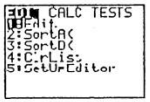
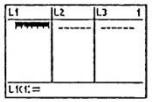
TI-83 or TI-84 for Business Statistics

Chapter 3

Entering Data

- Press [STAT] the first option is already highlighted (1:Edit) so you can either press [ENTER] or 1.





- 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 [2nd] [QUIT] 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. An alternative way is press [STAT], press **4** for **4:ClrList**, press [2nd], then the number key corresponding to the data list you wish to clear, for example [2nd] **1** will clear L1. Press [ENTER].

One Variable Statistics

- Press [STAT]. Use cursor keys to highlight CALC. Select **1:1-Var Stats**. Press [2nd] then the number key corresponding to your data list. Press Enter to calculate the statistics. Note: the calculator always defaults to L1 if you do not specify a data list.
- Note: Sx 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 [MATH]. Use cursor keys to move to the **PRB** menu. Select **4: !**, then press [ENTER] to calculate.

Combinations/Permutations

- Enter the number "trials" (n) on the home screen. Press [MATH]. Use cursor keys to move to the **PRB** menu. Press 2 for permutation (2: ${}_nP_r$), 3 for combination (3: ${}_nC_r$). Enter the number of "successes" (r). Press [ENTER] to calculate.

Chapter 5

Binomial Distribution

- Press [2nd] [DISTR]. This will get you a menu of probability distributions.
- Press 0 or arrow down to 0:binompdf(and press [ENTER]. This puts binompdf(on the home screen. Enter the values for n, p and x with a comma between each. 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.
- Press [ALPHA] A or arrow down to **A:binomcdf(** and press [ENTER]. This puts binomcdf(on the home screen. Enter the values for n, p and x with a comma between each. Press [ENTER]. This is the cumulative distribution function and will return you the probability of at most x successes.

Poisson Distribution

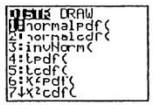
- Press [2nd] [DISTR]. This will get you a menu of probability distributions.
- Press [ALPHA] **B** or arrow down to **B:Poissonpdf(** and press [ENTER]. This puts poissonpdf(on the home screen. Enter the values for μ and x with a comma between each. Press [ENTER]. This is the probability density function and will return you the probability of exactly x successes.
- Press [ALPHA] **C** or arrow down to **C:Poissoncdf(** and press [ENTER]. This puts poissoncdf(on the home screen. Enter the values for μ and x with a comma between each. Press [ENTER]. This is the cumulative distribution function and will return you the probability of at most x successes.

Note: the calculator does not have the hypergeometric distribution.

Chapter 6

Normal Distribution

- Press [2nd] [DISTR]. This will get you a menu of probability distributions.
- Press **2** or arrow down to **2:normalcdf(** and press [ENTER]. This puts normalcdf(on the home screen. Enter the values for the lower x value (x_1), upper x value (x_2), μ, and σ with a comma between each. 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 normalcdf(80,110,100,20)



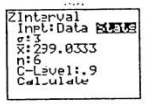
- If you leave out the μ and σ, then the default is the **standard normal distribution.**
- For a left tail area use a lower bound of –E99 (negative infinity), (press [2nd] [EE] to get E) and for a right tail are use an upper bound of E99 (infinity). For example to find $P(Z < -1.37)$ you should have normalcdf(-E99,-1.37)

Inverse Normal Distribution

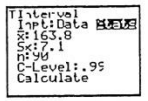
- Press [2nd] [DISTR]. This will get you a menu of probability distributions.
- Press **3** or arrow down to **3:invNorm(** and press [ENTER]. This puts invNorm(on the home screen. Enter the area to the left of the x value, μ, and σ with a comma between each. Press [ENTER]. This will return the percentile for the x value. For example to find the 95th percentile when the mean is 100 and the standard deviation is 20, you should have invNorm(.95,100,20).
- If you leave out the μ and σ, then the default is the **z-score** for the standard normal distribution.

Chapter 8 Confidence Intervals for one sample

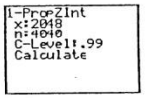
- The 100(1 - α)% confidence interval for μ, when σ is known, is $\overline{X} \pm z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$. On the TI-83 you can find a confidence intervals using the statistics menu. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the [7:ZInterval] option and press the [ENTER] key. Arrow over to the [Stats] menu and press the [ENTER] key. Then type in the population standard deviation, sample mean, sample size and confidence level, arrow down to [Calculate] and press the [ENTER] key. The calculator returns the answer in interval notation.



- The 100(1 - α)% confidence interval for μ, when σ is unknown, is $\overline{X} \pm t_{\alpha/2}\frac{s}{\sqrt{n}}$. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the [8:TInterval] option and press the [ENTER] key. Arrow over to the [Stats] menu and press the [ENTER] key. Then type in the sample mean, sample standard deviation, sample size and confidence level, arrow down to [Calculate] and press the [ENTER] key. The calculator returns the answer in interval notation. Be careful, if you accidentally use the [7:ZInterval] option you would get the wrong answer.

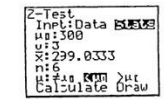


- A $100(1-\alpha)\%$ confidence interval for the population proportion p is $\hat{p} \pm z_{\alpha/2}\sqrt{\left(\frac{\hat{p}\hat{q}}{n}\right)}$. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the [A:1-PropZInterval] option and press the [ENTER] key. Then type in the values for X, sample size and confidence level, arrow down to [Calculate] 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 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.

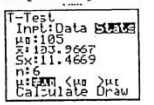


Chapter 9 Hypothesis Testing for One Population

- Hypothesis test for one sample population mean when σ is known, test statistic is. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the [1:Z-Test] option and press the [ENTER] key. Arrow over to the [Stats] menu and press the [ENTER] key. Then type in the hypothesized mean (μ_0), population standard deviation, sample mean, sample size, arrow over to the ≠, <, > sign that is the same as the problems alternative hypothesis statement then press the [ENTER]key, arrow down to [Calculate] and press the [ENTER] key. The calculator returns the z-test statistic and p-value.



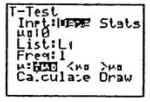
- Hypothesis test for one sample population mean when σ is unknown, test statistic is $t = \frac{\overline{X} - \mu_0}{s/\sqrt{n}}$. Press the [STAT] key and then the [EDIT] function, enter the data into list one. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the [2:T -Test] option and press the [ENTER] key. Arrow over to the [Stats] menu and press the [ENTER] key. Then type in the hypothesized mean (μ_0), sample standard



TI-83 or TI-84 for Business Statistics

deviation, sample mean, sample size, arrow over to the ≠, <, > sign that is the same as the problems alternative hypothesis statement then press the [ENTER]key, arrow down to [Calculate] and press the [ENTER] key. The calculator returns the test statistic t and p-value.

Or (If you have raw data in list one) Arrow over to the [Data] menu and press the [ENTER] key. Then type in the hypothesized mean (μ_0), L_1, leave Freq:1 alone, arrow over to the ≠, <, > sign that is the same in the problems alternative hypothesis statement then press the [ENTER]key, arrow down to [Calculate] and press the [ENTER] key. The calculator returns the t-test statistic and the p-value.



- Hypothesis test for one sample population proportion, test statistic is $Z = \dfrac{\hat{p} - p_0}{\sqrt{\left(\dfrac{p_0(1-p_0)}{n}\right)}}$. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the option [5:1-PropZTest] and press the [ENTER] key. Type in the hypothesized proportion (p_0), X, sample size, arrow over to the ≠, <, > sign that is the same in the problems alternative hypothesis statement then press the [ENTER] key, arrow down to [Calculate] and press the [ENTER] key. 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 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.

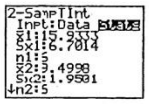
Chapter 10 Hypothesis Testing and Confidence Intervals for Two Populations

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

- The 100(1 - α)% confidence interval for the difference between the means of two populations $\mu_1 - \mu_2$, independent samples, is $\left(\overline{X}_1 - \overline{X}_2\right) \pm z_{\alpha/2}\sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}}$. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the option [9:2-SampZInt] and press the [ENTER] key. Arrow over to the [Stats] menu and press the [ENTER] key. Then type in the population standard deviations, the first sample mean and sample size, then the second sample mean and sample size, then enter the confidence level. Arrow down to [Calculate] and 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 $z = \dfrac{\left(\overline{X}_1 - \overline{X}_2\right) - \left(\mu_1 - \mu_2\right)}{\sqrt{\left(\dfrac{\sigma_1^2}{n_1}\right) + \left(\dfrac{\sigma_2^2}{n_2}\right)}}$. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the option [3:2-SampZTest] and press the [ENTER] key. Arrow over to the [Stats] menu and press the [ENTER] key. Then type in the population standard deviations, the first sample mean and sample size, then the second sample mean and sample size, arrow over to the ≠, <, > sign that is the same in the problems alternative hypothesis statement then press the [ENTER]key, arrow down to [Calculate] and press the [ENTER] key. 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 - α)% confidence interval for the difference between the means of two populations $\mu_1 - \mu_2$, independent samples is $\left(\overline{x}_1 - \overline{x}_2\right) \pm t_{\alpha/2}\sqrt{\left(\dfrac{s_1^2}{n_1}\right) + \left(\dfrac{s_2^2}{n_2}\right)}$. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the option [0:2-SampTInt] and press the [ENTER] key. Arrow over to the [Stats] menu and press the [Enter] key. Enter the sample means, sample standard deviations, sample sizes, confidence level. Highlight the No option under Pooled. Arrow down to [Calculate] and press the [ENTER] key. The calculator returns the confidence interval.



Or (If you have raw data in list one and list two) On the TI-83 press the [STAT] key and then the [EDIT] function, type the data into list one for sample one and list two for sample two. Arrow over to the [Data] menu and press the [ENTER] key. The defaults are List1: L_1, List2: L_2, Freq1:1, Freq2:1. If these are set different, arrow down and use [2nd] [1] to get L_1 and [2nd] [2] to get L_2. Then type in the confidence level. Highlight the No option under Pooled. Arrow down to [Calculate] and 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. The test statistic is $t = \dfrac{\left(\overline{X}_1 - \overline{X}_2\right) - \left(\mu_1 - \mu_2\right)}{\sqrt{\left(\dfrac{s_1^2}{n_1}\right) + \left(\dfrac{s_2^2}{n_2}\right)}}$. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the option [4:2-SampTTest] and press the [ENTER] key. Arrow over to the [Stats] menu and press the [Enter] key. Enter the sample means, sample standard deviations, sample sizes. Then arrow over to the not equal, <, > sign that is the same in the problems alternative hypothesis statement then press the [ENTER] key. Highlight the No option under Pooled. Arrow down to [Calculate] and press the [ENTER] key. The calculator returns the test statistic and the p-value. On the TI-83 press the [STAT] key and then the [EDIT] function, enter the data into list one for males and list two for females. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the option [4:2-SampTTest] and press the [ENTER] key. Arrow over to the [Data] menu and press the [ENTER] key. The defaults are List1: L_1, List2: L_2, Freq1:1, Freq2:1. If these are set different just arrow down and use [2nd] [1] to get L_1 and [2nd] [2] to get L_2. Then arrow over to the not equal, <, > sign that is the same in the problems alternative hypothesis statement then press the [ENTER] key. Highlight the No option under Pooled. Arrow down to [Calculate] and press the [ENTER] key. The calculator returns the test statistic t and the p-value.

10.3 Confidence Interval and Hypothesis Test for Matched Samples

- The 100(1 - α)% confidence interval for the difference between the means of two populations μ_D, dependent samples (matched pairs), is $\overline{D} \pm t_{\alpha/2}\dfrac{s_D}{\sqrt{n}}$. First find the differences between the samples. Then press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the [8:TInterval] option and press the [ENTER] key. Arrow over to the [Data] menu and press the [ENTER] key. The defaults are List: L_1, Freq:1. If this is set with a different list, arrow down and use [2nd] [1] to get L_1. Then type in the confidence level. Arrow down to [Calculate] and press the [ENTER] key. The calculator returns the confidence interval, $\overline{X} = \overline{D}$, $S_x = S_D$ and the sample size.
- Hypothesis test for the difference between the means of two populations μ_D for dependent samples (matched pairs) test statistic is $t = \dfrac{\overline{D} - \mu_D}{\dfrac{s_D}{\sqrt{n}}}$. First find the differences between the samples. Then press the [STAT] key and then the [EDIT] function, enter the difference column into list one. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the option [2:T -Test] and press the [ENTER] key. Arrow over to the [Data] menu and press the [ENTER] key. Then type in the hypothesized mean as 0, List: L_1, leave Freq:1 alone, arrow over to the ≠, <, > sign that is the same in the problems alternative hypothesis statement then press the [ENTER]key, arrow down to [Calculate] and press the [ENTER] key. The calculator returns the t-test statistic, the p-value, $\overline{X} = \overline{D}$, $S_x = S_D$ and the sample size.

10.4 Confidence Interval and Hypothesis Test for Two Population Proportions

- The 100(1 - α)% confidence interval for the difference between the proportions of two populations $p_1 - p_2$ is $\left(\overline{p}_1 - \overline{p}_2\right) \pm Z_{\alpha/2}\sqrt{\dfrac{\overline{p}_1\left(1-\overline{p}_1\right)}{n_1} + \dfrac{\overline{p}_2\left(1-\overline{p}_2\right)}{n_2}}$. Press the [STAT] key, arrow over to the [TESTS] menu, arrow

TI-83 or TI-84 for Business Statistics

down to the option [7:2-PropZInterval] and press the [ENTER] key. Type in the X_1, n_1, X_2, n_2, the confidence level, then press the [ENTER] key, arrow down to [Calculate] and press the [ENTER] key. The calculator returns the confidence interval.

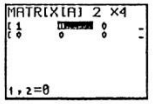
- Hypothesis test for the difference between the proportions of two populations $p_1 - p_2$, test statistic is $Z = \frac{(\bar{p}_1 - \bar{p}_2)}{\sqrt{\bar{p}(1-\bar{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the option [6:2-PropZTest] and press the [ENTER] key. Type in the X_1, n_1, X_2, n_2, arrow over to the $\neq, <, >$ sign that is the same in the problems alternative hypothesis statement then press the [ENTER] key, arrow down to [Calculate] and press the [ENTER] key. The calculator returns the z-test statistic and the p-value.

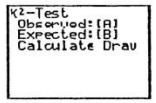
Chapter 11 Hypothesis Test for Two Population Variances

- Note: you cannot do the Confidence Interval or Hypothesis Test for the chi-squared test on the TI.
- Hypothesis test for two population variances or standard deviations, test statistic is $F = \frac{s_1^2}{s_2^2}$. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the option [D:2-SampFTest] and press the [ENTER] key. Arrow over to the [Stats] menu and press the [ENTER] key. Then type in the s_1, n_1, s_2, n_2, arrow over to the $\neq, <, >$ sign that is the same in the problems alternative hypothesis statement then press the [ENTER] key, arrow down to [Calculate] and press the [ENTER] key. The calculator returns the F-test statistic and the p-value.

Chapter 12 Test for Independence

- Hypothesis test for the independence of two variables (contingency tables). Press the [2nd] then [MATRX] key. Arrow over to the EDIT menu and 1:[A] should be highlighted, press the [ENTER] key. For a m X n contingency table, type in the number of rows(m) and the number of columns(n) at the top of the screen so that it looks like this MATRIX[A] m X n. For example a 2 X 4 contingency table, the top of the screen would look like this MATRIX[A] 2 X 4, as you hit [ENTER] the table will automatically widen to the size you put in. Now enter all of the observed values in there proper positions. Then press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the option [C: χ^2-Test] and press the [ENTER] key. Leave the default as Observed:[A] and Expected:[B], arrow down to [Calculate] and press the [ENTER] key. The calculator returns the χ^2-test statistic and the p-value. If you go back to the matrix menu [2nd] then [MATRX] key, arrow over to EDIT and choose 2:[B], you will see all of the expected values.





Chapter 13 Analysis of Variance

- ANOVA, hypothesis test for the equality of k population means. Note you have to have the actual raw data to do this test on the calculator. Press the [STAT] key and then the [EDIT] function, type the three lists of data into list one, two and three. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the option [F:ANOVA()] and press the [ENTER] key. This brings you back to the regular screen where you should now see ANOVA(. Now hit the [2nd] [L_1] [,] [2nd] [L_2] [,][2nd] [L_3])] keys in that order. You should now see ANOVA(L_1,L_2,L_3), if you had 4 lists you would then have an additional list. Press the [ENTER] key. 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. Note: you can only do this test on the TI-83 if you have the raw data.

Chapter 14 Regression

Correlation

- Press [STAT]. Use cursor keys to highlight CALC. Press 8 (8:LinReg (a+bx)). Press [2nd]. Press the number key corresponding to your list of x-values. Press the comma key [,]. Press [2nd] and the number key corresponding to your list of y-values. Press [ENTER] to calculate correlation (r).

Simple linear regression.

- On the TI-83 press the [STAT] key and then the [EDIT] function, type the x values into list one and the Y values into list two. Press the [STAT] key, arrow over to the [STAT] menu, arrow down to the option [E:LinRegTTest] and press the [ENTER] key. The default is Xlist: L_1, Ylist: L_2, Freq:1, β and $\rho \neq 0$. Arrow down to Calculate and press the [ENTER] key. The calculator returns the t-test statistic, the y-intercept a, slope b, s= $\sqrt{MSE}$, R^2, and r. The TI-83 does a t-test not an F-test. If you square this t-value it is the same as the F-value, and if you square the s value it is the same as the MSE, so you can use it to check your answers.