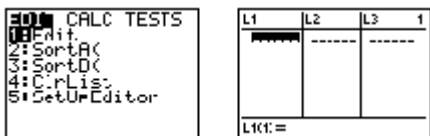


TI-83, TI-83 Plus or TI-84 for Non-Business Statistics

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 press 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. Press 1 or [ENTER] to select **1:1-Var Stats**. Press [2nd], then press 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: 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.

Sorting Data

- Press [STAT]. Press 2 or [ENTER] to select **SortA**(. Press [2nd], then press the number key corresponding to your data list that you want to sort. Press Enter, the calculator says Done. To see the sorted data go back into the Edit mode.

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. Press 4 (4:!) 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

Mean, Variance and Standard Deviation of a Discrete Probability Distribution Table

- 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 and P(X) data pairs, enter all X-values in one list. Enter all corresponding P(X)-values in a second list.
- Press [STAT]. Use cursor keys to highlight CALC. Press 1 or [ENTER] to select **1:1-Var Stats**. Press [2nd], then press the number key corresponding to your X list, then a comma, then [2nd] and the number key corresponding to your P(X) values. (Should look like this 1-Var Stats L₁,L₂) Press Enter to calculate the statistics. Where the calculator says \bar{x} this is μ the population mean and σ_x is the population standard deviation (square this number to get the population variance).

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 multinomial and hypergeometric distributions.

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)



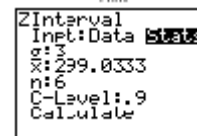
Inverse Normal Distribution

- 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 7

Confidence Intervals for one sample

- The $100(1 - \alpha)\%$ confidence interval for μ , σ is known, is $\bar{X} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$. On the TI-83 you can find a confidence interval 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 or sample 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.

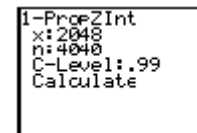
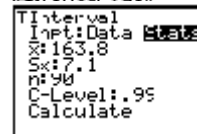


- The $100(1 - \alpha)\%$ confidence interval for μ , σ is unknown, is $\bar{X} \pm t_{n-1,\alpha/2} \frac{s}{\sqrt{n}}$. On the TI-83 you can find a confidence interval using the statistics menu. Press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the [8:TInterval] option and press the [ENTER] key. Arrow over to the [Stats] menu and press the [ENTER] key. Then type in the 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.



Or (if you have raw data in list one) Arrow over to the [Data] menu and press the [ENTER] key. Then type in the list name, L_1 , leave Freq:1 alone, enter the confidence level, arrow down to [Calculate] and press the [ENTER] key.

- A $100(1 - \alpha)\%$ confidence interval for the population proportion p is $\hat{p} \pm z_{\alpha/2} \sqrt{\frac{\hat{p}(1 - \hat{p})}{n}}$. 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



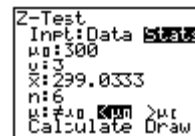
give you an error message if you put in a decimal for x or n. For example if $\hat{p} = .22$ and $n = 124$ then $.22*124 = 27.28$, so use $x = 27$.

Note: the calculator does not have a confidence interval for a standard deviation or variance

Chapter 8

Hypothesis testing for one sample

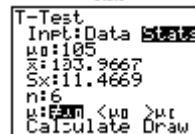
- Hypothesis test for one sample population mean when σ is known, test statistic is $Z = \frac{\bar{X} - \mu_0}{\frac{\sigma}{\sqrt{n}}}$.



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), sample or population standard deviation, sample mean, sample size, arrow over to the $\neq, <, >$ 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.

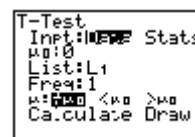
- Hypothesis test for one sample population mean when σ is unknown, test statistic is $t = \frac{\bar{X} - \mu_0}{\frac{s}{\sqrt{n}}}$. Press the [STAT]

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 or population standard deviation, sample mean, sample size, arrow over to the $\neq, <, >$ 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 t-test statistic 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 $\neq, <, >$ 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 t-test statistic and the p-value.



- Hypothesis test for one sample population proportion, test statistic is $Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}}$. 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 $\neq, <, >$ 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. 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

9.1 Confidence Interval and Hypothesis Test for Two Population Means Large Independent Samples

- Hypothesis test for the difference between the means of two populations $\mu_1 - \mu_2$, independent samples, σ_1 and σ_2

known, test statistic is $z = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\left(\frac{\sigma_1^2}{n_1}\right) + \left(\frac{\sigma_2^2}{n_2}\right)}}$. 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 sample or population standard deviations, the first sample mean and sample size, then the second sample mean and sample size, 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 test statistic z and the p -value.

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

samples, σ_1 and σ_2 known is $(\bar{X}_1 - \bar{X}_2) \pm z_{\alpha/2} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$. 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 sample or 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.

9.2 Confidence Interval and Hypothesis Test for Two Population Means Small Independent Samples

- Hypothesis test for the difference between the means of two populations $\mu_1 - \mu_2$, independent samples, σ_1 and σ_2

unknown. The test statistic for **unequal** variances is $t = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\left(\frac{S_1^2}{n_1}\right) + \left(\frac{S_2^2}{n_2}\right)}}$. 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 means, standard deviations, sample sizes, confidence level. 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 for unequal variances. 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 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 for unequal variances. Arrow down to [Calculate] and press the [ENTER] key. The calculator returns the test statistic t and the p -value. (**note: the regular 8th edition textbook has a different df rule, calculator returns**

$$df = \frac{\left(\left(\frac{s_1^2}{n_1}\right) + \left(\frac{s_2^2}{n_2}\right)\right)^2}{\left(\left(\frac{\left(\frac{s_1^2}{n_1}\right)^2}{(n_1 - 1)}\right) + \left(\frac{\left(\frac{s_2^2}{n_2}\right)^2}{(n_2 - 1)}\right)\right)}$$

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

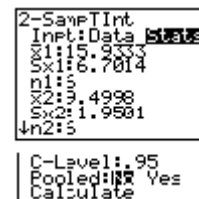
samples, σ_1 and σ_2 unknown for **unequal** variances is $(\bar{X}_1 - \bar{X}_2) \pm t_{\alpha/2} \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$. Press the [STAT] key, arrow over

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 means, standard deviations, sample sizes, confidence level. Highlight the No option under Pooled for unequal variances. 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) press the [STAT] key and then the [EDIT] function, type the data into list one for sample one and list two for sample two. 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 [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 for unequal variances. Arrow down to [Calculate] and press the [ENTER]



key. The calculator returns the confidence interval. (note: the regular 8th edition textbook has a different df rule,

calculator returns $df = \frac{\left(\frac{s_1^2}{n_1}\right) + \left(\frac{s_2^2}{n_2}\right)}{\left(\frac{\left(\frac{s_1^2}{n_1}\right)^2}{(n_1 - 1)}\right) + \left(\frac{\left(\frac{s_2^2}{n_2}\right)^2}{(n_2 - 1)}\right)}$.)

9.3 Confidence Interval and Hypothesis Test for Small Dependent Samples (Matched Pairs)

- Hypothesis test for the difference between the means of two populations μ_d , 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. Press the [STAT] key and then the [EDIT] key. Then type in the hypothesized mean as 0, List: L_1 , leave Freq:1 alone, 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 t-test statistic, the p-value, $\bar{X} = \bar{D}$ and $S_x = S_D$.

- The 100(1 - α)% confidence interval for the difference between the means of two populations μ_d , dependent samples, is $\bar{D} \pm t_{n-1, \alpha/2} \frac{s_D}{\sqrt{n}}$. First find the differences between the samples. Then on the TI-83 press the [STAT] key, arrow over to the [TESTS] menu, arrow down to the option [8:TInterval] 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, $\bar{X} = \bar{D}$ and $S_x = S_D$.

9.4 Confidence Interval and Hypothesis Test for Two Population Proportions

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

$Z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\bar{p}(1 - \bar{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$. 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.

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

$(\hat{p}_1 - \hat{p}_2) \pm Z_{\alpha/2} \sqrt{\frac{\hat{p}_1(1 - \hat{p}_1)}{n_1} + \frac{\hat{p}_2(1 - \hat{p}_2)}{n_2}}$. Press the [STAT] key, arrow over to the [TESTS] menu, arrow

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.

9.5 Hypothesis Test For Two Population Variances

- Hypothesis test for two population variances or standard deviations, test statistic is $F = \frac{s_1^2}{s_2^2}$. On the TI-83 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 test statistic F and the p-value.

Chapter 10

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, the standard error of estimate s, the coefficient of determination R^2 , and the correlation coefficient 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 $s = \sqrt{MSE}$, so you can use it to check your answer.

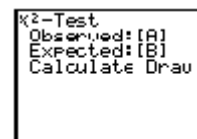
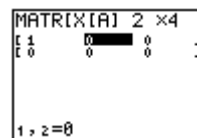
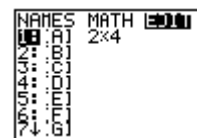
Chapter 11

Goodness of Fit Test

- Note: you cannot do the goodness of fit test on the TI-83.

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 3 contingency table, the top of the screen would look like this MATRIX[A] 2 X 3, 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 12

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