AP Statistics

Getting to know your **TI – NSpire** Graphing Calculator

Contents

Welcome to the World of Statistics

This class will be like no other math course you have taken.

Packet Overview

AP Statistics uses the TI graphing calculators 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 before entering the course. This packet will guide you through the basics and ask you to practice a variety of calculator skills.

Be sure to complete all pages of the packet so you know how to use the basics of your graphing calculator.

Directions

Read and practice the calculator keystrokes as you follow along with all the instructions. Throughout the packet you will encounter places where your response is required. One such place where your response is required are the “Practice” activities found throughout the packet.

Due Date

Complete this Calculator Packet before August 10, 2021. The calculator assessment at the end of the packet is a review for the calculator assessment August 10, 2021 The Calculator Packet will go in the gradebook as the first graded math assignment. Failure to complete this packet will negatively affect your grade for the first semester. Please make every effort to do your best work.

Questions

If you have any questions, contact Dr. Stevens at sstevens@ecseagles.com

Overview: In statistics we use data. Here is how to store lists of data into your calculator.

Entering a Data Set

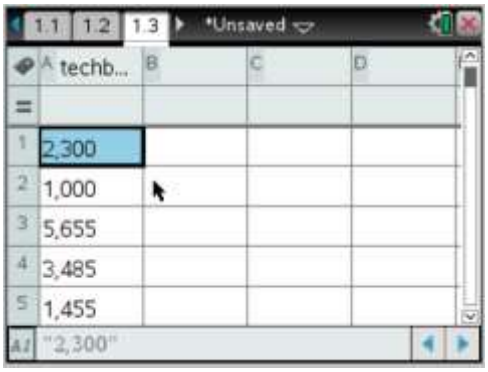
Here is a random sample of End-of-Year Bonus amounts given by a certain technology company in 2014. The steps below will show you how to enter this information into your calculator.

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

1. **SCROLL DOWN** to the spreadsheet ICON and press the center button.

2. **SCROLL UP** and select an empty sheet (i.e. 1.1, 1.2, etc.) **SCROLL UP** to the letter **"A"** and type "**techbonus**" using the keypad.

3. Type the data into Column A.

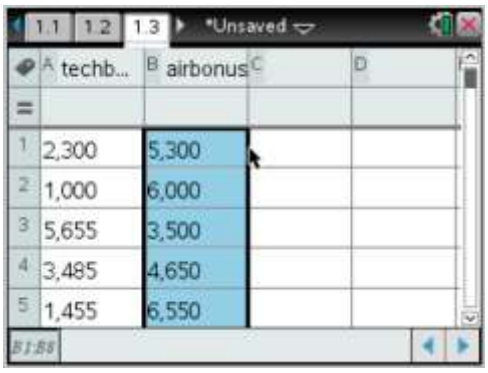


The data is now stored into the calculator.

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 label Column B as "**airbonus**" and enter the data into column B.



4. The data is now stored in your calculator.

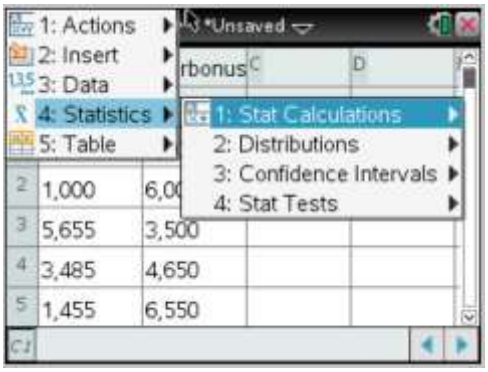
Summary Statistics

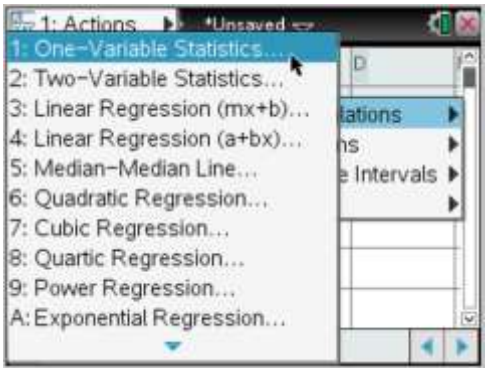
How to find the Mean, Median, and Standard Deviation

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

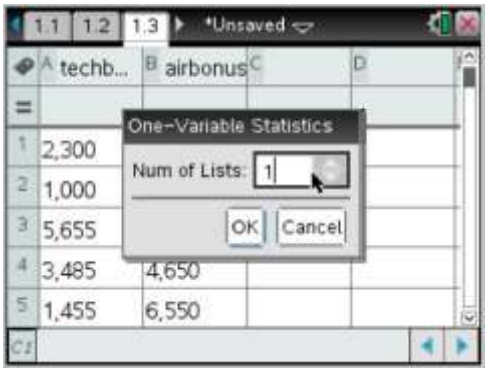
1. From the spreadsheet, select a square to the right of the data.

2. Next press **MENU**. A menu will appear. Select: **4 Statistics**; **1 Stat Calculations**; and **1 One-Variable Statistics**

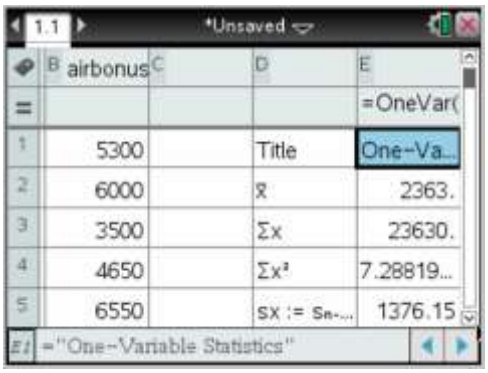


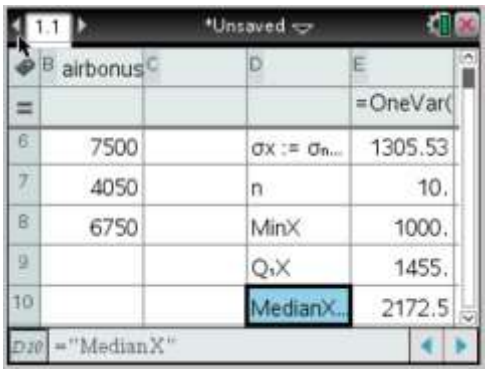


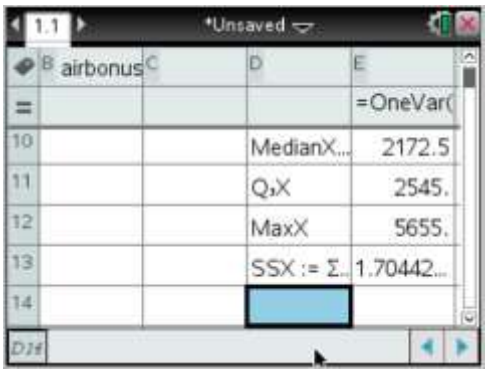
3. Select **1-List**. Then, select the x-variable for **techbonus**.



4. Press **OK** and see the summary statistics displayed. These are the summary statistics of the bonuses for the technology company. Scroll down to see all summary data.







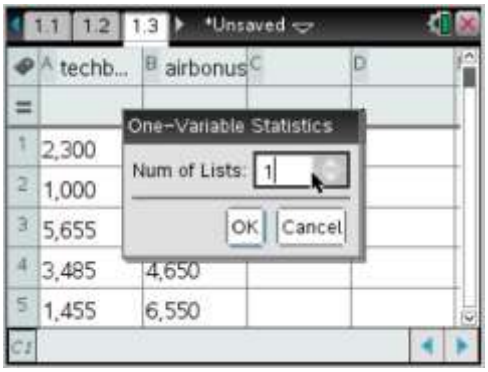
Now identify the Mean, Median, and Standard Deviations.
To do this you need to learn some notation.

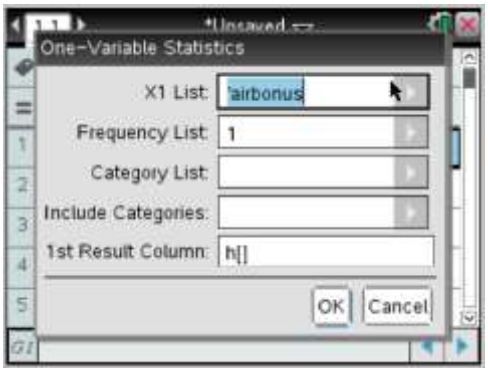
$\bar{x}$ = sample mean "x-bar" s_x = sample standard deviation Med = median

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

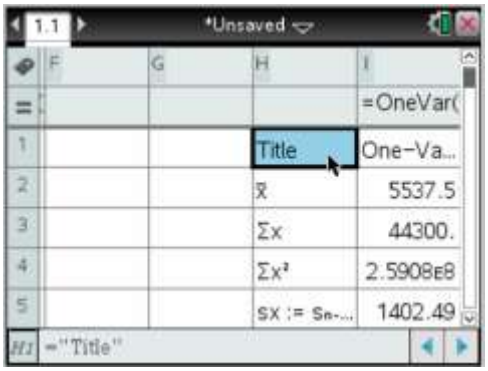
5. Move the cursor to an empty cell. Repeat step 2.

6. Select **1-List**. Then, select the x-variable for **airbonus**.





7. Press **OK** and see the summary statistics displayed. These are the summary statistics of the bonuses for the airline company. Scroll down to see all summary data.



Now summarize the results by completing the table below:

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

Data and the TI NSpire

1. Cells can be individually or collectively cleared just as in a spreadsheet.

2. A data set can be deleted simply by pressing the X in the upper right hand corner. The calculator will then ask if you would like to save the "**Document**".

3. A list of all saved documents can be found from the home page. Press the home key to return to the home page.

4. Use the menu to retrieve the desired "**Document.**"

Practice

Entering a Data Set and finding Summary Statistics

Below are two tables showing candy bars that contain nuts with those that don't.

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 Fat for candies with and without nuts.

Helpful Hint: It is possible to enter all these data sets into one spreadsheet as long as you remember which list has which data set.

	Mean Calories	Mean Fat Content
Candies with Nuts		
Candies without Nuts		

Free Response:

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

_____

_____

_____

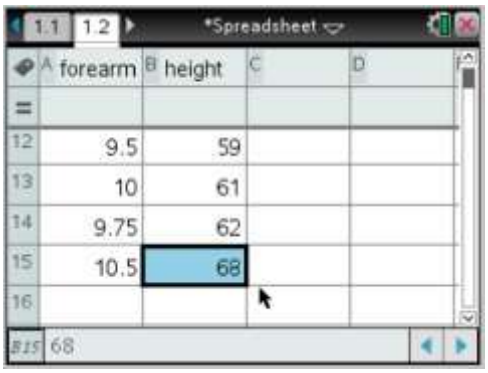
Overview: In statistics we often want to know if there is a linear relationship between two variables.

Constructing a Scatterplot

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

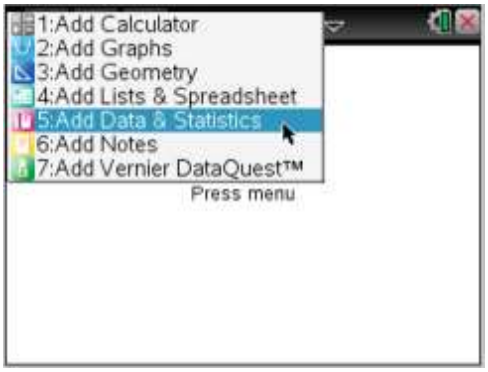
Person	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Forearm (in)	11.25	12	12	12.5	12.5	11	10	11.5	11	12	11.75	9.5	10	9.75	10.5
Height (in)	69	70	75	72	70	68	67	68	68	69	73	59	61	62	68

1. Create a new spreadsheet. Enter forearm data into column A and height into column B. (Notice that person number is not a data value of interest to us, so we do not enter it into the calculator.)

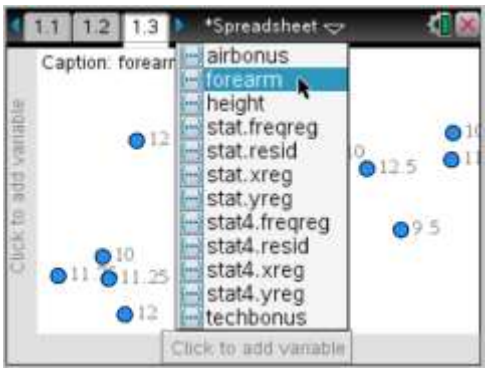


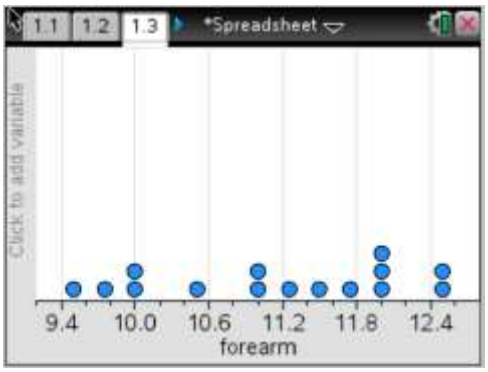
   In this example, we will use forearm length as our x-axis data and height as our y-axis data.

2. Set up the scatterplot. Press **ctrl** and **doc**. Then select **5: Add Data & Statistics**.

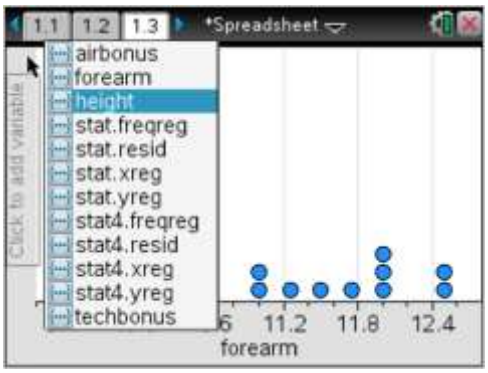


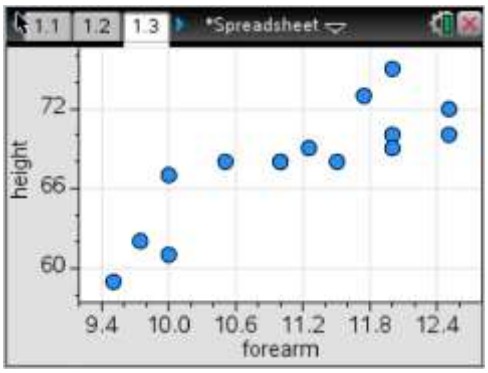
3. Click on the box "**Click to add variable**" on the x-axis and select **forearm**.





4. Click on the box "**Click to add variable**" on the y-axis and select **height**.





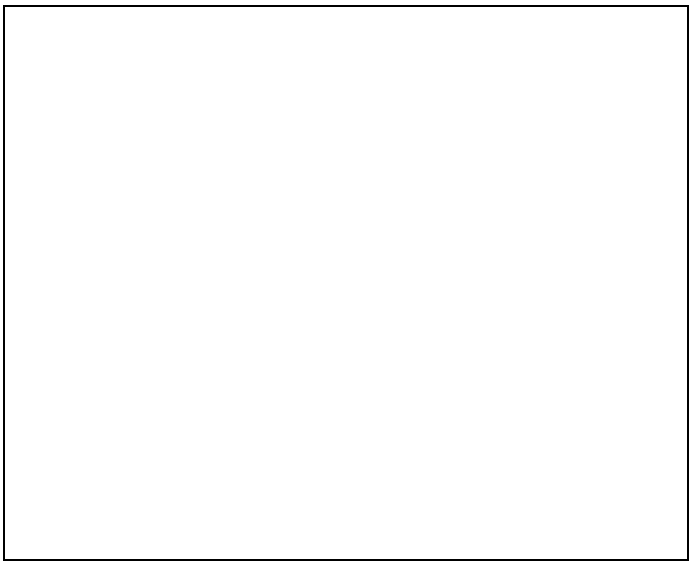
Practice

Constructing a Scatterplot

One can determine how old a tree is by counting its rings, but that requires cutting the tree down. Can we estimate the age simply from its diameter? A forester measured 27 trees of the same species that had been cut down and counted the rings to determine the ages of the trees. Enter the data for Diameter into L1 and data for Age into L2, then use the calculator to create a scatterplot, and lastly describe the association.

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		

Draw a sketch of the scatter plot in the space provided.



Describe the association between diameter and age of trees.

_____

_____

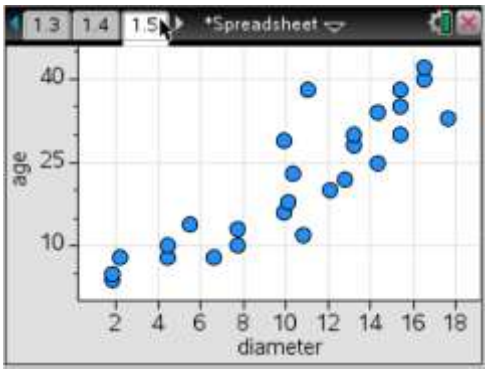
_____

Overview: In statistics we often need the line that best fits a scatter plot. We are also extremely interested in the value of the slope and what it represents.

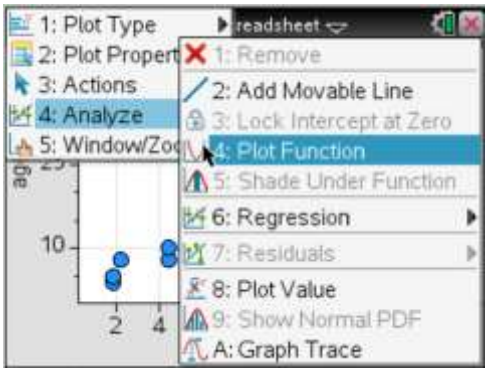
Determining the Line of Best Fit: Linear Regression

Use the same data set from page 11 and find the line that best fits the scatterplot.

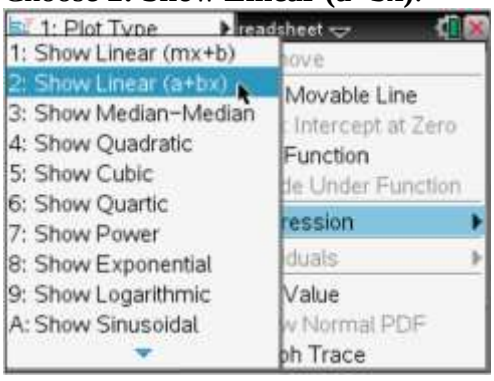
1. Open the document page with the graph:

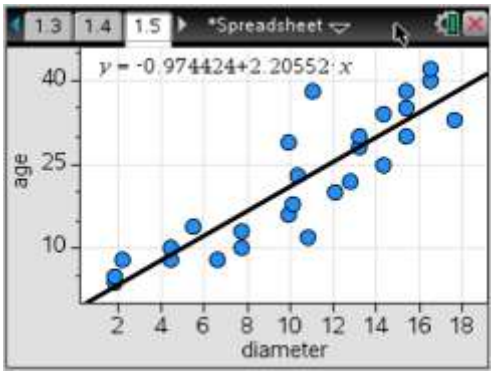


2. To add regression equation ($y = a + bx$); press **MENU**; **4:Analyze**; and **6:Regression**.

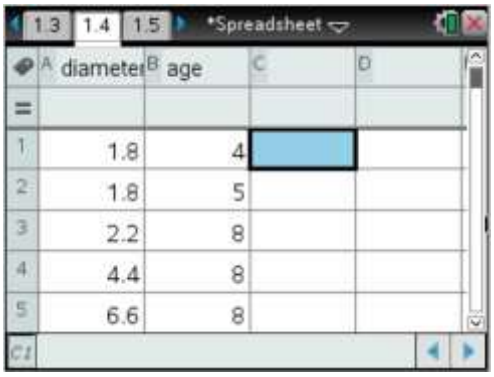


3. Choose **2: Show Linear (a+bx)**.

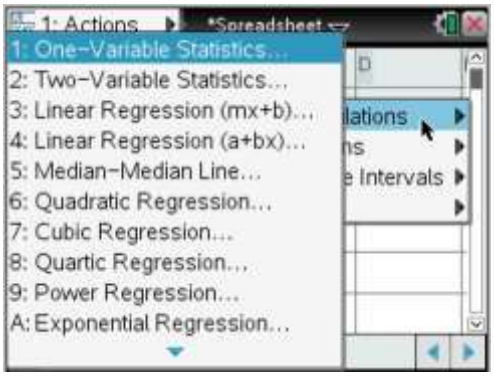


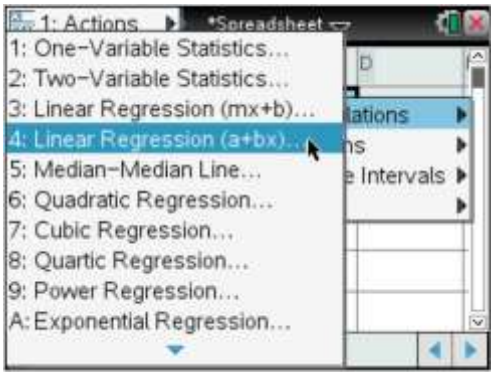


4. To find the correlation coefficient, r, and the coefficient of determination, r^2, return to the spreadsheet data page and select a box to the right of the data.

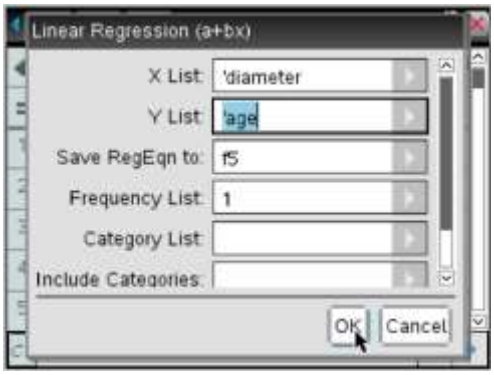


5. Choose **Menu**; **4: Statistics**; **1: Stat Caluations**; and **4: Linear Regression (a+bx)**



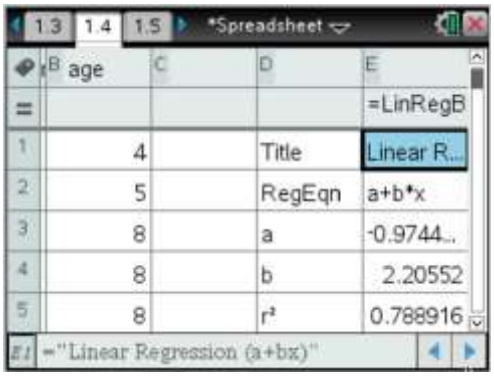


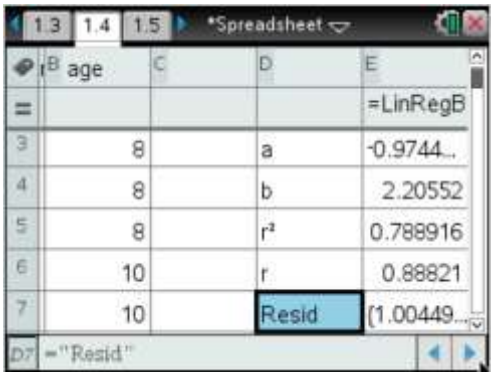
6. Use the pull-down menu to select **diameter** as the **X List** and **age** as the **Y List**.



From this calculator display, the equation of the best fit line is
y = -.9744 + 2.2055x

The Linear Regression data will appear in the spreadsheet.





Practice
Constructing a Scatterplot & Best Fit Lines

For your practice we are going to revisit the data on page 9, comparing forearm length in inches to height in inches. Clear all your old lists and re-enter this data set.

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

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 scatter plot and best fit line in the space provided.

Record your results of the best fit line. Describe the association between forearm length and height.

a = _____

b = _____

Write the equation of the best fit line here.

y = _____

_____

_____

_____

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

_____

_____

Overview: In statistics we often want to see the shape of univariate (one-variable) data.

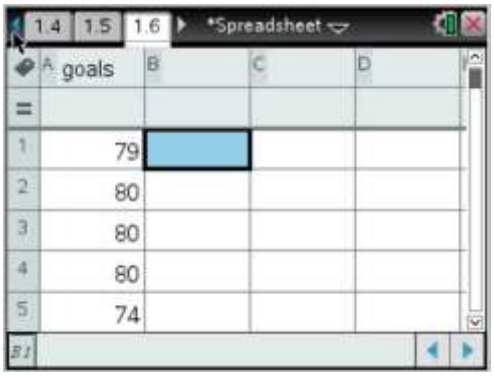
How to Construct a Histogram

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

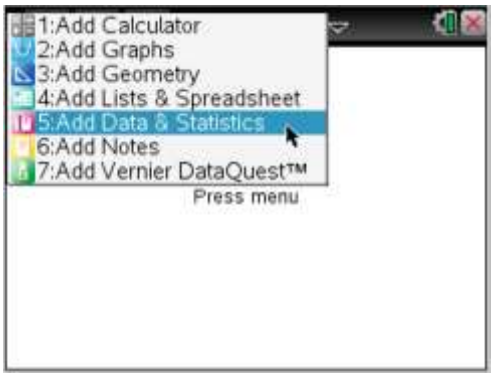
79, 80, 80, 80, 74, 80, 80, 79, 64, 78, 73, 78, 74, 45, 81, 48, 80, 82, 82, 70

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

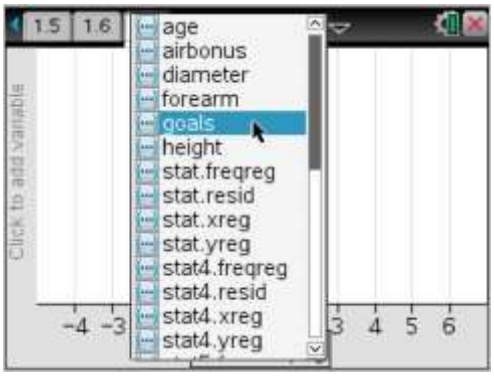
1. Create a new spreadsheet and type data into Column A.

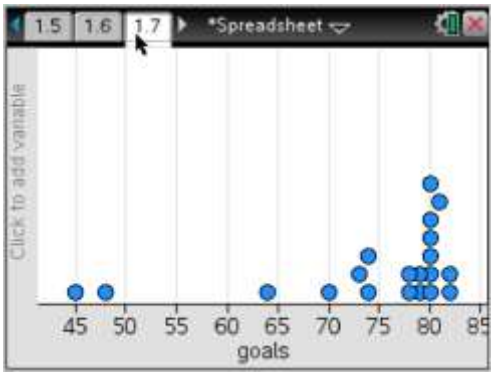


2. First set up a dot plot. Press **ctrl** and **doc**. Then select **5: Add Data & Statistics**.

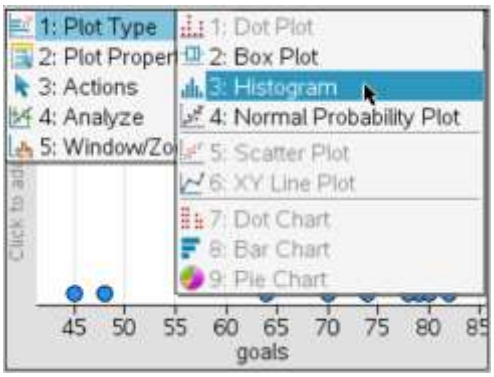


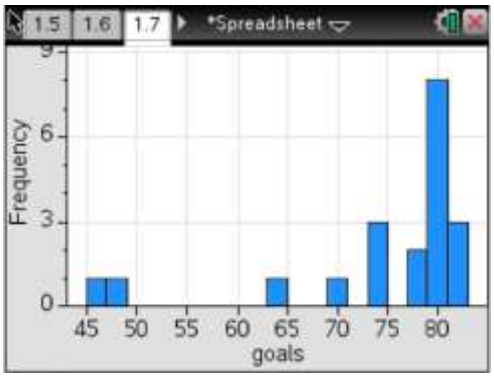
3. Click on the box "**Click to add variable**" on the x-axis and select **goals**.





4. Press **MENU**. Then select **1: Plot Type** followed by **3: Histogram**.

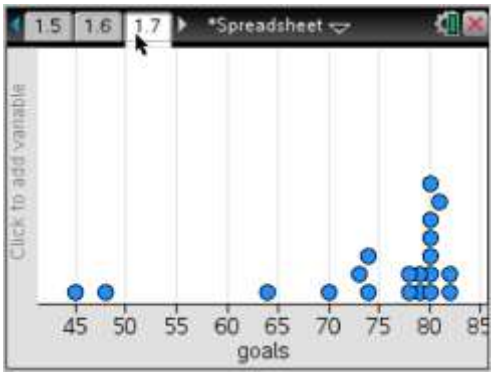




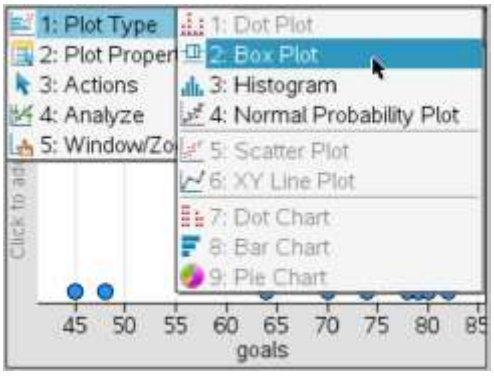
How to Construct a Boxplot

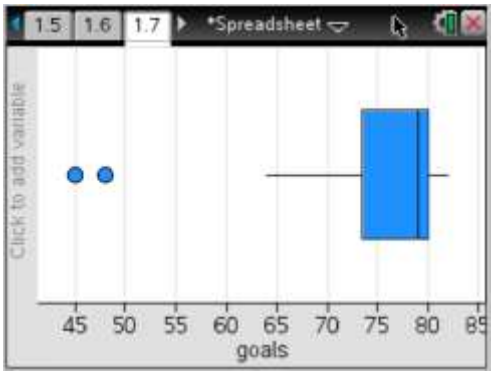
Using the same data from page 16 (Gretzky) create a boxplot by following the steps below.

1. Return to the dot plot.

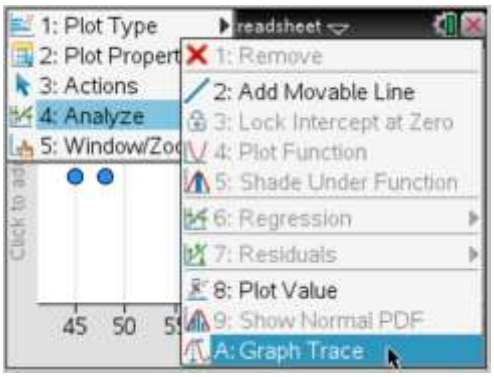


2. Press **MENU**. Then select **1: Plot Type** followed by **2: Box Plot**.





3. Use trace to find numbers from the plot by selecting **MENU**; **4: Analyze**; and **A: Graph Trace**.



Practice
Constructing a Histogram and Boxplot

Data Set: "A study titled 'Body Composition of Elite Class Distance Runners' was conducted by M. Pollock et al. to determine whether elite distance runners are actually thinner than other people." (***The Marathon: Physiological, Medical, Epidemiological, and Psychological Studies***" P. Milvey (ed.), New York: New York Academy of Sciences, p. 366). The sample data, in millimeters (mm), is presented below:

Runners			Others			
7.3	6.7	8.7	24.0	19.9	7.5	18.4
3.0	5.1	8.8	28.0	29.4	20.3	19.0
7.8	3.8	6.2	9.3	18.1	22.8	24.2
5.4	6.4	6.3	9.6	19.4	16.3	16.3
3.7	7.5	4.6	12.4	5.2	12.2	15.6

Runners Histogram	Others Boxplot

Runners Histogram	Others Boxplot

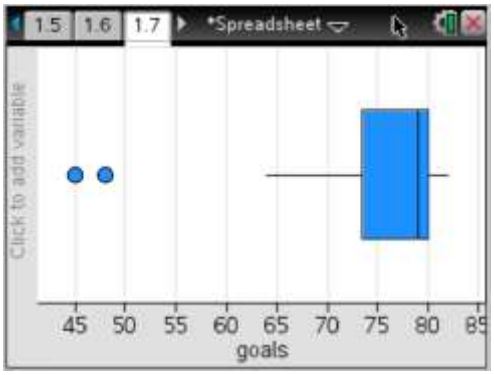
Reference: Weiss, Neil A. **Elementary Statistics 8th Edition**. Addison-Wesley, 2012.

How to Construct a Histogram and Boxplot on the same screen.

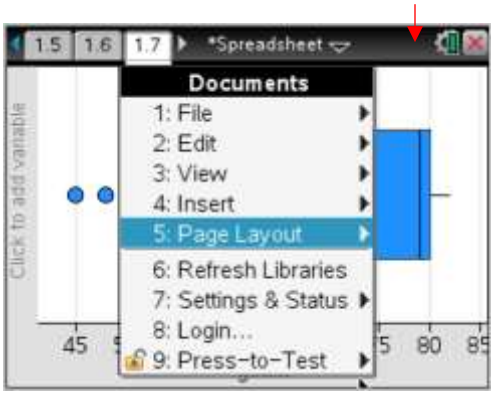
Using the Wayne Gretzky data set on page 15, create a Histogram and Boxplot at the same time.

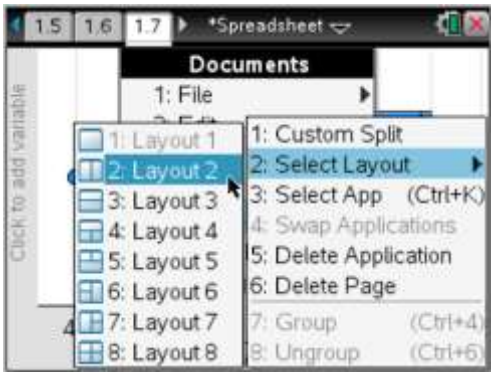
79, 80, 80, 80, 74, 80, 80, 79, 64, 78, 73, 78, 74, 45, 81, 48, 80, 82, 82, 70

1. Begin with the screen with the boxplot:

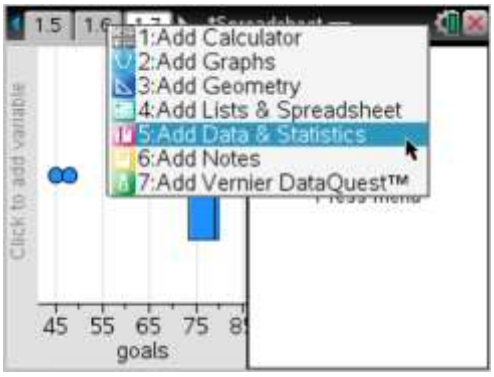


2. Press the black arrow at the top of the page and choose **5: Page Layout**; **2: Select Layout**; and **2: Layout 2**.

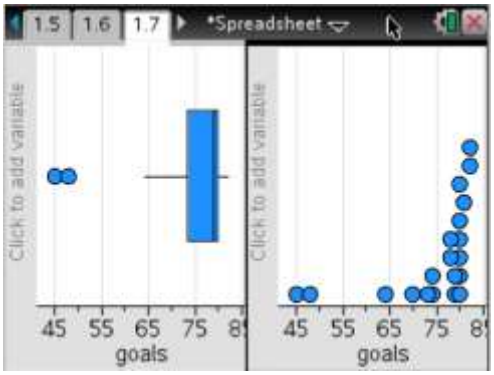




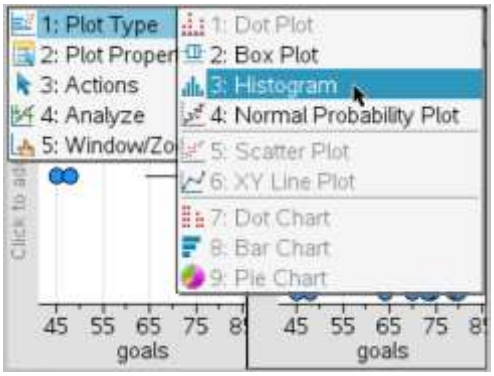
3. To add a histogram, press **MENU** followed by **5: Add Data & Statistics**.

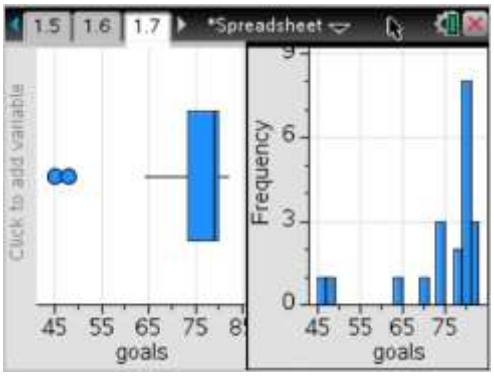


4. Click on the box "**Click to add variable**" on the x-axis and select **goals**.

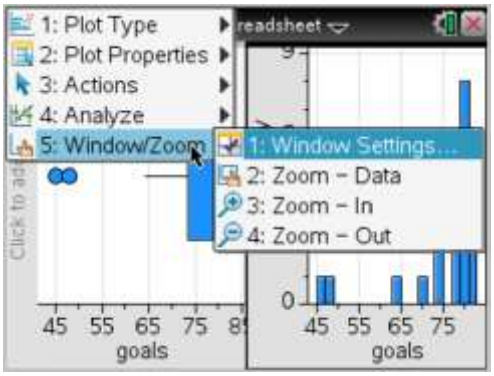


Press **MENU**. Then select **1: Plot Type** followed by **3: Histogram**.





5. To zoom in or out on a graph; press **MENU**; **5: Window/Zoom**; and then select the appropriate **ZOOM** feature.



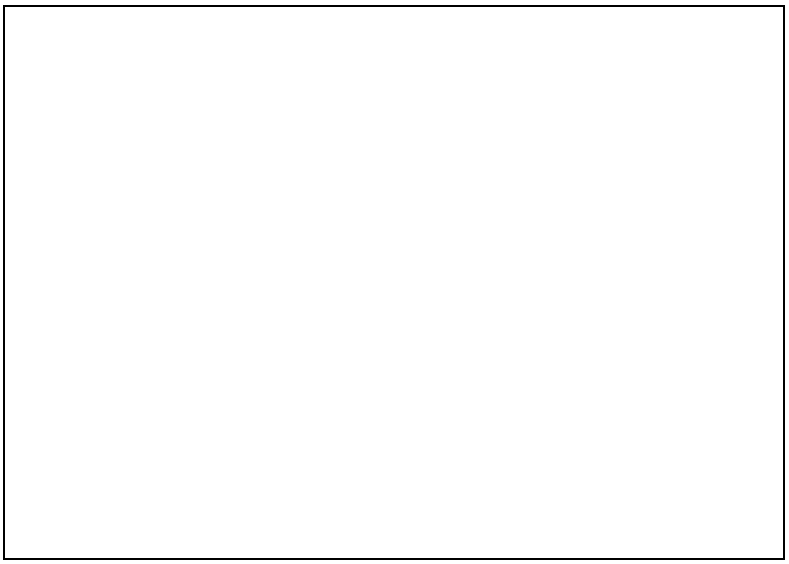
Practice

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.



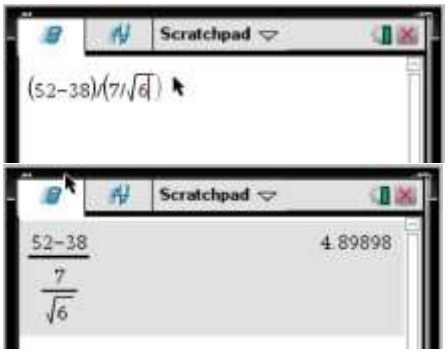
Press **TRACE** and give the values from the boxplot below.

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

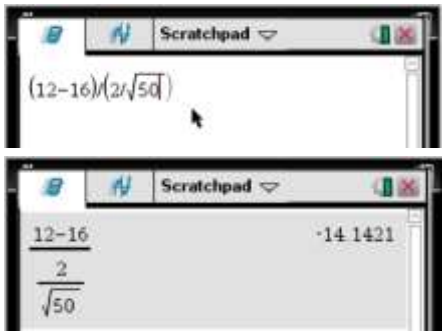
Keystrokes: How to Correctly Enter Expressions into you Calculator

Below are two commonly used calculations in statistics. You are to correctly get the solutions to each. When using the calculator, it is often necessary to use grouping symbols (such as parenthesis).

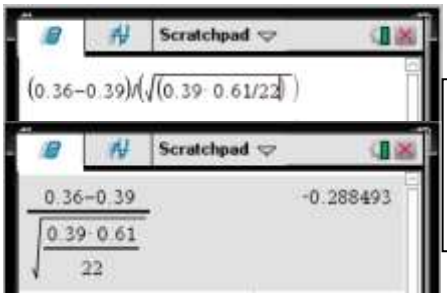
A) $\dfrac{52-38}{\frac{7}{\sqrt{6}}}$ =



B) $\dfrac{12-16}{\frac{2}{\sqrt{50}}}$ =

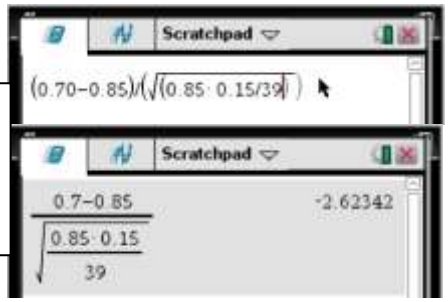


C) $\dfrac{0.36-0.39}{\sqrt{\frac{0.39(1-0.39)}{22}}}$ =



Notice .61 is used in place of 1-0.39. Some calculations we do in our head if easy.

D) $\dfrac{0.70-0.85}{\sqrt{\frac{0.85(1-0.85)}{39}}}$ =



Practice: Keystrokes

Enter the following calculations and see if you can correctly match the solutions provided.

E) $\dfrac{36\text{-}30}{\frac{6.74}{\sqrt{30}}}$ =

F) $\dfrac{124\text{-}175}{\frac{76.4}{\sqrt{46}}}$ =

G) $\dfrac{0.14\text{-}0.165}{\sqrt{\frac{0.165(1\text{-}0.165)}{84}}}$ =

H) $\dfrac{0.54\text{-}0.5}{\sqrt{\frac{0.5(1\text{-}.5)}{26}}}$ =

Solutions: E)4.876, F)-4.527, G)-0.617, H).408

Calculator Assessment

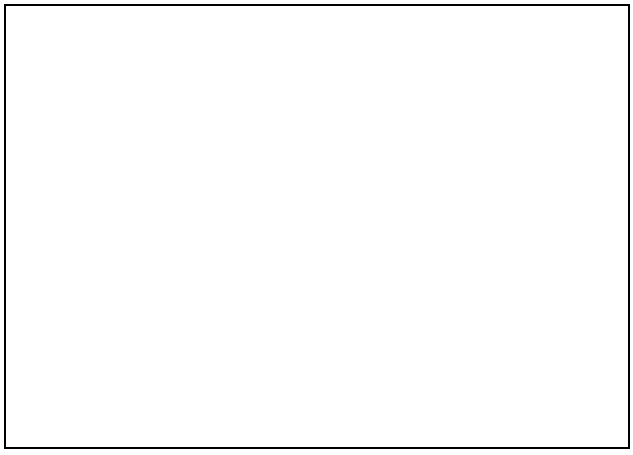
You are expected to have done the practice problems in this packet and have learned how to do basic statistical functions on your calculator. This assessment serves as a review for the calculator assessment during week one of school and is due September 14, 2020.

Listed below are the calories for 17 different meat Hot Dogs:

137	191	182	190	172	147	146	139	175
136	179	153	107	195	135	140	138	

1. Create a **Histogram** on your calculator and sketch it. Be sure create title, label each axes and make a uniform scale on each axes.

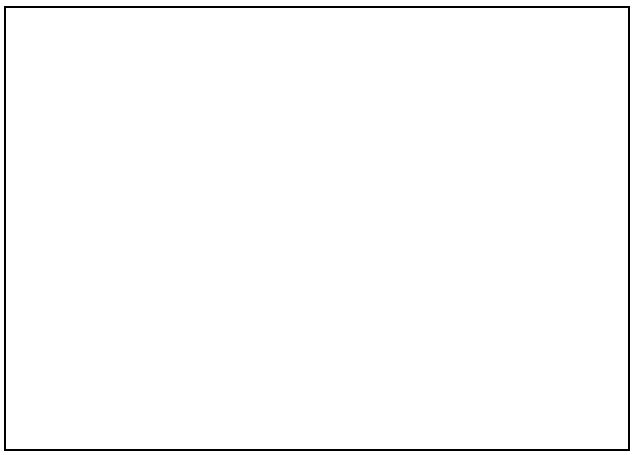
2. Change the "**WINDOW**" to Xmin=100, Xmax=200, Xscl=10 and make another sketch. *Recall, when changing the WINDOW press **GRAPH**, not ZOOM, 9:ZoomStat. Pressing 9:ZoomStat will undo the changes you just made to your WINDOW.*



3. Why are the histograms different if the data has not changed?

4. Press **TRACE** and move it right and left. Describe what the calculator is telling you.

5. Next make a **BoxPlot** for the same data set from page 23 and sketch it. Be sure to create a title, label of axes and uniform scale on the axes.



6. Now make a combination Histogram and Boxplot on the same screen. Sketch it. Be sure to create a title, label of axes and uniform scale on the axes.

7. Press **TRACE** on the BoxPlot and record the "5-number summary".

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

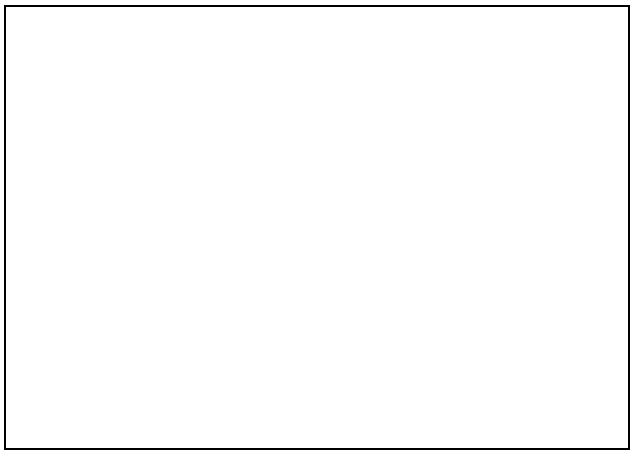
8. Find the sample mean, median, and sample standard deviation of this sample.

	Hot Dog Calories
Sample Mean	
Median	
Sample Standard Deviation	

9. The following is the nutritional facts of some of McDonald's products:

Food Item	**Total Fat (g)**	**Total Calories**
Hamburger	9	250
Cheeseburger	12	300
Quarter Pounder	19	410
Quarter Pounder with Cheese	26	510
Big Mac	29	540
Big N' Tasty	24	460
Large Fries	25	500
Filet-O-Fish	18	380
Grilled Chicken	10	420
Crispy Chicken	20	534
Double Quarter Pounder w/Ch.	42	740
S.W. Salad w/ Grilled Chicken	9	320

10. Create a Scatter Plot with Fat as x-list and Calories as y-list. Make a sketch of your Scatter Plot below. Be sure to create a title, label of axes and uniform scale on the axes.



11. Calculate the equation of the best fit line and write it here

$\hat{y}$ = _____

12. Draw the regression line on your calculator and then add to your sketch above.

13. Describe the association between Total Fat and Total Calories.

_____

_____

_____

Throughout this packet you have learned some useful calculator skills that will be necessary in AP Statistics. In addition, you have been introduced to some unique notation and concepts used in statistics. Complete the following by referring to items in the packet.

14. What is the symbol we use in Statistics to represent the sample mean?

_____

15. What is the symbol we use in Statistics to represent the sample standard deviation?

_____

16. In Algebra we use "m" for slope. In Statistics what letter represents slope?

_____

17. In Statistics what is the interpretation of what slope represents?

_____

Congratulations on successfully completing the
TI Graphing Calculator Packet.

I expect that you will come to class being comfortable using the basics of your graphing calculator. If any content in this packet was a struggle, practice it again. Be prepared for a quiz over this material.