Exploring Normality

Here are some data on men's heights from 100 randomly selected men listed in a frequency table. Note: heights are in inches.

1. Begin a new document on your Nspire. Press (on), select *New document,* then *Add Lists & Spreadsheet.*

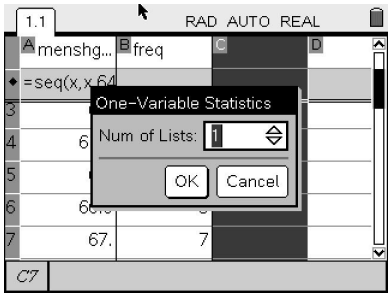
2. At the top of Column A, make sure to name your list, **menshghts**. To enter the data in **menshghts**, use the sequence command. In the formula bar press (enter) and type **seq(x, x, 64, 77, 0.5).**

3. Name column B, **freq,** and enter the frequencies in column B.

Men's hght (in)	Freq	Men's hght (in)	Freq
64	1	70.	13
64.5	2	70.5	5
65.	6	71.	7
65.5	1	71.5	7
66.	4	72.	3
66.5	3	72.5	1
67.	7	73.	4
67.5	6	73.5	4
68.	3	74.	1
68.5	11	74.5	1
69.	5	76.	1
69.5	3	77.	1

What do notice about your lists of data and the table above?

4. To perform one variable statistics, press (menu) and select *Statistics*, *Stat Calculations*, *One-Variable Statistics*. The following windows will be displayed:



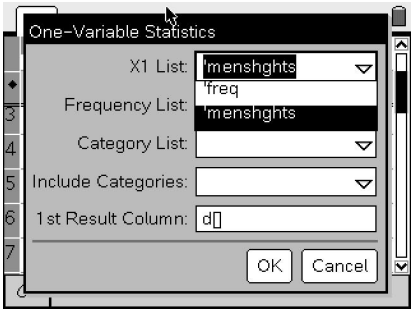
(tab) to OK and press ☐.

X1 List → <men's heights>

Frequency List → <frequencies>

(tab) to OK and the one variable statistics should be displayed.

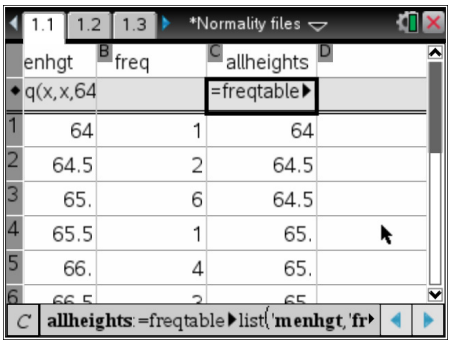
Each calculation is stored as a **stat.** variable.



Graphing the data

To graph the data and be able to explore the normality, we have to create a list that contains all of the men's heights.

1. In the *Lists & Spreadsheet*, name a new column: **allheights.**
2. Press [enter] and in the formula bar press [enter] again. Press [📖] and arrow down to **freqtable▸list.**
3. Press [enter], [var], and select **menhgt.** Then press [var] again and select **freq**.
4. Press [enter] and all of the men's heights should be displayed in the list.



Displaying the graph

5. Press [ctrl] [I] to insert a *Data & Statistics* page.
6. Press (tab) and select **allheights** for the horizontal axis. The data should now move into a dotplot.

   The frequency plot is now displayed in a *Data & Statistics* page as a histogram.
   NOTE→ To change your plot type press (menu) *Plot type*, and you can change your dotplot to a *Histogram*, a *Box Plot,* or a *Normal Probability Plot*.

7. Looking at the histogram, answer the questions below.

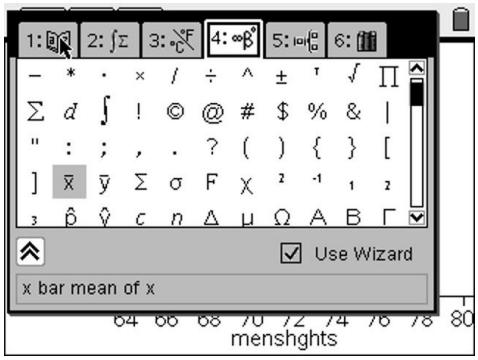
Describe this histogram.

Can we state these data are approximately normal? Why or why not?

Determine if the data satisfy the empirical rule. List all necessary information.

To explore the normality, let's change the bin width to the standard deviation and the alignment to the mean. The standard deviation for the men's heights is stored as **stat.sx** and the mean of the men's heights is stored as **stat.x̄.**

4. On the Data & Statistics page, arrow to an empty space in the graph and press (ctrl) (menu). Change the bin width → **stat.sx** (standard deviation of the men's heights) and the alignment → **stat. x̄** (To access the **x̄,** while in the alignment box press (📖). Press (tab) until the [1:📖] has a box around it, [1:📖]. Then press ▶ until the math symbols tab is highlighted.)



Describe what happened to the histogram. What does each of the columns represent?

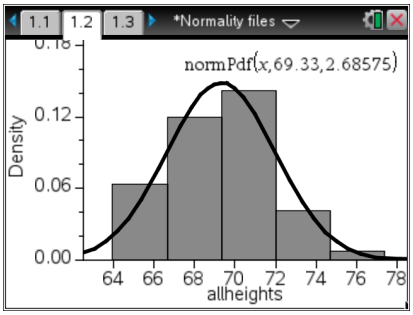
Arrow over each column in the histogram, click [⊙], and hold. Do this for each of the bars of the histogram.

What do these numbers mean and how do they compare with the numbers you used to determine if the data follow the empirical rule?

8. After checking if the data follow the empirical rule, change the vertical axis to **density.** In an empty space in the graph, press ctrl menu , *Scale*, *Density*.

9. We can use the *normal pdf* command and **overlay** the normal curve for this set of data.

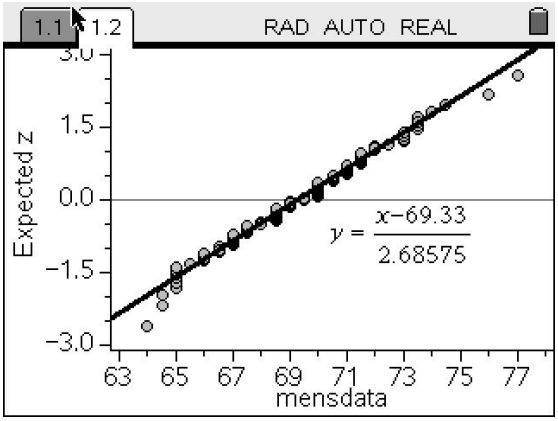
   Press menu *Analyze*, *Show Normal PDF*.



Based on the overlay of the Normal Curve, how would you describe the fit of the data to the normal curve?

10. The last way to check for normality is the **Normal Probability Plot**.

Press (menu), *Plot Type*, *Normal Probability Plot*.



Describe this normal probability plot.

Can we say the distribution of these heights is normal? Use the three previous graphs to support your conclusion.