Statistics with the TI-86

The TI-86 Manual, besides coming with your calculator, can be downloaded or read in a browser in Adobe Acrobat Reader form from http://education.ti.com/product/pdf/gb/ti86book.pdf.

Using Graphlink to Transfer Files

You can link two TI-86's and select the data types to be transmitted, including programs. You can also back up the entire memory of a TI-86 onto another TI-86. To do this, you connect the calculators by the graphlink cable. Make sure that it is inserted securely in each calculator. How to do this is found in Chapter 18 of the Manual.

Receiving Files. If you have the receiving calculator, hit 2^{nd} LINK RECV. You then get the Waiting message and the busy indicator. This means the calculator is ready to receive a transmission. To cancel this receive mode, press ON. If you get a LINK TRANSMISSION ERROR message, hit EXIT to get back to the LINK menu. If all items are transmitted successfully, you get the Done message. If a file comes through with the same name as one on your calculator, you will get a DUPLICATE NAME error message. Then you must select an option from the menu. RENAM prompts you for a new name, which you type in followed by ENTER. OVERW replaces what is presently on the calculator with the new file. SKIP jumps to the next file. EXIT cancels the rest of the transmission.

Sending files. To transmit files to another calculator, hit 2^{nd} LINK SEND. You will primarily transmit programs (hit PRGM) and lists (hit MORE LIST). You could also choose ALL. Whichever you choose, arrow down through the list of file names, hitting SELCT each time you are in front of one you want to send. To send all in the list, just hit ALL+. To deselect all, hit ALL-. Once all have been selected, making sure the other calculator is in receive mode, hit XMIT.

Installing the Inferential Statistics and Distribution Features

These features are installed by means of assembly language. This will give the TI-86 statistical features similar to the TI-83+. By using graphlink, transfer the program Infstats to your calculator. The receiving calculator should hit 2^{nd} LINK RECV. The sending calculator should hit 2^{nd} LINK SEND PRGM. You will see a screen similar to that of Figure 1. Down arrow until the cursor is in front of Infstats, then hit SELCT. Then hit XMIT. This should transmit the program. Once that is done, hit 2^{nd} CATLG-VARS CATLG. Then use the up and down arrows to move the cursor to a position in front of Asm(- see Figure 2 - and press ENTER. Then hit the PRGM key, followed by NAMES from the menu. Then find Infstat in the bottom menu line (you may need to hit the MORE key one or more times to do this – See Figure 3) and select it by hitting the appropriate button. Now hit ENTER. You get a message saying that some things will be overwritten. That is probably harmless for us, so hit F1 for Continue. Once you get the message Done, you can hit the CLEAR key to clear the screen. At this point, you can now find the new STAT menu at 2^{nd} MATH MORE.

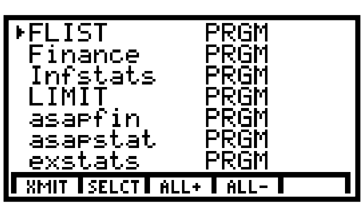

Figure 1 Figure 2 Figure 3

A manual covering these features can be downloaded or read in a browser in Adobe Acrobat Reader form from http://www.ti.com/calc/pdf/86infst.pdf.

Setting a Custom Menu

To access the custom menu in the calculator, press the CUSTOM key. You put in the custom menu items that you refer to often. But how do you put items in this menu? Start by hitting 2nd CATLG-VARS and then CATLG. This is a list of all things that can be placed in the custom menu. Suppose you wish to put rand in the fourth position of our custom menu. Use the ▲, ▼, PAGE↑, and PAGE↓ keys to get the cursor arrow just to the left of rand. Your screen should look something like Figure 4 below. Now press CUSTM(F3). You get a screen like Figure 5. Now press F4. This puts rand in the fourth position. Anything already there will be overwritten. See Figure 6. To get back to the menu bar of Figure 4, just press EXIT. To blank out an item in the custom menu, hit BLANK followed by the key F1-F5 below the item you wish to blank out. Recall that a ▸ at the right hand end of the menu bar means more items can be accessed by pressing MORE. This menu can then be accessed at any time by simply pressing the CUSTOM key.

Figure 4

Figure 5

Figure 6

Random Numbers on the TI-86

The random number commands are found at 2nd MATH PROB. They are:

rand (Returns a random number > 0 and < 1 after ENTER is punched. Continuing to punch ENTER generates more random numbers. To control a random number sequence, first store an integer seed value to rand (such as 0▸rand) where ▸ refers to the STO▸ key. Entering 0▸rand:rand, for instance, followed by as many ENTER strokes as you wish random numbers, will always generate the same sequence of random numbers.)

randInt(*lower*, *upper* [,*#of Trials*]) (This is randIn on the menu. Returns a random integer bound by the specified integers, *lower* ≤ integer ≤ *upper* ; to return a list of random integers, specify an integer > 1 for *#ofTrials*.)

randNorm(*mean*, *stdDeviation* [, *#ofTrials*]) (This is randN on the menu. Returns a random real number from a normal distribution specified by *mean* and *stdDeviation*; to return a list of random numbers, specify an integer > 1 for *#ofTrials*.)

randBin(*#ofTrials*, *probabilityOfSuccess* [, *#ofSimulations*]) (This is randBi on the menu. Returns a random real number from a binomial distribution, where *#ofTrials* ≥ 1 and 0 ≤ *probabilityOfSuccess* ≤ 1; to return a list of random numbers, specify an integer > 1 for *#ofSimulations*.

You can find more about this on page 50 of the Manual.

Descriptive Statistics on the TI-86

Entering lists on the home page. To do statistics on the calculator, you work with lists. You will save lists to list variables. Any legal variable name can be used. Lists are entered manually on the home page by beginning with a left brace "{", typing in the numbers separated by a comma, and ending with a right brace "}". The braces are found by hitting 2nd LIST. Suppose you have two lists as follows:

x	10	8	13	9	11	14	6	4	12	7	5
y	7.46	6.77	12.74	7.11	7.81	8.84	6.08	5.39	8.15	6.42	5.73

Also, suppose you want to save the x list as LA and the y list as LB since these lists will be used later. Start with the x list. After hitting CLEAR to clear the home page (possibly preceded by some EXIT's to clear any menus), hit 2nd LIST {. This places the left brace on the home page. See Figure 7. Then punch in the numbers, each separated by a comma, followed by }. See Figure 8. To save the list as LA, hit the **STO▸** key. The cursor is now in alpha mode (a capital A shows in the cursor), so type the list name LA. Then hit ENTER. See Figure 9. (Hitting ALPHA shifts one from numeric to and from alpha mode.) The y list can similarly be entered as LB.

Figure 7

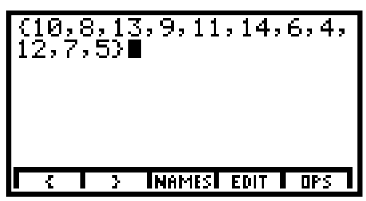

Figure 8

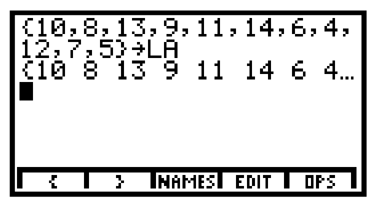

Figure 9

Editing lists with the TI-86. There are two ways to get to the list editor in the TI-86, 2nd LIST EDIT and 2nd STAT EDIT. Three lists that are always present in the TI-86 are xStat, yStat, and fStat. To enter a list called PROTEIN, whose elements are listed below, hit 2nd STAT EDIT. You get a window like that in Figure 10. Use the up arrow key to move the cursor to the top row, and then the right arrow key to move horizontally until you reach a blank column. See Figure 11. Then type PROTEIN and hit ENTER▼.

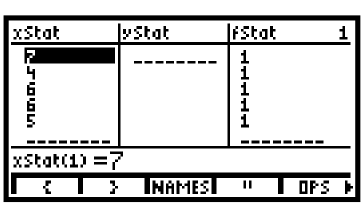

Figure 10

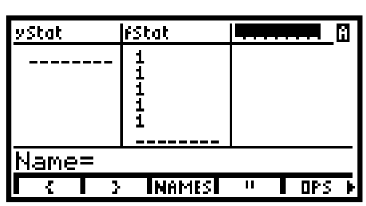

Figure 11

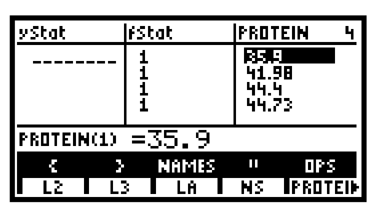

Figure 12

Now successively punch in each of the 61 elements in the list, each followed by ▼ or ENTER.

35.90	41.98	44.40	44.73	47.23	51.16	51.70	53.07	54.07	54.38	54.41	55.05	55.47
57.68	57.73	57.90	58.50	59.20	59.36	59.76	61.10	61.70	61.90	62.20	62.32	62.80
63.96	66.60	67.10	67.20	69.91	70.17	71.50	72.10	72.20	72.30	73.50	73.53	74.78
76.33	77.40	77.63	78.15	79.55	82.60	83.82	84.70	85.40	86.24	88.17	88.78	91.47
95.06	95.33	100.36	106.00	109.30	114.79	128.40	149.49	153.56				

When editing an already entered list, use the arrow keys to move horizontally to the list you want to work with. Then edit the list, adding or changing items as necessary. You can delete any element of a list by hitting the DEL key when the cursor is on that element. To choose a different list to work with, use the arrow keys to move horizontally onto the list you want. If the list you want to work with is not displayed in the list editor, move to a blank spot in the top line, hit NAMES, and, using the MORE key if necessary, choose the list name from the menu using F1-F5. Of course, you could also just type in the list name, as you do if creating a new list. In either case, now hit ▼ or ENTER▼. You can remove a list and all its elements from the editor by hitting the DEL key when the cursor is on the list's name. To sort the list PROTEIN into ascending order, hit 2^{nd} STAT EDIT, move the cursor onto the name PROTEIN, hit OPS sortA 2^{nd} NAMES, find the list name PROTEIN in the menu (you may need to use the MORE key), and then hit ENTER. The list should now be sorted in ascending order. See Figure 12.

One variable statistics with the TI-86. Assuming the lists are properly prepared and that you are on the home page, hit 2nd STAT CALC OneVa. This puts OneVar on the home screen. Unless the list you want the descriptive statistics for is xStat (the default), you either need to type the list name (PROTEIN here) or find it in the list of names at 2nd LIST NAMES. Now hit ENTER. See Figure 13. You can remove any menus remaining by using the EXIT key. You can get any hidden results by hitting ▼ or ▲. From top to bottom you have the mean, the sum of the data entries, the sum of the data entries squared, the sample standard deviation, the population standard deviation, the number of data points, the minimum value, the first quartile value, the median, the third quartile value, and the maximum value.

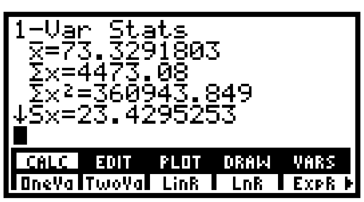

Figure 13

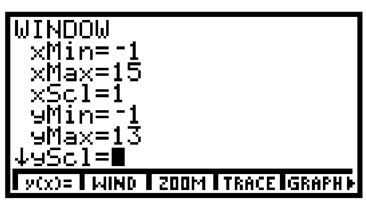

Figure 14

Two variable statistics with the TI-86. Use the lists LA (the x's) and LB (the y's) entered earlier. If you intend to draw a scatter plot, do the following: Hit GRAPH y(x)=. Then hit DELf until all functions are erased. Next hit 2nd WIND. Notice that the x's are between 4 and 14 and the y's are between 5 and 13. To set a graphing window that includes all of these values, sets reasonable scales, and has the axes showing, enter the numbers -1, 15, 1, -1, 13, 1 in order, each followed by ▼. Figure 14 shows the screen just prior to the last ▼. This sets my axes for my graph. The x-axis will go from -1 to 15 with tic marks each one unit, and the y-axis will go from -1 to 13 with tic marks each one unit. This insures that each of the (x,y) data pairs will plot on the viewing screen and that both axes will be seen. Now hit EXIT.

Then I hit 2nd STAT CALC LinR 2nd LIST NAMES. Choose LA from the list, hit the “,” key, and then choose LB from the list. Finally, hit ENTER. You get a listing like that in Figure 15 (hitting EXIT once shows the whole display). Then hit 2nd STAT DRAW SCAT to get the scatter plot. Hitting CLEAR gives Figure 16. Hit EXIT to get the menus back. Hitting MORE DRREG adds the graph of the regression line to the scatter plot of Figure 16. Again hitting CLEAR, you get Figure 17.

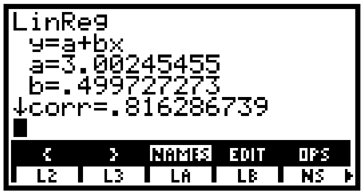

Figure 15

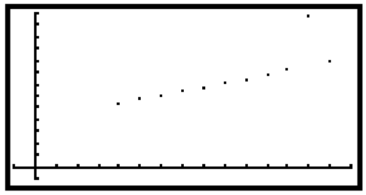
Figure 16

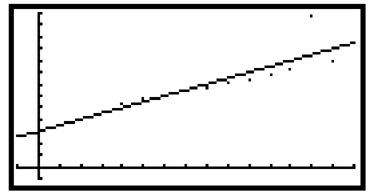
Figure 17

You can forecast based on the regression line. This can be done at any time after LinR. Go to the main STAT menu (2nd STAT) and hit MORE FCST. Type in a value for x that is within the range of your x values (or close to them), say 15, and then hit ▼. You get the display in Figure 18. Then hit SOLVE. You get the display of Figure 19, which gives the corresponding y-value from the regression line.

Figure 18

Figure 19

Probability Distribution Functions on the TI-86

Binomial Distribution. Assume that for a sample of n=15 you have that p = .75. You want to find first P(X=6 | 15, .75). We can compute this probability by using the **binomial probability density function**

$$f(x) = \binom{n}{x} p^x (1-p)^{n-x}, x = 0...n.$$

After clearing your screen, hit 2nd MATH MORE STAT DISTR MORE bipdf. This places bipdf(on the home screen. Complete this to bipdf(15,.75,6) and hit ENTER. You get that first P(X=6 | 15, .75) = .0034. See Figure 20. If you do not put in the parameter x=6, you get a list of all the probabilities from P(X=0) through P(X=15). See Figure 21. You use the right arrow key to see the values that are to the right.

Figure 20

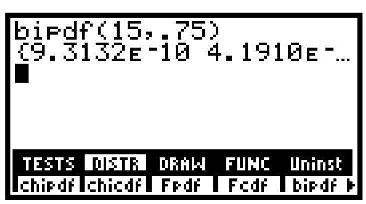

Figure 21

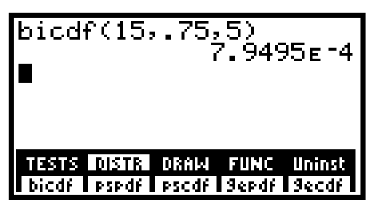

Figure 22

To find P(X≤5 | 15, .75), use the **binomial cumulative density function**. After clearing your screen, hit 2nd MATH MORE STAT DISTR MORE MORE bicdf. Complete this to bicdf(15,.75,5) and hit

ENTER. You get that P(X≤5 | 15, .75) = .0008. See Figure 22. If you do not put in the parameter x=5, you get a list of all the cumulative probabilities from P(X≤0) through P(X≤15). See Figure 23. You use the right arrow key to see the values that are to the right.

To find P(6≤X≤9 | 15, .75), use P(X≤9 | 15, .75) – P(X≤5 | 15, .75). On the TI home screen, this would be bicdf(15,.75,9) – bicdf(15,.75,5). See Figure 24.

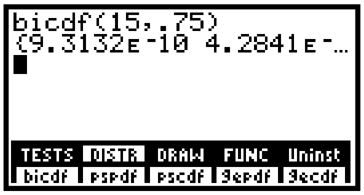

Figure 23

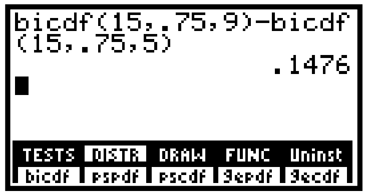

Figure 24

Poisson Distribution. Assume that λ = .5. You want to find P(X=1 | .5). You can compute this probability by using the **Poisson probability density function**

$$f(x) = \frac{e^{-\lambda}\lambda^x}{x!}, x = 0,1,2,\ldots.$$

After clearing your screen, hit 2nd MATH MORE STAT DISTR MORE MORE pspdf. This places pspdf(on the home screen. Complete this to pspdf(.5,1) and hit ENTER. You get that first P(X=1 | .5) = .3033. See Figure 25. Instead of putting in the parameter x=1, you may enter a list of x's instead.

To find P(X≤7 | 2.2), use the **Poisson cumulative density function**. After clearing your screen, hit 2nd MATH MORE STAT DISTR MORE MORE pscdf. Complete this to pscdf(2.2,7) and hit ENTER. You get that P(X≤7 | 2.2) = .9980. See Figure 26. Instead of putting in the parameter x=7, you may enter a list of x's instead.

To find P(4≤X≤9 | 2.2), use P(X≤9 | 2.2) – P(X≤3 | 2.2). On the TI home screen, this would be pscdf(2.2,9) – pscdf(2.2,3). See Figure 27.

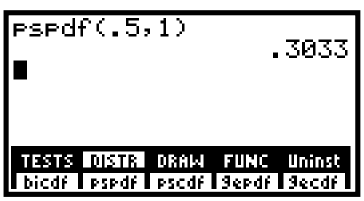

Figure 25

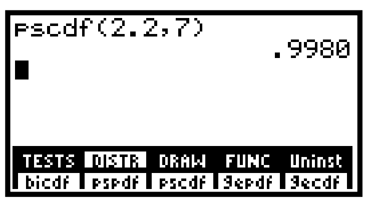

Figure 26

Figure 27

Normal Distribution. The **normal probability density function** is given by

$$f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{\frac{-(x-\mu)^2}{2\sigma^2}}, \sigma > 0.$$

Assume μ = 100 and σ = 20. You wish to plot the normal curve for these parameters. First go to GRAPH WIND and set the window, based on our parameters, to xMin=40, xMax=160, xScl=20, yMin=0, yMax=.05, yScl=1, and xRes=1. This will allow you to see the curve a distance of three standard deviations from the mean in both directions and cause tick marks to be placed along the x-axis at intervals of one standard deviation. Now hit y(x)= and then hit DELf as many times as necessary to clear \y1=. Then hit 2nd MATH MORE STAT DISTR nmpdf. This leaves you with \y1=nmpdf(showing on the screen. Complete this to \y1=nmpdf(x,100,20). See Figure 28. Then hit EXIT EXIT GRAPH(F5). After hitting CLEAR to remove the menus, you get a screen like that of Figure 29.

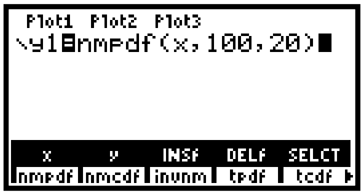

Figure 28

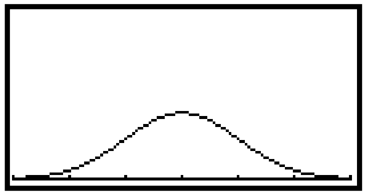

Figure 29

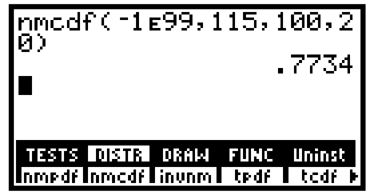

Figure 30

To find P(X≤115), you need to use the **normal cumulative density function**. After clearing your screen, hit 2nd MATH MORE STAT DISTR nmcdf. This places nmcdf(on the home screen. Now complete this to nmcdf(-1E 99,115,100,20) – you get the E by hitting the EE key – and hit ENTER. You get that P(X≤115) = .7734. See Figure 30. Again, not including the mean and standard deviation will result in the assumption of the standard normal distribution. To find P(X≥95), you would complete the command to nmcdf(95,1E 99,100,20). Note that -1E 99 represents -∞ and 1E 99 represents +∞. To find P(90≤X≤135), complete the command to nmcdf(90,135,100,20).

To find x_1 such that P(X≤ x_1) = .6523, after clearing the screen, hit 2nd MATH MORE STAT DISTR invnm. This is for the **inverse normal distribution function**. . This places invnm(on the home screen. Now complete this to invnm(.6523,100,20) and hit ENTER. You get that x_1 = 107.8307. See Figure 31.

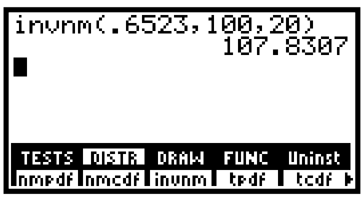

Figure 31

Figure 32

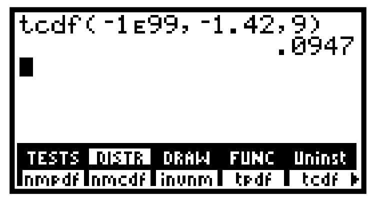

Figure 33

Student's *t* Distribution. The **cumulative *t* distribution** can be used to compute probabilities such as P(*t*≥1.23|df=18) or P(*t*<–1.42|df=9). To find the former, hit 2nd MATH MORE STAT DISTR tcdf and complete the command to tcdf(1.23, 1E99,18) to get P(*t*≥1.23|df=18) = .1173. See Figure 32. To find the latter, hit 2nd MATH MORE STAT DISTR tcdf and complete the command to tcdf(-1E99, -1.42, 9) to get P(*t*<–1.42|df=9) = .0947. See Figure 33.

χ^2 Distribution. The **cumulative χ^2 distribution** can be used to compute probabilities such as P(χ^2 ≥24|df=16). To find this, hit 2nd MATH MORE STAT DISTR MORE chicdf and complete the command to chicdf (24, 1E99,16) to get P(χ^2 ≥24|df=16) = .0895. See Figure 34.

F Distribution. The **cumulative F distribution** can be used to compute probabilities such as P(F ≥20|num df=3,denom df=6). To find this, hit 2nd MATH MORE STAT DISTR MORE Fcdf and complete the command to Fcdf (20, 1E99,3,6) to get P(F ≥20|num df=3,denom df=6)= .0016. See Figure 35.

Figure 34

Figure 35

Inferential Statistics on the TI-86

Begin by entering two lists of data from two independent samples. As an example, cadmium level determinations were made on the placentas of two groups of mothers in nanograms per gram. The first group of 18 mothers were nonsmokers (NS), while the second group of 14 mothers were smokers (SM).

NS: 10.0 8.4 12.8 25.0 11.8 9.8 12.5 15.4 23.5 9.4 25.1 19.5 25.5 9.8 7.5 11.8 12.2 15.0

SM: 30.0 30.1 15.0 24.1 30.5 17.8 16.8 14.8 13.4 28.5 17.5 14.4 12.5 20.4

NS has a mean of 14.72 and a standard deviation of 6.20, while SM has a mean of 20.41 and a standard deviation 6.81.

Confidence Interval for a Population Mean. To find a 95% confidence interval for the mean of NS, hit 2nd MATH MORE STAT TESTS MORE Tint1. See Figure 36. In the window that comes up, move the flashing cursor, if necessary, onto Data by using the left arrow. Do this since the data has been entered as a list. Now hit ENTER followed by the down arrow, hit DEL as many times as necessary to get rid of any previous list name, then type ALPHA ALPHA NS. Now hit the down arrow twice and type .95. Then hit CALC. You are given (11.64,17.805) as the confidence interval, along with n=18 and the mean and standard deviation. See Figure 37. Hit EXIT or CLEAR to clear the display.

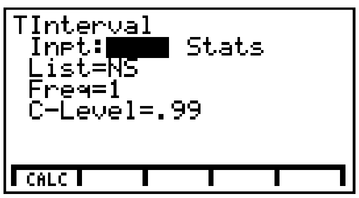

Figure 36

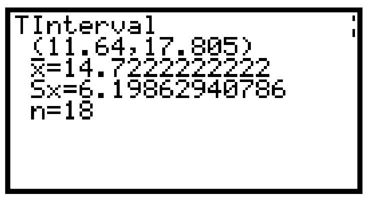

Figure 37

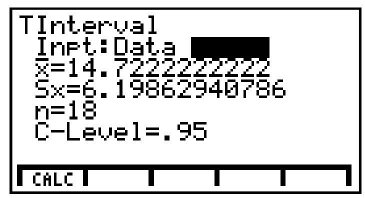

Figure 38

If the data list wasn't in the calculator, but you know the standard deviation and mean, when you get to the choice of Data vs. Stats, rightarrow to Stats, hit ENTER, and then down arrow. See Figure 38. Type in 14.72 for the mean x-bar, down arrow, type in 6.20 for the standard deviation Sx, down arrow, type in 18 for n, down arrow, type in .95 for C-Level, and then hit CALC. Here you get a confidence interval of (11.637,17.803), just a bit different from above since more rounding was done here for the mean and standard deviation.

If the population standard deviation is known, one can use Zint1 instead of Tint1, making use of the normal distribution.

Confidence Interval for the Difference Between Two Population Means. Use NS and SM as data. To find a 95% confidence interval for the difference of the means of NS and SM, hit 2nd MATH MORE STAT TESTS MORE Tint2. In the window that comes up, move the flashing cursor, if necessary, onto Data by using the left arrow. Again, do this since the data has been entered as a list. Now hit ENTER followed by the down arrow. Enter NS for List1, SM for List2, 1 for both Freq1 and Freq2, and .95 for C-Level. For Pooled (pooled variance), assuming that it is not known that the population variances are equal, put the flashing cursor on NO (YES for equal variances), hit ENTER, and then hit CALC. You are given a confidence interval of (-10.49, -.8987) along with other relevant results.

If the population standard deviations are known, one can use Zint2 instead of Tint2, making use of the normal distribution.

Confidence Interval for a Population Proportion. You want a 99% confidence interval for the proportion of a certain population of boys who have attempted suicide. Of a sample of 96 boys, 18 had attempted suicide. Hit 2nd MATH MORE STAT TESTS MORE MORE ZPin1. For x, enter 18; for n, enter 96; and for C-Level, enter .99. Then hit CALC. You are given an interval of (.08489,.29011) with a p-hat of .1875.

Confidence Interval for the Difference between Two Population Proportions. 60 of 123 girls from a related population have attempted suicide. Hit 2nd MATH MORE STAT TESTS MORE MORE ZPin2. For x1, enter 18; for n1, enter 96; for x2, enter 60; for n2, enter 123; and for C-Level, enter .99. Then hit CALC. You are given an interval of (-.4552,-.1454) with a p-hat1 of .1875 and a p-hat2 of .4878.

Hypothesis Testing for a Single Population Mean. Use as a null hypothesis H_0: μ = 14 for the data set NS and use a t-test. Hit 2nd MATH MORE STAT TESTS TTest. See Figure 39. Choose Data by placing the flashing cursor on it and pressing ENTER. Put 14 for μ0, NS for List, 1 for Freq, and ≠μ0 for μ. Hitting CALC gives t=.4943 and p=.6274 along with other results. See Figure 40.

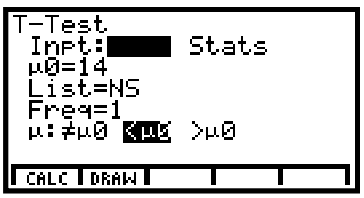

Figure 39

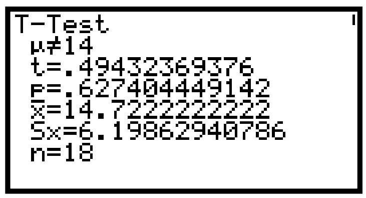

Figure 40

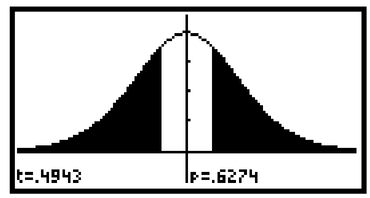

Figure 41

To get a graphical representation instead, hit DRAW instead of CALC. The t and p values are given below the graph. See Figure 41. For this to work, you need to have deleted any functions under y(x)= in the GRAPH menu. To bring up the graph menu, hit the EXIT key. When a menu is obscuring the t and p values at the bottom of the screen, just hit CLEAR.

Hypothesis Testing for the Difference between Two Population Means. Use as a null hypothesis H_0: μ1 = μ2 for the data sets NS and SM and use a t-test. Hit 2nd MATH MORE STAT TESTS Tsam2. Choose Data by placing the flashing cursor on it and pressing ENTER. Put NS for List1, SM for List2, 1 for Freq1 and Freq2, ≠μ2 for μ1, and No for Pooled. Hitting CALC gives that t=-2.4379 and p=.0217 along with other results.

To get a graphical representation instead, hit DRAW instead of CALC. The t and p values are given below the graph. For this to work, you need to have deleted any functions under y(x)= in the GRAPH menu. To bring up the graph menu, hit the EXIT key. When a menu is obscuring the t and p values at the bottom of the screen, just hit CLEAR.

Hypothesis Testing for comparing Two Standard Deviations. Use as a null hypothesis H_0: σ1 = σ2 for the data sets NS and SM and use an F-test. We will also use as an alternate hypothesis H_A: σ1 < σ2 . Hit 2nd MATH MORE STAT TESTS MORE MORE Fsam2. See Figure 42. Choose Data by placing the flashing cursor on it and pressing ENTER. Put NS for List1, SM for List2, 1 for Freq1 and Freq2, and <σ2 for σ1. Hitting CALC gives us F=.8275 and p=.3513 along with other results. See Figure 43.

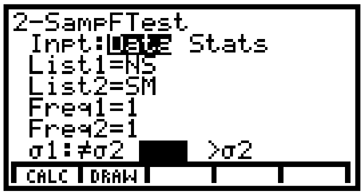

Figure 42

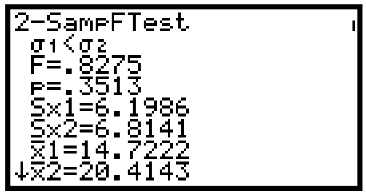

Figure 43

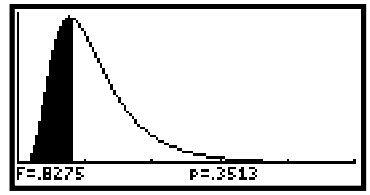

Figure 44

To get a graphical representation instead, hit DRAW instead of CALC. See Figure 44. The F and p values are given below the graph. For this to work, you need to have deleted any functions under y(x)= in the GRAPH menu. . To bring up the graph menu, hit the EXIT key. When a menu is obscuring the F and p values at the bottom of the screen, just hit CLEAR.

Hypothesis Testing for a Single Population Proportion. In a survey of injection drug users in a large city, 18 out of 423, i.e. p-hat = .0426, were HIV positive. Can one conclude that fewer than 5% of the population of injection drug users in the city are HIV positive. Use H_0: p = .05, so H_A: p < .05. Hit 2nd MATH MORE STAT TESTS ZPrp1. See Figure 45. Put in .05 for p0, 18 for x, 423 for n, then move the cursor over <p0 for prop, and then hit CALC. You get as a result that z=-.7027 with a p-value of .2411. See Figure 46.

To get a graphical representation instead, hit DRAW instead of CALC. The z and p values are given below the graph. See Figure 47. For this to work, you need to have deleted any functions under y(x)= in the GRAPH menu. To bring up the graph menu, hit the EXIT key. When a menu is obscuring the z and p values at the bottom of the screen, just hit CLEAR.

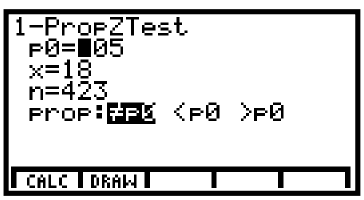

Figure 45

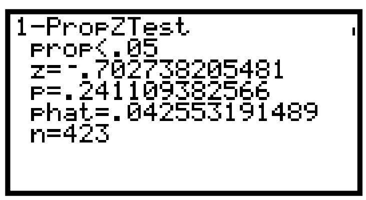

Figure 46

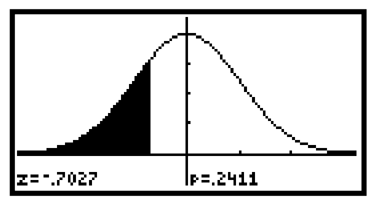

Figure 47

Hypothesis Testing for the Difference between Two Population Proportions. Return to the situation where 18 of 96 boys and 60 of 123 girls attempted suicide. Use as a null hypothesis H_0: p1 = p2 with H_A: p1 < p2. Hit 2nd MATH MORE STAT TESTS MORE ZPrp2. For x1, enter 18; for n1, enter 96; for x2, enter 60; for n2, enter 123; and for p1, enter <p2. Then hit CALC. You get as a result that z=-4.6049 with a p-value of .000002.

One-Way Anova. Enter three lists in the calculator, L1={7, 4, 6, 6, 5}, L2={6,5,5,8,7}, and L3={4,7,6,7,6}. The null hypothesis here is H_0: μ1=μ2=μ3 with H_A : not all of μ1, μ2, μ3 are equal. To run the test, hit 2nd MATH MORE STAT MORE RsltOn ENTER. This pastes the command RsltOn on your home page, followed by the word Done. This allows the results of the test to be printed to the screen instead of just placed in memory. Then hit MORE TESTS MORE MORE MORE ANOVA. This pastes ANOVA(on your home page. Complete the command to ANOVA(L1,L2,L3) (see Figure 48), then hit ENTER. You are given an F score of .3111 with a p-value of .7384 along with other relevant information. See Figure 49. Press the down arrow key several times to get the rest of the information. See Figure 50.

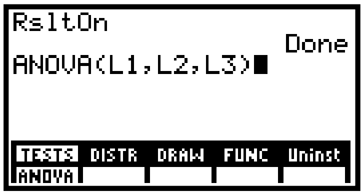

Figure 48

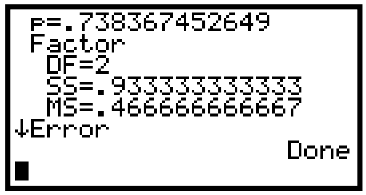

Figure 49

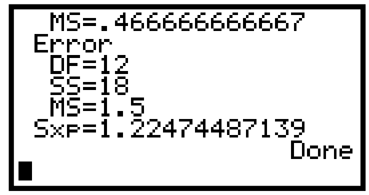

Figure 50

Chi-Square. First enter a matrix of observed values. Call this matrix OB. Here use $OB = \begin{bmatrix} 23 & 4 & 10 \\ 10 & 14 & 35 \end{bmatrix}$. To enter the matrix, hit 2nd MATRX EDIT, type in OB for Name, then hit ENTER 2ENTER 3 ENTER 23. Then continue by hitting each number in succession followed by ENTER. See Figure 51. When you are finished, hit EXIT. Then enter the matrix of expected values. Here that matrix will be $EX = \begin{bmatrix} 12.72 & 6.94 & 17.34 \\ 20.28 & 11.06 & 27.66 \end{bmatrix}$. The null hypothesis is that there is no association between the row and column variable, with the alternative hypothesis being that the variables are related. Hit 2nd MATH MORE STAT TESTS MORE MORE Chitst. For Observed, type in OB, and for Expected, type in EX. See Figure 52. Then hit CALC. You get a χ^2 of 20.6062 and a p-value of .00003, with a df of 2.

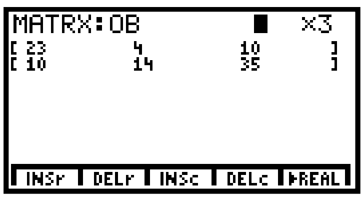

Figure 51

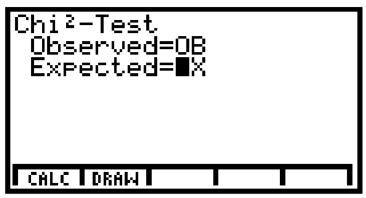

Figure 52

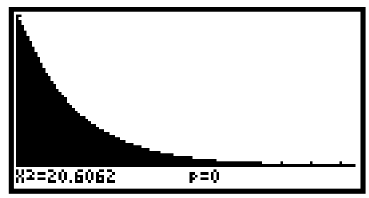

Figure 53

To get a graphical representation instead, hit DRAW instead of CALC. The chi-square and p values are given below the graph. See Figure 53. For this to work, you need to have deleted any functions under y(x)= in the GRAPH menu. To bring up the graph menu, hit the EXIT key. When a menu is obscuring the chi-square and p values at the bottom of the screen, just hit CLEAR.