

## Inferential Statistics on the TI-89

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, make sure you are in the List Editor and hit  $\text{2nd}[F7](\text{Ints}) \rightarrow 2:\text{TInterval}$ . In the first screen that comes up, choose Data, hit  $\text{ENTER}$ , and then fill in the second screen as in Figure 33. Then hit  $\text{ENTER}$ . You are given (11.64,17.8) as the confidence interval, along with the point estimate ( $\bar{x}=14.7222$ ), margin of error ( $\text{ME}=3.08251$ ), degrees of freedom ( $\text{df}=17$ ), sample standard deviation ( $\text{Sx}=6.19863$ ), and sample size ( $n=18$ ). See Figure 34.



Figure 33

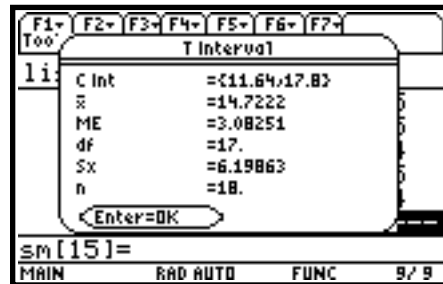


Figure 34

If a data list isn't in the calculator, but you know the standard deviation and mean, when you get to the choice of Data vs. Stats, choose Stats, hit  $\text{ENTER}$ , and then fill in the boxes as shown in Figure 35. Here you also get the same confidence interval of (11.64,17.8), although some of the other statistics are just a bit different from above since more rounding was done here for the mean and standard deviation.



Figure 35

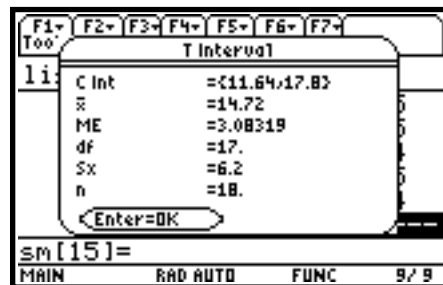


Figure 36

If the population standard deviation  $\sigma$  is known, you can make use of the normal distribution by choosing  $\text{2nd}[F7](\text{Ints}) \rightarrow 1:\text{ZInterval}$  instead of  $\text{2nd}[F7](\text{Ints}) \rightarrow 2:\text{TInterval}$ .

**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  $\text{2nd}[F7](\text{Ints}) \rightarrow 4:2\text{-SampTInt}$ . In the first window that comes up, choose Data. Again, do this since the data has been entered as lists. Now hit  $\text{ENTER}$  and fill in the boxes of the second window with 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, choose NO (YES for equal variances). See Figure 37. Then hit **[ENTER]** to get the results. As you can see from Figure 38, you are given a confidence interval of  $(-10.5, -8.99)$  along with other relevant results.

If the population standard deviations are known, you can use **[2nd][F7](Ints)→4:3-SampZInt** instead of **[2nd][F7](Ints)→4:2-SampTInt**, making use of the normal distribution.

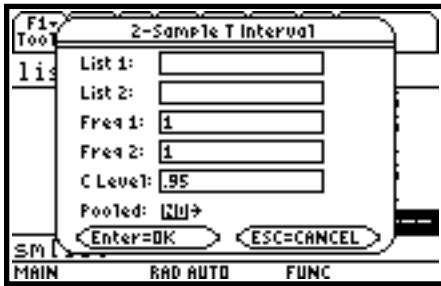


Figure 37

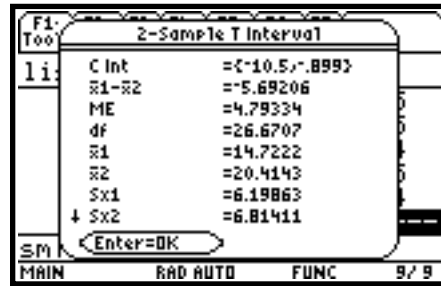


Figure 38

**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][F7](Ints)→5:1-PropZInt**. For Successes, x, enter 18; for n, enter 96; and for C Level, enter .99. Then hit **[ENTER]**. You are given an interval of  $(.0849, .29013)$  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][F7](Ints)→6:2-PropZInt**. For Successes, x1, enter 18; for n1, enter 96; for Successes, x2, enter 60; for n2, enter 123; and for C Level, enter .99. Then hit **[ENTER]**. You are given an interval of  $(-.455, -.1453)$  with a p-hat1 of .1875 and a p-hat2 of .487805.

**Confidence Interval for Linear Regression using t.** Return to the earlier linear regression example using listx and listy. Hit **[2nd][F7](Ints)→7:1-LinRegTInt**. One of the choices in the page that opens is Response or Slope.

In the Response case, an X Value is required to determine a calculated y value,  $y_{\hat{}}$ , at which point a prediction confidence interval around  $y_{\hat{}}$  is determined, as well as a confidence interval for the mean. Complete the window as in Figures 39 and 40, noticing the use of an X Value of 10. Notice also the arrows on the left side of the window indicating some values are off screen, necessitating scrolling.



Figure 39



Figure 40

Then hit **[ENTER]**. The results screen is shown in Figures 41 and 42, scrolling again being necessary to see it all. In Figure 41, the 99% confidence interval C Int= $(6.729, 9.27)$  is for the mean of  $y_{\hat{}}(10)$ , and in Figure 42 the 99% confidence interval pred Int= $(3.786, 12.213)$  is for  $y_{\hat{}}(10)$ . You can also

observe the regression data in Figure 42.

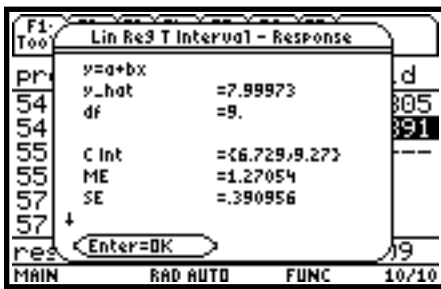


Figure 41

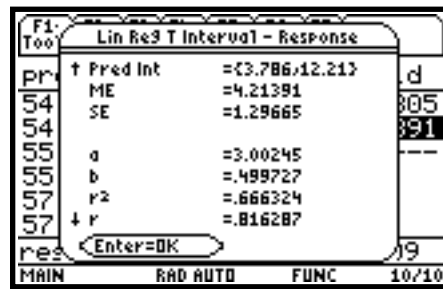


Figure 42

In the Slope case, LinRegTInt computes a linear regression T confidence interval for the slope coefficient  $b$ . If the confidence interval contains 0 this is insufficient evidence to indicate that the data exhibits a linear relationship. Entering the data as above, except for X Value, which is inaccessible, you get a 99% confidence interval  $C\ Int=(.1166,.88283)$  for the slope  $b$ . Since 0 is not in the interval, you can conclude the existence of a linear relationship. Again, the regression data is available.

**Confidence Interval for Multiple Regression.** Enter the following lists: listx1, listx2 and listy1 as given below.

listx1:	1	2	3	3.5	4.5
listx2:	4	3	2	1	1
listy1:	4	5	6	7	8

We are assuming that  $y_1$  is a function of  $x_1$  and  $x_2$ . Hit  $\text{2nd}[F7](\text{Ints})\rightarrow 8:1\text{-MultRegInt}$ . This corresponds to the Response option above. In the first window that opens, choose 2 for Num of Ind vars and then hit  $\text{ENTER}$ . In the second window, fill in the boxes as shown in Figure 43. The X Value List of  $\{2,3\}$  corresponds to the point  $(x_1,x_2)=(2,3)$ . Then press  $\text{ENTER}$ . The results screen is shown in Figures 44 and 45. In Figure 44, the 95% confidence interval  $C\ Int=(3.928,6.189)$  is for the mean of  $y\_hat(2,3)$ , and in Figure 45 the 99% confidence interval  $pred\ Int=(2.687,7.433)$  is for  $y\_hat(2,3)$ . You can also observe the regression data in both figures, with the regression equation, using B List. To find the values of Blist, after hitting  $\text{ENTER}$ , move the cursor onto a blank list name, hit  $\text{2nd}[VAR-LINK]$ , and scroll down to  $blist$  under  $\text{STATVARS}$  and hit  $\text{ENTER}$ . From  $blist$  in the List Editor (see Figure 46), you can determine that the regression equation is  $y_1=3.5882 + x_1 -.1765 x_2$ .

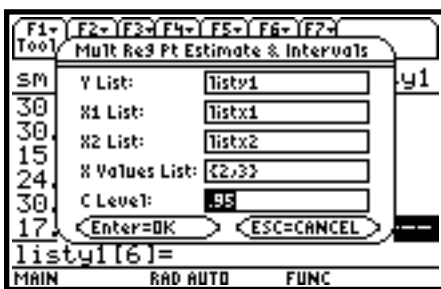


Figure 43

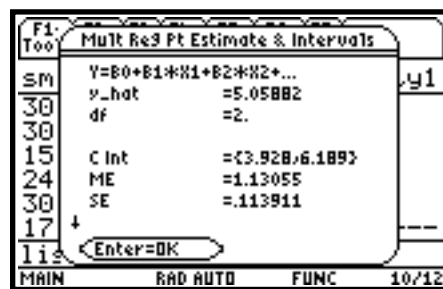


Figure 44