ClassPad 101

for ClassPad Version 3.00+

LESSON 11

Introduction to Statistics

Welcome

Statistics is a very interesting field of mathematics that gives meaning to numbers. In Statistics, we learn ways of analyzing groups of numbers (data) to gain insight and draw conclusions. In this lesson, you will learn the basic skills needed to use the Statistics application to analyze data.

Lesson Goals

- To understand a histogram
- To understand a box-and-whisker diagram
- To be able to understand some statistical results
- To be able to fit a regression curve to data

In Lesson 11, you will learn how to:

- Input data
- Use Statistics to analyze your data
- Create a box-and-whisker diagram
- Draw a histogram
- Draw a normal distribution curve
- Draw scatter plots
- Fit a regression curve to data

Upon completion of this lesson, you will be able to answer the following questions:

1. What does the height of a histogram bar represent?
2. What percentage of data is represented by a single whisker?
3. What percentage of data is represented by the inner two boxes in a box-and-whisker diagram?
4. What does the  button open?
5. Why would we want to fit a regression curve to data?

Time required

About 70 minutes.

Getting Started

We will begin this lesson by constructing a Histogram to help us analyze a set of data. Next, we will explore data using box-and-whisker diagrams and scatter plots. When you take Statistics, you will learn many other techniques for analyzing data. If you really enjoy Statistics, you may want to consider becoming an Actuary.

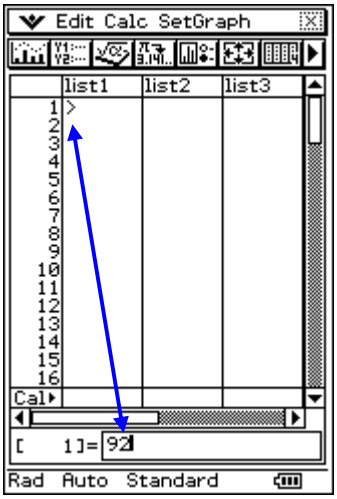
PART I

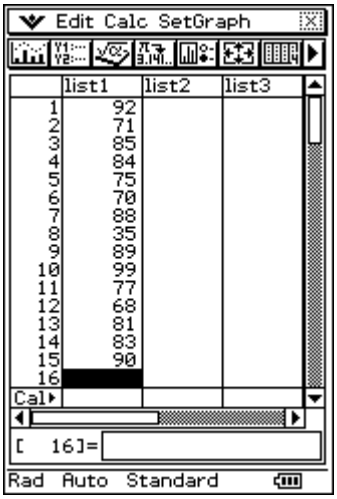
In this part, we will look at data using (a) a histogram diagram, (b) a box-and-whisker diagram and (c) both.

1. Setting Up to Draw a Histogram

a. Open I and clear the window (if needed)
b. Notice **row 1** of **list1** is highlighted
c. Type in the **data** shown in **list1** (test scores from a math final)
d. Press **EXE** after each entry

*To change a number, just click on it and type

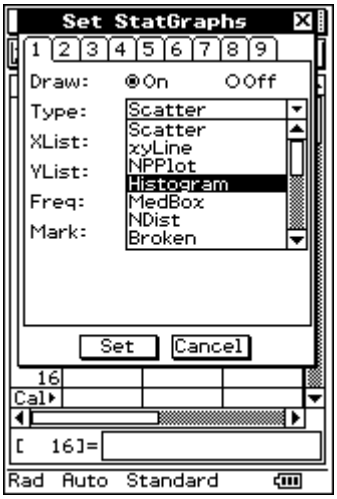


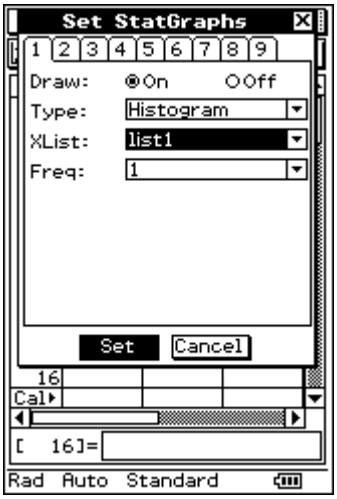


2. Setting Up to Draw a Histogram

In Statistics there are many ways to display data. The different types of distributions you can select to display data are in a dropdown list within the SetGraph menu.

a. We need to set up the histogram
b. Open the **SetGraph menu**
c. Select **Settings…**
d. Click **tab 1** if needed
e. **Draw** should be **On**
f. Change **Type** to **Histogram**
g. Set the **XList** to **list1**
h. Set the **Freq** to **1**
i. Click **Set**

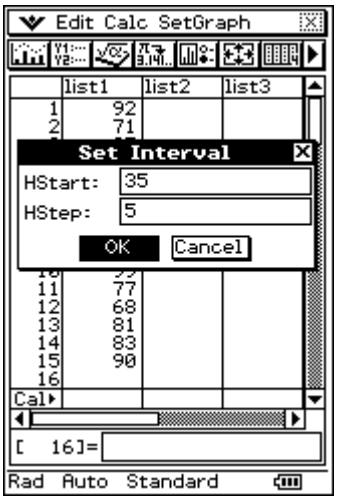


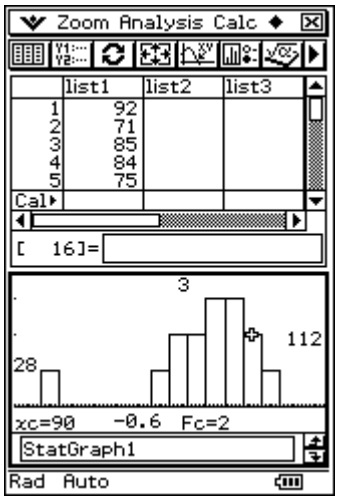


3. Drawing a Histogram

When drawing a histogram, we need to decide on a starting point and a width for each class. The height of each bar will show the frequency of the class. We will use a width of five units.

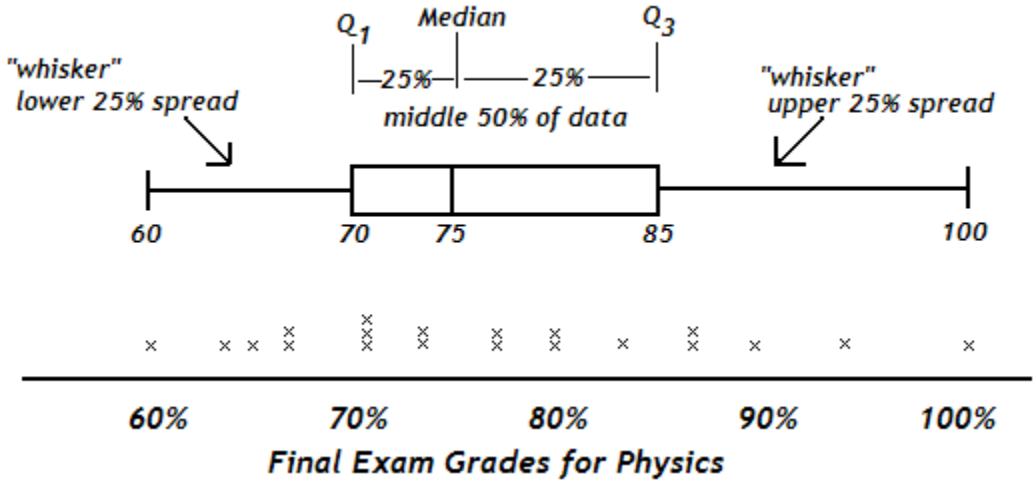
a. Click y to begin the final step
b. Set **HStart** to **35**
c. Set **HStep** to **5**
d. Click **OK**
e. Select **Analysis / Trace**
f. Move the cursor using the your arrow keys or the ' or] arrows on the cursor pad
g. Notice the values below the graph





Next*, box-and-whisker *(example is from a different test):

The box-and-whisker diagram gives us information about data by dividing it into sections of 25% each, called quartiles. Once you understand the box-and-whisker diagram, you will find it very useful.

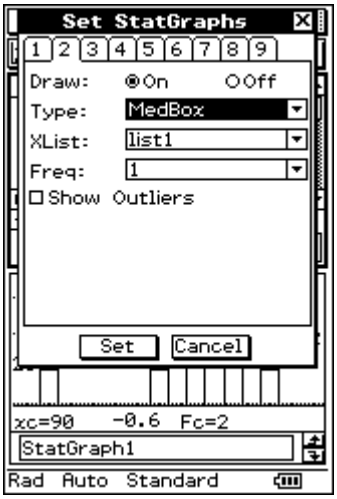


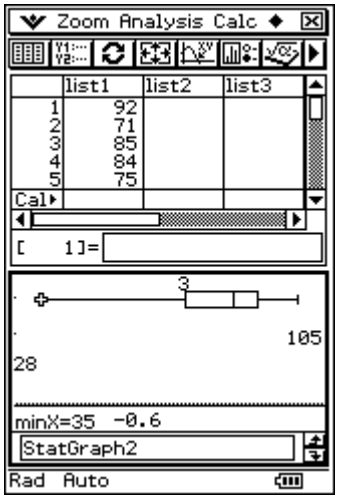
I like box-and-whisker diagrams because they give a lot of information visually. In the diagram we can easily see that:

- 25% of the students scored between 70 and 75 on the test (a spread of 5 points)
- The upper 50% of the scores is more spread out than the lower 50%.
- The high score (end of upper whisker) was a 100.
- The low score (end of lower whisker) was a 60.
- The interquartile range is 85-70=15. So, the inner 50% of the scores are within 15 points of each other.

4. Drawing a Box-and-Whisker Diagram for our Math Grades

a. **Click** on the G button
b. Select **tab 2**
c. Change Draw to **On**
d. For **Type** select **MedBox** (this means Box and Whisker)
e. Select **tab 1** and change Draw to **Off**
f. Click **Set**
g. **Click** y if needed
h. Select **Analysis / Trace**
i. **Explore…**

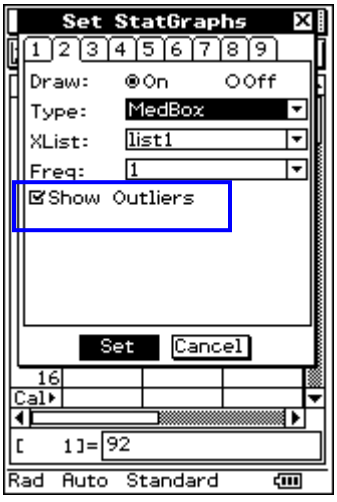


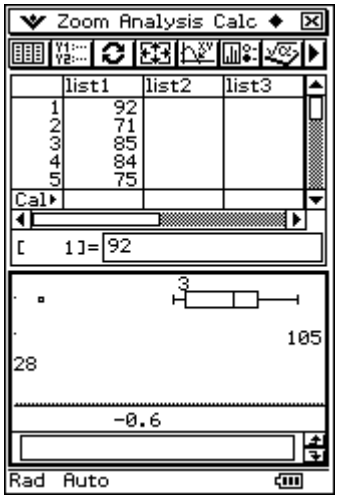


5. Viewing Outliers

Notice that the grade of 35 is much lower than all other grades. We can exclude this value (called an "outlier") by checking Show Outliers.

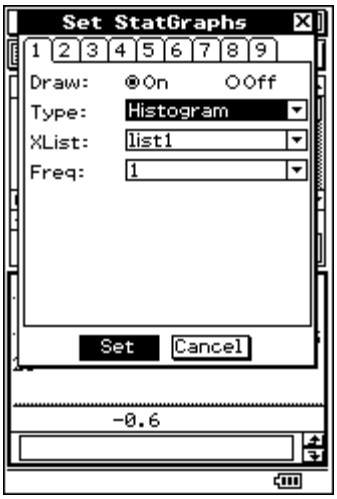
a. **Click** on the G button
b. Select **tab 2**
c. Check **Show Outliers**
d. **Click Set**
e. **Click** y if needed

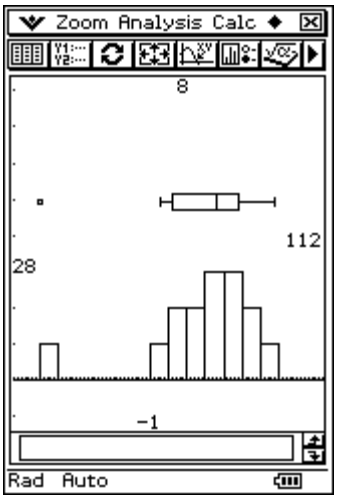




6. Viewing Two Diagrams at Once

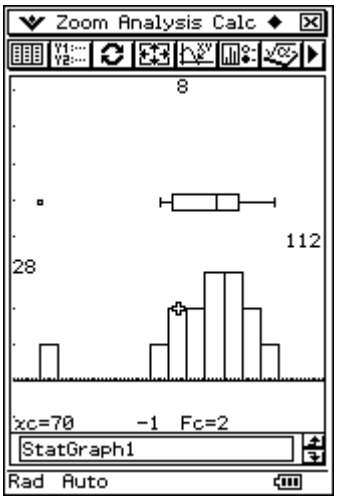
a. **Click** on the G button
b. Select **tab 1** and change Draw to **On**
c. Click **Set**
d. **Click** y if needed
e. Set **HStart** to **35**
a. Set **HStep** to **5**
b. Click **OK**
f. Click **Resize**
g. Press the **up arrow key three times** to separate the diagrams

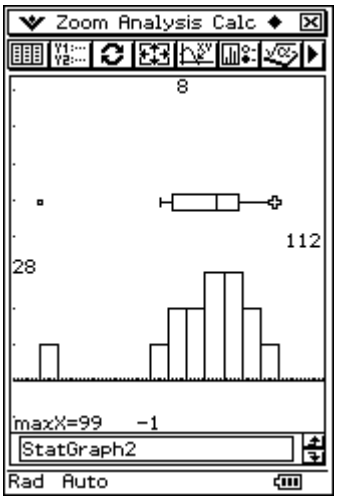




7. Tracing Two Diagrams

a. Open the **Analysis menu** and select **Trace**
b. Use your **left** and **right arrow keys** to move along the histogram
c. Use the **up arrow key** to jump to the box-and-whisker diagram
d. Use the **down arrow key** to jump back





PART I
Practice Exercises

Before beginning the practice exercises, open a word document, type in the following information and then *save it as Lesson11 in your CASIO folder within My Documents*:

- Date: (enter today's date)
- To: (put your instructor's name here)
- From: (put your name here)
- Re: Lesson 11

1. The table below contains a list of US Presidents and their age at the time of their inauguration into office.

President	Age at Inauguration	President	Age at Inauguration
Washington	57	B. Harrison	55
J. Adams	61	Cleveland	55
Jefferson	57	McKinley	54
Madison	57	T. Roosevelt	42
Monroe	58	Taft	51
J. Q. Adams	57	Wilson	56
Jackson	61	Harding	55
Van Buren	54	Coolidge	51
W. H. Harrison	68	Hoover	54
Tyler	51	F. D. Roosevelt	51
Polk	49	Truman	60
Taylor	64	Eisenhower	61
Fillmore	50	Kennedy	43
Pierce	48	L. B. Johnson	55
Buchanan	65	Nixon	56
Lincoln	52	Ford	61
A. Johnson	56	Carter	52
Grant	46	Reagan	69
Hayes	54	G. Bush	64
Garfield	49	Clinton	46
Arthur	51	G. W. Bush	54
Cleveland	47		

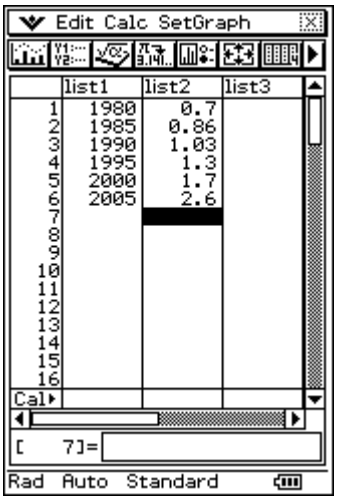
2. Open the eActivity named **L11_PartI_a** in the **Lesson 11** folder.
3. The Presidents' ages are listed in list1 for you! Expand the List Editor strip.
4. Draw a **box-and-whisker (MedBox)** diagram for the Presidents' ages.
5. Trace so that the youngest president's age shows below the graph.
6. Once you have the age showing, get a **screen capture**. Paste it into your Lesson11 document (under a title of PART I).
7. Trace so that the oldest president's age shows below the graph.
8. With the oldest age showing, get a **screen capture.** Add two blank spaces following the first screen capture and then paste this one.
9. Draw a **Histogram** (using tab 2) of the President ages using a **frequency** of **1**. Begin the histogram at **40** and step in **5** year increments.
10. **Resize** the window and press the up arrow a few times to separate the diagrams.
11. With both diagrams showing, get a **screen capture.** Add two blank spaces following the last screen capture and then paste this one.
12. You do not need to save your eActivity!

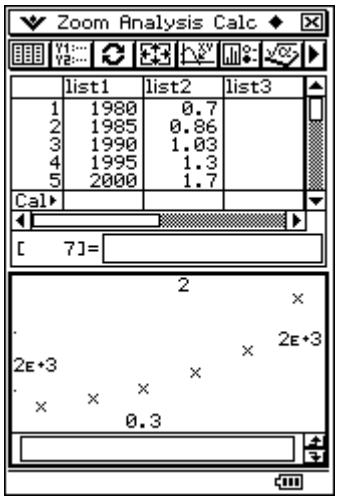
PART II

One important use of Statistics is to make predictions based on data we collect by trying to fit it to a pattern. In this section, we will construct scatter plots and fit regression curves to the data.

1. Drawing a Scatter Plot

a. Open Statistics and clear the window
b. **Input** the data shown
*The data shows the average yearly cost of a gallon of gas since 1980
c. Click y to plot the data
d. Spreadsheet plots a scatter plot by default!
e. Click G
f. Change **Mark** to **cross**
g. Click y if needed



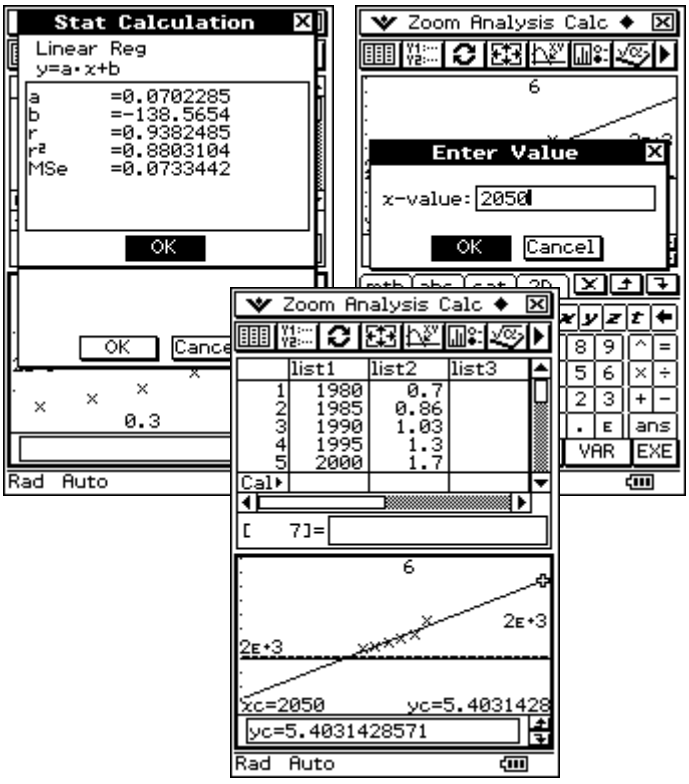


2. Using Data to Predict the Future

a. While the Graph window has focus, open the **Calc menu** and select **Linear Reg**
b. Set **Copy Formula** to **y1**
c. Click **OK**
d. Data for your regression line shows
e. Click **OK** again
f. Pretty good fit!
g. **PRESS** the **– key TWICE** to **zoom out**
h. Open the **Analysis menu** and select **Trace**
i. To predict the cost of gas in the year 2050, **TYPE** in **2050** and click **OK**

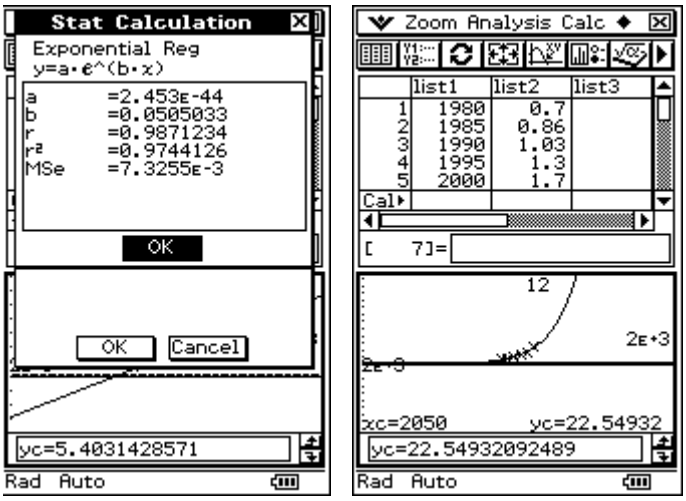
*We predict that a gallon of gas will cost $5.40 in 2050.

Is this a good prediction?



3. Another Regression Curve

a. While the Graph window has focus, open the **Calc menu** and select **Exponential Reg**
b. Set **Copy Formula** to **y2**
c. Click **OK**
d. Data for your regression line shows
e. Click **OK** again
f. Better fit!
g. **PRESS** the **–key THREE times** to **zoom out**
h. Open the **Analysis menu** and select **Trace**

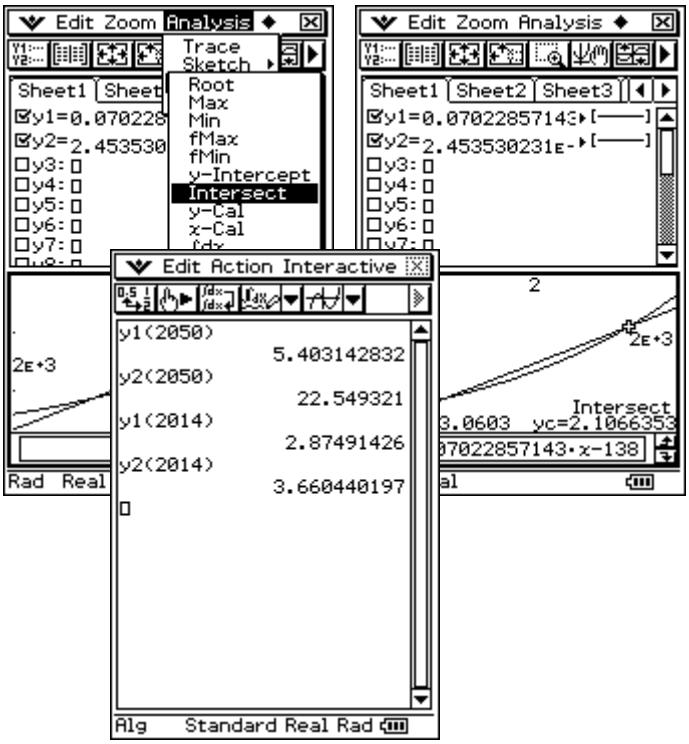


j. After selecting Trace and zooming, to predict the cost of gas in the year 2050, **TYPE** in **2050** and click **OK**

*Is a cost of $22.55 a better estimate for a gallon of gas in 2050? Only time will tell!

4. Using the Copied Formulas (y1 and y2)

a. **Click** m and **then** W
b. The regression curves copied to y1 and y2 show
c. **Click** $ to graph them
d. **PRESS** the **+ key THREE times**
e. Find the points of intersection (years same cost is predicted)
f. **Click** m and **then** M
g. Clear the Main window
h. **Type** in y1(2050) and click u to evaluate
i. **Type** in y2(2050) and click u to evaluate
j. Try other years if you want to.



PART II
Practice Exercises

1. The table below contains the amount of money spent (in millions of dollars) on fishing tackle in the US from 1986 to 1995.

Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Amount Spent	615	673	775	850	760	772	775	701	689	730

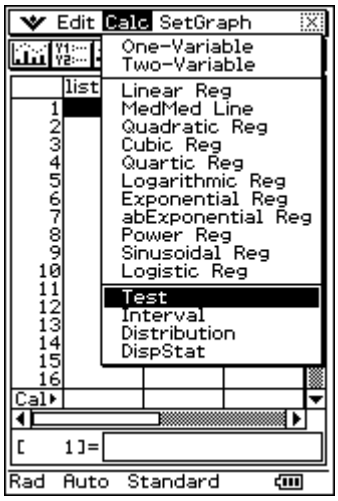
2. Open the eActivity named **L11_PartII_a** in the **Lesson 11** folder.
3. Expand the List Editor strip, and draw a scatter plot of the data.
4. With your scatter plot showing, get a **screen capture.** Paste it into your Lesson 11 document (under a title of PART II).
5. Calculate a linear regression for your scatter plot and then graph it.
6. With your linear regression graph and scatter plot showing, get a **screen capture.** Add two blank spaces following the first screen capture and then paste this one.
7. Calculate a cubic regression for your scatter plot and then graph it.
8. With your cubic regression graph and scatter plot showing, get a **screen capture.** Add two blank spaces following the last screen capture and then paste this one.
9. You do not need to save your work!

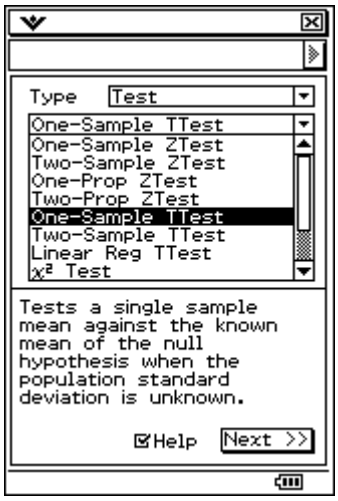
PART III

In this part, we will work with the Statistics Wizard. The wizard is very useful for studying tests, intervals and distributions.

1. Where is the Statistics Wizard?

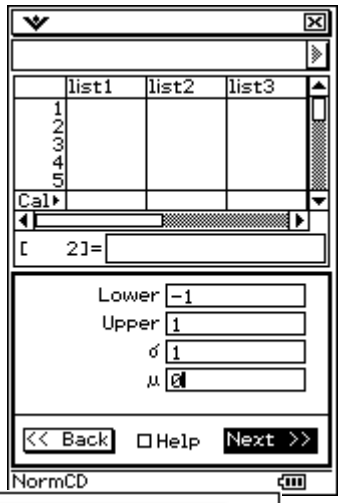
a. Open I
b. Select **Calc / Test**
c. Resize the window
d. Check **Help**
e. Scroll to view the different types of tests
f. You can also scroll through the list using the keyboards **up** and **down arrows**

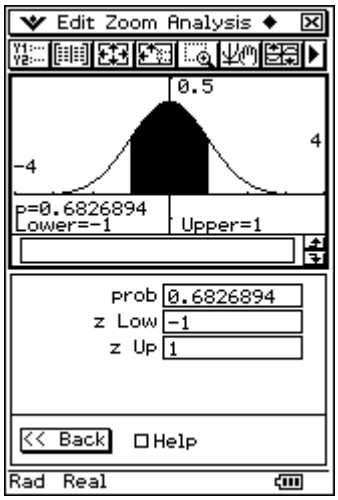


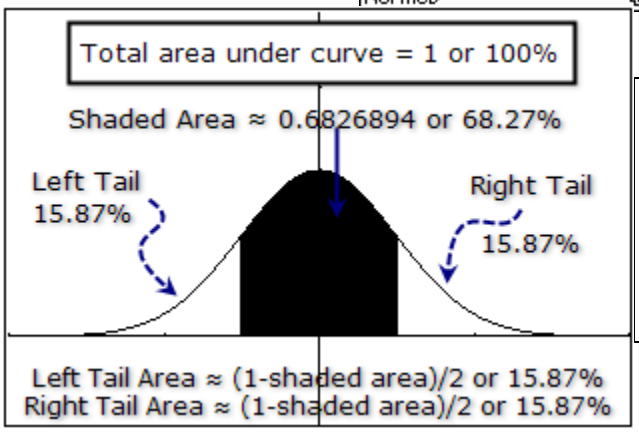


2. Using the Statistics Wizard to Explore

a. **Resize** and click in the **List Editor**
b. Select **Calc / Distribution**
c. Select **Normal CD**
d. Click **Next** and input the data shown
e. Click **Next** again
f. Click $to graph



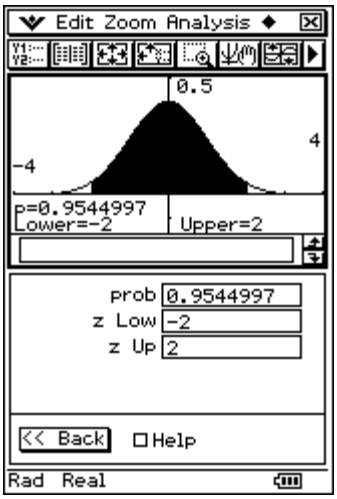


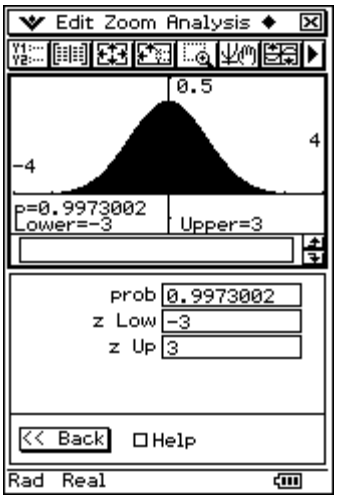


This shows that roughly 68.27% lies within 1 standard deviation (σ) on either side of the mean (μ).

3. Exploring by Editing Data (continued from #2)

a. Click **Back** once
b. Change **Lower** to **-2** and **Upper** to **2**
c. Click **Next** again
d. Click $ to re-graph
e. Click **Back** once
f. Change **Lower** to **-3** and **Upper** to **3**
g. Click **Next** again
h. Click $ to re-graph





Notice that roughly **95.45% lies within 2 standard deviations** (σ) on either side of the mean (μ).
And, roughly **99.73% lies within 3 standard deviations** (σ) on either side of the mean (μ).

PART III
Practice Exercises

1. Assume that the weights of chicken eggs are normally distributed with a population mean μ (called "mu") of 60g and a standard deviation σ (called "sigma") of 4g.
2. A farmer gives you a sample of 5 eggs (n=5). You decide to try a few statistical tests on the eggs.
3. First, you find the average weight of the sample eggs. The average weight, called the sample mean or x-bar, is 63g.
4. Open the Statistics application and select **Calc / Test**.
5. For **Type Test**, select **One-Sample ZTest**.
6. Select **Variable** (not List).
7. Click **Next**.
8. For the **condition** select greater than (**>**).
9. Input the required information. **Hint:** Open Help and click in each field to figure out which values go where.
10. Get a **screen capture.** Paste it into your Lesson 11 document (under a title of PART III).
11. Click **Next**.

12. Click the  button. With your data results and graph showing, get a **screen capture.** Add two blank spaces following the last screen capture and then paste this one.

*What does the data mean?

One way to think about the result is this: If the μ condition is true (the mean weight is 60g) then there is about a 4.7% chance that we will obtain a sample of 5 eggs with an average weight that is 63g (x-bar) or greater.

13. Click **Back.**
14. Change the **μ condition** to less than (**<**).
15. Click **Next**.
16. Click the  button.
17. With your data results and graph showing, get a **screen capture.** Add two blank spaces following the last screen capture and then paste this one.

*In this case, if the μ condition is true (the mean weight is 60g) then there is about a 95.3% chance that we will obtain a sample of 5 eggs with an average weight that is 63g (x-bar) or less. Hey, this makes sense!

PART IV

Reflection Exercises

You have just completed the eleventh lesson in ClassPad 101. I hope you enjoyed learning about Statistics. Please take a few moments to copy and paste the following four questions at the end of your Lesson11 document and answer them.

1. Approximately how long did it take you to complete this lesson?
2. Which activity did you find particularly useful?
3. Did you find any part of this activity difficult to follow? If so, which part? Also, how did you overcome the difficulty?

Assessment 11: Introduction to Statistics

- **Checkpoint**: Your word processed document, titled "Lesson11", should contain the following activities:
  1. Three screen captures from PART I.
  2. Three screen captures from PART II.
  3. Three screen captures from PART III.
  4. Three reflection questions with answers from PART IV.
- **Submit** your **Lesson11 document** to your instructor for grading.

