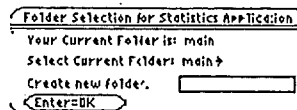
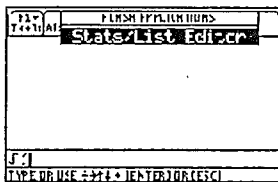
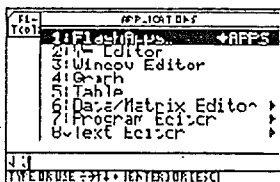


TI-89, TI-92 Plus or Voyage 200 for Business Statistics

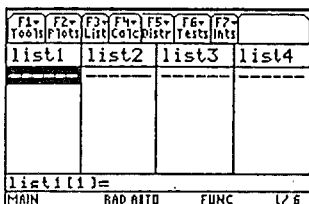
Chapter 3

Entering Data

- Press [APPS], select FlashApps then press [ENTER]. Highlight Stats/List Editor then press [ENTER]. Press [ENTER] again to select the main folder. (Note: If you do not have FlashApps or Stats/List Editor then you can download it from the web.)



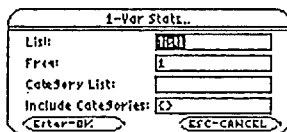
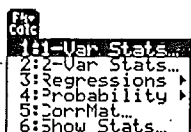
- Make sure the cursor is in the list, not on the list name and type the desired values pressing [ENTER] after each one. For x-y data pairs, enter all x-values in one list. Enter all corresponding y-values in a second list.



- Press [Home] to return to the home screen.
- To clear a previously stored list of data values, arrow up to the list name you want to clear, press [CLEAR], then press enter.

One Variable Statistics

- Enter the data in list1. Select F4 for the Calc menu. Use cursor keys to highlight 1:1-Var Stats. Type in the name of



your list without space, for example list1. Press enter twice and the statistics will appear in a new window. Use the cursor keys to arrow up and down to see all of the values.

- Note: S_x is the sample standard deviation. The quartiles calculated by the TI calculators differ somewhat from those found using the procedure in the text for this class. Make sure that you do the quartiles by hand.

Chapter 4

Factorials

- On the home screen, enter the number of which you would like to find the factorial. Press [2nd] [Math] > 7:Probability > 1:!. Press [ENTER] to calculate.

Combinations/Permutations

- Press [2nd] [Math] > 7:Probability > Press 2 for permutation (2: nPr), 3 for combination (3: nCr). Enter the sample size on the home screen, then a comma, then enter the number of "successes" then end the parenthesis. Press [ENTER] to calculate.

Chapter 5

Binomial Distribution

- Go to the [Apps] Stat/List Editor, then select F5 [DISTR]. This will get you a menu of probability distributions.
- Arrow down to binomial Pdf and press [ENTER]. Enter the values for n, p and x into each cell. Press [ENTER]. This is the probability density function and will return you the probability of exactly x successes. If you leave off the x value and just enter n and p, you will get all the probabilities for each x from 0 to n.
- Arrow down to binomial Cdf and press [ENTER]. Enter the values for n, p and lower and upper value of x into each cell. Press [ENTER]. This is the cumulative distribution function and will return you the probability between the lower and upper x-values, inclusive.

39 or 92

Poisson Distribution

- Go to the [Apps] Stat/List Editor, then select F5 [DISTR]. This will get you a menu of probability distributions.
- Arrow down to Poisson Pdf and press [ENTER]. Enter the values for μ and x into each cell. Press [ENTER]. This is the probability density function and will return you the probability of exactly x successes.
- Arrow down to Poisson Cdf and press [ENTER]. Enter the values for μ and the lower and upper values of x into each cell. Press [ENTER]. This is the cumulative distribution function and will return you the probability between the lower and upper x -values, inclusive.

Note: the calculator does not have the hypergeometric distribution.

Chapter 6

Normal Distribution

- Go to the [Apps] Stat/List Editor, then select F5 [DISTR]. This will get you a menu of probability distributions.
- Arrow down to Normal Cdf and press [ENTER]. Enter the values for the lower x value (x_1), upper x value (x_2), μ , and σ into each cell. Press [ENTER]. This is the cumulative distribution function and will return $P(x_1 < X < x_2)$. For example to find $P(80 < X < 110)$ when the mean is 100 and the standard deviation is 20, you should have in the following order 80, 110, 100, 20.
- If you have a z -score, use $\mu = 0$ and $\sigma = 1$, then you will get standard normal distribution.
- For a left tail area use a lower bound of negative infinity ($-\infty$), and for a right tail are use an upper bound infinity (∞).

Inverse Normal Distribution

- Go to the [Apps] Stat/List Editor, then select F5 [DISTR]. This will get you a menu of probability distributions.
- Arrow down to Inverse Normal and press [ENTER]. Enter the area to the left of the x value, μ , and σ into each cell. Press [ENTER]. This will return the percentile for the x value. For example to find the 95th percentile when the mean is 100 and the standard deviation is 20, you should enter .95, 100, 20.
- If you use $\mu = 0$ and $\sigma = 1$, then the default is the z -score for the standard normal distribution.

Chapter 8 Confidence Intervals for one sample

- The $100(1 - \alpha)\%$ confidence interval for μ , when σ is known, is $\bar{X} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$. Go to

the [Apps] Stat/List Editor, then select 2nd then F7 [Ints], then select 1: ZInterval. Choose the input method, data is when you have entered data into a list previously or stats when you are given the mean and standard deviation already. Type in the population standard deviation, sample mean, sample size (or list name (list1), and Freq: 1) and confidence level, and press the [ENTER] key to calculate. The calculator returns the answer in interval notation.

- The $100(1 - \alpha)\%$ confidence interval for μ , when σ is unknown, is $\bar{X} \pm t_{\alpha/2} \frac{s}{\sqrt{n}}$. Go

to the [Apps] Stat/List Editor, then select 2nd then F7 [Ints], then select 1:TInterval. Choose the input method, data is when you have entered data into a list previously or stats when you are given the mean and standard deviation already. Type in the mean, standard deviation, sample size (or list name (list1), and Freq: 1) and confidence level, and press the [ENTER] key. The calculator returns the answer in interval notation. Be careful, if you accidentally use the [1:ZInterval] option you would get the wrong answer.

- A $100(1 - \alpha)\%$ confidence interval for the population proportion p is

$\hat{p} \pm z_{\alpha/2} \sqrt{\frac{\hat{p}\hat{q}}{n}}$. Go to the [Apps] Stat/List Editor, then select 2nd then F7 [Ints], then

select 5: 1-PropZInt. Type in the values for X , sample size and confidence level, and press the [ENTER] key. The calculator returns the answer in interval notation. Note: sometimes you are not given the x value but a percentage instead. To find the x value to use in the calculator, multiply \hat{p} by the sample size and round off to the nearest integer. The calculator will give you an error message if you put in a decimal for x or n . For example if $\hat{p} = .22$ and $n = 124$ then $.22 * 124 = 27.28$, so use $x = 27$.

Chapter 9 Hypothesis Testing for One Population

- Hypothesis test for a population mean when σ is known, test statistic is $Z = \frac{\bar{X} - \mu_0}{\sigma/\sqrt{n}}$. Go

to the [Apps] Stat/List Editor, then select 2nd then F6 [Tests], then select 1: ZTest. Choose the input method, data is when you have entered data into a list previously or stats when you are given the mean and standard deviation already. Type in the hypothesized mean (μ_0), population standard deviation, sample mean, sample size, (or list name (list1), and Freq: 1), arrow over to the $\neq, <, >$ sign and select the same as the problems alternative hypothesis statement then press the [ENTER] key to calculate. The calculator returns the z-test statistic and p-value.

- Hypothesis test for a population mean when σ is unknown, test statistic is $t = \frac{\bar{X} - \mu_0}{s/\sqrt{n}}$.

Go to the [Apps] Stat/List Editor, then select 2nd then F6 [Tests], then select 2: T-Test. Choose the input method, data is when you have entered data into a list previously or stats when you are given the mean and standard deviation already. Then type in the hypothesized mean (μ_0), sample standard deviation, sample mean, sample size, (or list name (list1), and Freq: 1), arrow over to the $\neq, <, >$ and select the sign that is the same as the problems alternative hypothesis statement then press the [ENTER] key to calculate. The calculator returns the t-test statistic and p-value.

- Hypothesis test for one sample population proportion, test statistic is $Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$. Go to the [Apps]

Stat/List Editor, then select 2nd then F6 [Tests], then select 5: 1-PropZ-Test. Type in the hypothesized proportion (p_0), x, sample size, arrow over to the $\neq, <, >$ sign that is the same in the problems alternative hypothesis statement then press the [ENTER] key to calculate. The calculator returns the z-test statistic and the p-value. Note: sometimes you are not given the x value but a percentage instead. To find the x value to use in the calculator, multiply \hat{p} by the sample size and round off to the nearest integer. The calculator will give you an error message if you put in a decimal for x or n. For example if $\hat{p} = .22$ and $n = 124$ then $.22 * 124 = 27.28$, so use $x = 27$.

Chapter 10

10.1 Confidence Interval and Hypothesis Test for Two Population Means When σ_1 and σ_2 are Known

- The $100(1 - \alpha)\%$ confidence interval for the difference between the means of two populations

$\mu_1 - \mu_2$, independent samples, is $(\bar{X}_1 - \bar{X}_2) \pm z_{\alpha/2} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$. Go to the [Apps]

Stat/List Editor, then select 2nd then F5 [Ints], then select 3: 2-SampZInt. Then type in the population standard deviations, the first sample mean and sample size, then the second sample mean and sample size, (or list names (list3 & list4), and Freq1:1 & Freq2:1), then enter the confidence level. To calculate press the [ENTER] key. The calculator returns the confidence interval.

- Hypothesis test for the difference between the means of two populations $\mu_1 - \mu_2$,

independent samples, test statistic is $z = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$. Go to the [Apps]

Stat/List Editor, then select 2nd then F6 [Tests], then select 3: 2-SampZ-Test. Then type in the population standard deviations, the first sample mean and sample size, then the second sample mean and sample size, (or list names (list3 & list4), and Freq1:1 & Freq2:1), arrow

over to the $\neq, <, >$ sign that is the same in the problems alternative hypothesis statement then press the [ENTER] key to calculate. The calculator returns the z-test statistic and the p-value.

10.2 Confidence Interval and Hypothesis Test for Two Population Means When σ_1 and σ_2 are Unknown

- The $100(1 - \alpha)\%$ confidence interval for the difference between the means of two populations $\mu_1 - \mu_2$, independent

samples is $(\bar{X}_1 - \bar{X}_2) \pm t_{\alpha/2} \sqrt{\left(\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}\right) \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$. Go to the

[Apps] Stat/List Editor, then select 2nd then F5 [Ints], then select 4: 2-SampTInt. Enter the sample means, sample standard deviations, sample sizes, (or list names (list3 & list4), and Freq1:1 & Freq2:1), confidence level. Highlight the No option under Pooled. Press the [ENTER] key to calculate. The calculator returns the confidence interval.

- Hypothesis test for the difference between the means of two populations $\mu_1 - \mu_2$, independent samples. The test statistic is

$t = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\left(\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}\right) \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$. Go to the [Apps] Stat/List Editor,

then select 2nd then F6 [Tests], then select 4: 2-SampT-Test. Enter the sample means, sample standard deviations, and sample sizes, (or list names (list3 & list4), and Freq1:1 & Freq2:1). Then arrow over to the not equal, $\neq, >, <$ and select the sign that is the same in the problems alternative hypothesis statement. Highlight the No option under Pooled. Press the [ENTER] key to calculate. The calculator returns the t-test statistic and the p-value.

10.3 Confidence Interval and Hypothesis Test for Matched Samples

- The $100(1 - \alpha)\%$ confidence interval for the difference between the means of two populations μ_D , dependent samples

(matched pairs), is $\bar{D} \pm t_{\alpha/2} \frac{s_D}{\sqrt{n}}$. First find the differences between the samples. Go to the

[Apps] Stat/List Editor, then enter the differences into list 1. Select 2nd then F7 [Ints], then select 2: T-Interval. Select the [Data] menu. Enter in List: list1, Freq:1. Then type in the confidence level. Press the [ENTER] key to calculate. The calculator returns the confidence interval.

- Hypothesis test for the difference between the means of two populations μ_D for dependent samples (matched pairs)

test statistic is $t = \frac{\bar{D} - \mu_D}{\frac{s_D}{\sqrt{n}}}$. First find the differences between the samples. Go to the [Apps] Stat/List Editor, then

enter the differences into list 1. Select 2nd then F6 [Tests], then select 2: T-Test. Select the [Data] menu. Then type in the hypothesized mean as 0, List: list1, Freq:1, arrow over to the $\neq, <, >$ and select the sign that is the same in the problems alternative hypothesis, press the [ENTER] key to calculate. The calculator returns the t-test statistic and the p-value.

10.4 Confidence Interval and Hypothesis Test for Two Population Proportions

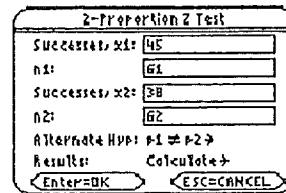
- The $100(1 - \alpha)\%$ confidence interval for the difference between the proportions of two populations $p_1 - p_2$ is

$(\hat{p}_1 - \hat{p}_2) \pm Z_{\alpha/2} \sqrt{\frac{\hat{p}_1(1 - \hat{p}_1)}{n_1} + \frac{\hat{p}_2(1 - \hat{p}_2)}{n_2}}$. Go to the [Apps] Stat/List Editor, then select 2nd then F7 [Ints], then

select 6: 2-PropZInt. Type in the x_1, n_1, x_2, n_2 , the confidence level, then press the [ENTER] key to calculate. The calculator returns the confidence interval.

- Hypothesis test for the difference between the proportions of two populations $p_1 - p_2$,

test statistic is $Z = \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$. Go to the [Apps] Stat/List Editor, then



select 2nd then F6 [Tests], then select 6: 2-PropZTest. Type in the x_1, n_1, x_2, n_2 ,

arrow over to the $\neq, <, >$ and select the sign that is the same in the problems alternative hypothesis statement. Press the [ENTER] key to calculate. The calculator returns the z-test statistic, sample proportions, pooled proportion, and the p-value.

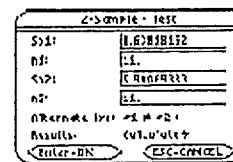
Chapter 11 Hypothesis Test for Two Population Variances

- Note: you cannot do this chi-squared confidence interval on the TI-89.

- Hypothesis test for two population variances or standard deviations, test statistic is $F = \frac{s_1^2}{s_2^2}$.

Go to the [Apps] Stat/List Editor, then select 2nd then F6 [Tests], then select 9: 2-SampFTest.

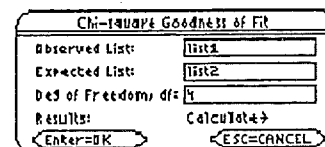
Then type in the s_1, n_1, s_2, n_2 , (or list names list1 & list2), select the sign, $\neq, <, >$ that is the same in the problems alternative hypothesis statement, press the [ENTER] key to calculate. The calculator returns the F-test statistic and the p-value.



Chapter 12

Goodness of Fit Test

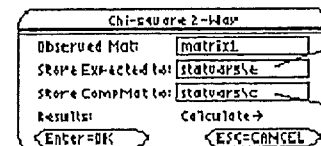
- Hypothesis test for three or more proportions (goodness of fit test). Go to the [Apps] Stat/List Editor, then type in the observed values into list 1, and the expected values into list 2. Select 2nd then F6 [Tests], then select 7: Chi-2GOF. Type in the list names and the degrees of freedom (df = k-1). Then press the [ENTER] key to calculate. The calculator returns the χ^2 -test statistic and the p-value.



Test for Independence

Hypothesis test for the independence of two variables (contingency tables).

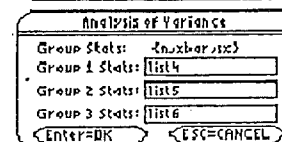
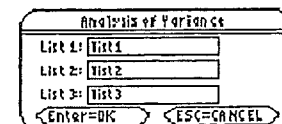
- First you need to create the matrix for the observed values: Press: [Home] to return to the Home screen, press [Apps] and select 6:Data/Matrix Editor. A menu is displayed, select 3:New. The New dialog box is displayed. Press the right arrow key to highlight 2:Matrix, and press [ENTER] to choose Matrix type. Press the down arrow key to highlight 1:main, and press [ENTER], to choose main folder. Press the down arrow key, and then enter the name o in the Variable field. Enter 3 for Row dimension and 2 for Column dimension. Press [ENTER] to display the matrix editor. Enter 4, 9, 5 in c1 and 7, 2, 3 in c2. Press \blacklozenge [Apps] [ENTER] to close the matrix editor and return to the list editor. If you have more than one Application loaded, press \blacklozenge [Apps], and then select Stats/List Editor.
- To display the Chi-square 2-Way dialog box, press 2nd then F6 [Tests], then select 8: Chi-2 2-way. Enter in the Observed Mat: o ; Store Expected to: statvars\e ; Store CompMat to: statvars\c. This will store the expected values in the matrix folder statvars with the name e, and the $(o-e)^2/e$ values in the matrix c. Press the [ENTER] key to calculate. The calculator returns the χ^2 -test statistic and the p-value. If you go back to the matrix menu you will see all of the expected and $(o-e)^2/e$ values.



Chapter 13

Analysis of Variance

- ANOVA, hypothesis test for the equality of k population means. Go to the [Apps] Stat/List Editor, then type in the data for each group into a separate list, (or if you don't have the raw data, enter the sample size, sample mean and sample variance for group 1 into list1 in that order, repeat for list2, etc). Select 2nd then F6 [Tests], then select C:ANOVA. Select the input method data or stats. Select the number of groups. Press the [ENTER] key to calculate. The calculator returns the F-test statistic, the p-value,



Factor (Treatment) df, SS and MS, Error df, SS and MS. The last value Sxp is the square root of the MSE.

- The calculator will also do a Two-way ANOVA block design.

Chapter 10

Simple linear regression.

- Go to the [Apps] Stat/List Editor, then type in the x-values into list1 and the y-values into list2. Select 2nd then F6 [Tests], then select A:LinRegTTest. Enter the following, Xlist: list1 ; Y List: list2 ; Freq: 1, select the alternative hypothesis as $\beta \neq 0$, store results to: none. Press the [ENTER] key to calculate. The calculator returns the t-test statistic, the y-intercept a, slope b, $s = \sqrt{MSE}$, R^2 , and r.
- For an F-test use the Multiple Regression test with only one x list, (independent variables = 1).

| Linear Regression T Test | |
|---|----------------|
| X List: | list1 |
| Y List: | list2 |
| Freq: | 1 |
| Alternate Hyp: | $\beta \neq 0$ |
| Store ResEqn to: | none |
| Results: | Calculate |
| <input type="button" value="Enter=OK"/> <input type="button" value="ESC=CANCEL"/> | |

| Multiple Regression Tests | |
|---|-------|
| Num of Ind Vars: | 1 |
| V List: | list1 |
| X1 List: | list2 |
| X2 List: | list3 |
| X3 List: | |
| X4 List: | |
| <input type="button" value="Enter=OK"/> <input type="button" value="ESC=CANCEL"/> | |