	10.3	23
1.8	5	14.3	25
2.2	8	13.2	28
4.4	8	9.9	29
6.6	8	13.2	30
4.4	10	15.4	30
7.7	10	17.6	33
10.8	12	14.3	34
7.7	13	15.4	35
5.5	14	11.0	38
9.9	16	15.4	38
10.1	18	16.5	40
12.1	20	16.5	42
12.8	22		

Your task: Enter the data for Diameter in L_1 and the data for Age in L_2 . Have your calculator do the following, then show your results in the spaces provided:

1. Create a scatterplot of the data set.
2. Find the equation of the best fit line.
3. Graph the best fit line over the scatterplot.

Draw a sketch of the scatterplot and best fit line in the space provided.



Record your results of the best fit line.

a = _____

b = _____

Write the equation of the best fit line here:

Describe the association between diameter and age of the trees.

In the context of the problem, describe what the value of the slope represents.

HOW TO CONSTRUCT A HISTOGRAM:

During his 20 seasons in the NHL, Wayne Gretzky score 50% more goals than anyone who ever played professional hockey. Here are the number of goals Gretzky scored during each season:

70 80 80 80 74 80 80 79 64 78 73 78 74 45 81 48 80 82 82 70

The following are steps to create a histogram for this data set.

1. Clear all of the data previously stored in your lists and enter this data set into L₁.

L1	L2	L3	1
81			
48			
80			
82			
82			
70			
L1(21) =			

- Set up the histogram. Press **2nd** and **Y=(STAT PLOT)**

```

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

- Select **Plot 1** by pressing **ENTER** or **1**.

```

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

*Recall this is set up for your previous scatterplot.
We will need to change this histograms.*

- For **Type**, select a histogram (the choice with the bars).

```

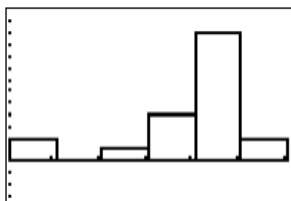
Plot1 Plot2 Plot3
On Off Off
Type: [L1] [L2] [HIST]
Xlist:L1
Freq:1
  
```

- Indicate where your data is store for Xlist. In our case, you should have entered L₁.

```

Plot1 Plot2 Plot3
On Off Off
Type: [L1] [L2] [HIST]
Xlist:L1
Freq:1
  
```

- Press **ZOOM** and select **ZoomStat** or **9**.



*Try pressing **TRACE** and move the
arrows left and right to see what
happens.*

HOW TO CONSTRUCT A BOXPLOT:

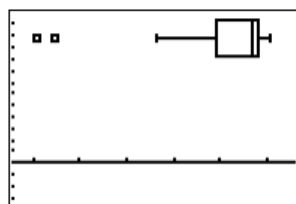
Using the same data from above, create a boxplot by following the steps below.

- Go back to **STAT PLOT** and choose **Type** as boxplot by pressing the right arrow key. (Choose the one with the dots.)

```

Plot1 Plot2 Plot3
On Off Off
Type: [L1] [L2] [HIST]
Xlist:L1
Freq:1
Mark: [ ] + .
  
```

2. Press **ZOOM** and select **ZoomStat** or 9.



Try pressing **TRACE** and move the arrows left and right to see what happens.

Practice 3 Constructing a Histogram and a Boxplot

Data Set: A study examining the health risks of smoking measured the cholesterol levels of people who had smoked for at least 25 years and people of similar ages who had smoked for no more than 5 years and then stopped. Create histograms and boxplots for both groups and sketch each graph below.

Smokers				Ex-smokers		
225	211	209	284	250	134	300
258	216	196	288	249	213	310
250	200	209	280	175	174	328
225	256	243	200	160	188	321
213	246	225	237	213	257	292
232	267	232	216	200	271	227
216	243	200	155	238	163	263
216	271	230	309	192	242	249
183	280	217	305	242	267	243
287	217	246	351	217	267	218
200	280	209		217	183	228

Smokers Histogram	Smokers Boxplot

Ex-smokers Histogram	Ex-smokers Boxplot

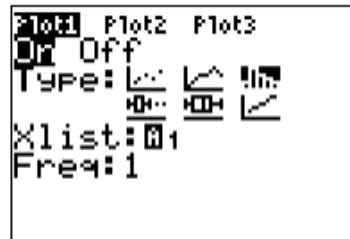
Using the Wayne Gretzky data above, create a histogram and boxplot at the same time.

- | L1 | L2 | L3 | 1 |
|---------|----|----|---|
| 81 | | | |
| 48 | | | |
| 80 | | | |
| 82 | | | |
| 82 | | | |
| 70 | | | |
| | | | |
| L1(2) = | | | |

- ```

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

```



- ```

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

```

- Plot1: 1002 Plot3:
Off
Type:   
  
Xlist: L1
Freq: 1
Mark:  + .

-

This does look messy with the histogram overlapping the boxplot. Follow the steps below to separate them.

6. Press **WINDOW**.

```

WINDOW
Xmin=■5
Xmax=89.4
Xscl=7.4
Ymin=-3.30759
Ymax=12.87
Yscl=1
↓Xres=1

```

7. Separate the histogram from the boxplot by increasing the **Ymax** to **20**.

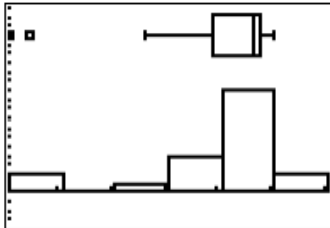
```

WINDOW
Xmin=45
Xmax=89.4
Xscl=7.4
Ymin=-3.30759
Ymax=20■
Yscl=1
↓Xres=1

```

The Ymax value is not always 20. In general, you need to increase the value of the Ymax so the height of the histogram shrinks. Often this is trial and error to pick a good Ymax.

8. Press **GRAPH** (Do not press 9:ZoomStat, it will put Ymax back to its original value.)



*Try pressing **TRACE** and move the arrows left and right as well as up and down to see what happens.*

Practice 4 Constructing a Histogram and Boxplot on the Same Graph

Thirty-two teams competed in the 2010 World Cup. Below is are the mean number of passes per match for each of the 32 teams.

352, 548, 348, 450, 375, 400, 360, 345, 394, 334, 409, 329, 280, 252, 406, 222, 268, 332, 399, 380, 221, 266, 311, 365, 358, 309, 305, 352, 543, 277, 270, 293

Create both a histogram and boxplot on the same graph. Make a sketch of your results in the space provided.



Press **TRACE** and give the values from the boxplot below.

minX = _____ Q1 = _____ Med = _____ Q3 = _____ maxX = _____