STA 2023

Instructions for using TI-83 and TI-84 Plus Calculator to do Computations

Chapter 3 – Statistics for Describing, Exploring, and Comparing Data

- **To Create a List**
  - Press **[STAT]**, then select "**1: Edit…**"
  - Enter each item of the list, pressing **[ENTER]** to set the value.
  - To view the list elements, press **[2ND]** then **[STAT]** (which accesses the [**LIST**] option), then select the list. Press **[ENTER]** to display the elements of the selected list.
- **To get Sample Statistics:**
  - Press [STAT], then move to the **CALC** submenu, then select "**1: 1–Var Stats**"
  - Select the list you want to get the information for (press **[2ND]** then **[STAT]** (which accesses the [**LIST**] option), then press [**ENTER**] to get a listing of the Sample Statistics:
    - $\bar{x}$: Sample Mean;
    - $\sum x$: Sum of List values
    - $\sum x^2$: Sum of squares of values
    - Sx : Sample Standard Deviation
    - σx : Population S.D. (estimate)
    - n : Sample size
    - minX: Minimum sample value
    - maxX: Maximum sample value
    - Q_1 : First Quartile
    - Med: Median/2nd Quartile
    - Q_3 : Third Quartile

Chapter 4 – Probability

- **To calculate** $n!$
  - Type the number n on the view screen first
  - Press **[MATH]**, then move to the **PRB** submenu, then choose "**4: !**"
  - Press **[ENTER]** to get the answer.
- **To calculate** ${}_nP_r$
  - Type the number ***n*** on the view screen first
  - Press **[MATH]**, then move to the **PRB** submenu, then choose "**2: nPr**"
  - Type the number ***r*** after the "nPr" on the screen.
  - Press **[ENTER]** to get the answer.
- **To calculate** ${}_nC_r$
  - Type the number ***n*** on the view screen first
  - Press **[MATH]**, then move to the **PRB** submenu, then choose "**3: nCr**"
  - Type the number ***r*** after the "nCr" on the screen.
  - Press **[ENTER]** to get the answer.
- **Note:** In both ${}_nP_r$ and ${}_nC_r$, *n* and *r* are positive integers and with $n \geq r$.

Chapter 5 – Discrete Probability Distributions

- **To Calculate the probability of getting EXACTLY *x* successes from *n* trials, where the probability of success is *p*.**
  - Press **[2ND]** then **[VARS]** (which accesses the [**DISTR**] option), then select "**A: binompdf(** "
  - Enter inputs of the function as follows: **binompdf**(*n*, *p*, *x*).
  - Press **[ENTER]** to display the probability of getting exactly *x* successes.
- **To Calculate the probability of getting AT MOST *x* successes (that is, *x* or less successes) from *n* trials, where the probability of success is *p*.**
  - Press **[2ND]** then **[VARS]** (which accesses the [**DISTR**] option), then select "**B: binomcdf(** "
  - Enter inputs of the function as follows: **binomcdf**(*n*, *p*, *x*).
  - Press **[ENTER]** to display the probability of getting at most *x* successes.

Chapter 6 – Normal Probability Distributions

- **To Calculate the probability of falling BETWEEN *x* and *y* (*x* < *y*), where the population mean is μ and the standard deviation is σ.**
  - Press **[2ND]** then **[VARS]** (which accesses the [**DISTR**] option), then select "**2: normalcdf(** "
  - Enter inputs of the function as follows: **normalcdf**(*x*, *y*, μ, σ).
  - Press **[ENTER]** to display the probability falling between values *x* and *y*.
- **To Calculate the probability of getting values LESS THAN *x*, (same mean and standard deviation as above).**
  - Press **[2ND]** then **[VARS]** (which accesses the [**DISTR**] option), then select "**2: normalcdf(** "
  - Enter inputs of the function as follows: **normalcdf**(-E99, *x*, μ, σ).
  - Press **[ENTER]** to display the probability getting values less than *x*.

Note: -E99 (which is -1×10^{99}) is a way to express –∞ on the calculator.

-E99 is obtained by pressing [(**–**)] then [**2ND**] then [**,**] (to access the [**EE**] option) then typing "**99**".

- **To Calculate the P_n (n^{th} percentile) of the data (same mean and standard deviation as above).**
  - Press **[2ND]** then **[VARS]** (which accesses the [**DISTR**] option), then select "**3: invNorm(** "
  - Enter inputs of the function as follows: **invNorm**(p, μ, σ), where p is n in decimal form (so the 85th percentile is written as 0.85)
  - Press **[ENTER]** to display $\mathbf{P}_n$.

Chapter 7 – Estimates and Sample Size

- **To Calculate the Confidence Interval and an Estimate**
  - Press **[STAT]** then move to the **TESTS** submenu, then select "**A: 1-PropZInt…** "
  - Enter requested info as follows: **x** is the number of responses (must be an integer), **n** is the sample size and **C-Level** is the Confidence Level as a decimal (If $\alpha = 0.05$, then the C-Level is 0.95)
  - Highlight "CALCULATE" and press **[ENTER]**. The results displayed are as follows:
    - (a, b) is the confidence interval for the population proportion, which is $\left(\hat{p} - E,\ \hat{p} - E\right)$, where E is the Margin of Error
    - $\hat{p}$ is the sample proportion
    - **n** is the sample size
- **To Calculate an Estimate for the Population Mean when σ is KNOWN**
  - Press **[STAT]** then move to the **TESTS** submenu, then select "**7: ZInterval…**"
  - Enter requested info (should be clear) and press [**ENTER**] to calculate. The results displayed are as follows:
    - (a, b) is the confidence interval for the population mean, which is $\left(\bar{x} - E,\ \bar{x} - E\right)$, where E is the Margin of Error
    - $\bar{x}$ is the sample mean
    - **n** is the sample size
- **To Calculate an Estimate for the Population Mean when σ is NOT KNOWN**
  - Press **[STAT]** then move to the **TESTS** submenu, then select "**8: TInterval…**"
  - Enter requested info (**Sx** is the sample standard deviation. The rest should be clear.). Press [**ENTER**] to calculate. The results displayed are as follows:
    - (a, b) is the confidence interval for the population mean, as stated above
- **To Calculate the Critical Values for *t* distributions**
  - Press **[2ND]** then **[VARS]** (which accesses the [**DISTR**] option), then select "**4: invT(** "
  - Enter inputs of the function as follows: **invT**(a, df), where ***a*** is the area to the LEFT of the critical value and ***df*** is the degrees of freedom.
  - Press **[ENTER]** to display the critical value $t_{\alpha/2}$.
- **To Calculate the Critical Values for normal distributions**
  - Press **[2ND]** then **[VARS]** (which accesses the [**DISTR**] option), then select "**3: invNorm(** "
  - Enter inputs of the function as follows: **invNorm**(a, *0, 1*), where ***a*** is the area to the LEFT of the critical value
  - Press **[ENTER]** to display the critical value $z_{\alpha/2}$.

Chapter 8 – Hypothesis Testing

- **To Test a Claim about a Proportion**
  - Press **[STAT]** then move to the **TESTS** submenu, then select "**5: 1-PropZTest…** "
  - Enter requested info as follows: $\mathbf{p_0}$ is the proportion corresponding to the null hypothesis $\mathbf{H_0}$; **x** is the number of samples showing the characteristic of interest; **n** is the sample size.
  - Choose **prop** as follows: If doing a 2-tailed test choose $\neq \mathbf{p_0}$; if doing a left-tailed test choose $< \mathbf{p_0}$; if doing right-tailed test choose $> \mathbf{p_0}$. Press [**ENTER**] to select your option.
  - Highlight "CALCULATE" and press **[ENTER]**. The results displayed are as follows:
    - z is the test statistic
    - **p** is the p-value for the test
    - $\hat{p}$ is the sample proportion
- **To Test a Claim about a Mean when σ is KNOWN**
  - Press **[STAT]** then move to the **TESTS** submenu, then select "**1: Z-Test…**"
  - Enter requested info as follows: $\boldsymbol{\mu_0}$ is the mean corresponding to the null hypothesis $\mathbf{H_0}$. Other inputs should be recognized.
  - Choose **μ** as follows: If doing a 2-tailed test choose: $\neq \boldsymbol{\mu}_0$; if doing a left-tailed test choose: $< \boldsymbol{\mu}_0$; if doing right-tailed test choose: $> \boldsymbol{\mu_0}$. Press [**ENTER**] to select your option.
  - Highlight "CALCULATE" and press **[ENTER]**. The results displayed are as follows:
    - z is the test statistic
    - **p** is the p-value for the test
    - Other data is straightforward

- **To Test a Claim about a Mean when σ is NOT KNOWN**
  - Press **[STAT]** then move to the **TESTS** submenu, then select "**2: T-Test…**"
  - Enter requested info as follows: μ_0 is the mean corresponding to the null hypothesis H_0. **Sx** is the sample standard deviation. Other inputs should be recognized.
  - Choose **μ** as follows: If doing a 2-tailed test choose: $\neq \mu_0$; if doing a left-tailed test choose: $< \mu_0$; if doing right-tailed test choose: $> \mu_0$. Press [**ENTER**] to select your option.
  - Highlight "CALCULATE" and press **[ENTER]**. The results displayed are as follows:
    - ***t*** is the test statistic
    - **p** is the p-value for the test
    - Other data is straightforward

- **To Calculate p-Values given the test statistic *t*, and the Sample Size *n*, when σ is NOT KNOWN**
  - Press **[2ND]** then **[VARS]** (which accesses the [**DISTR**] option), then select "**6: tcdf(** "
  - If performing a RIGHT-tailed test, enter inputs of the function as follows: **tcdf**(*t*, 99, *df*), where ***t*** is the test statistic, and ***df*** is the degrees of freedom.
  - If performing a LEFT-tailed test, enter inputs of the function as follows: **tcdf**(-99, *t*, *df*), where ***t*** is the test statistic, and ***df*** is the degrees of freedom.
  - If performing a TWO-tailed test, and the *t*-value is **negative** then **p** = 2 × **tcdf**(-99, *t*, *df*). If *t*-value is **positive** then **p** = 2 × **tcdf**(*t*, 99, *df*)

Chapter 9 – Inferences from Two Samples

- **To Test Hypothesis About Two Proportions**
  - Press **[STAT]** then move to the **TESTS** submenu, then select "**6: 2-PropZTest…** "
  - Enter requested info as follows: **x1**, **n1** relate to data from the one sample, and **n2**, **n2** relate to data from the one sample
  - Choose **p1** as follows: If doing a 2-tailed test choose ≠ **p2**; if doing a left-tailed test choose < **p2**; if doing right-tailed test choose > **p2**. Press [**ENTER**] to select your option.
  - Highlight "CALCULATE" and press **[ENTER]**. The results displayed are as follows:
    - *z* is the test statistic
    - **p** is the P-value for the test
    - Other data is straightforward

- **To Test Hypothesis About Two Means from Independent Samples (Standard Deviations Unknown & Unequal)**
  - Press **[STAT]** then move to the **TESTS** submenu, then select "**4: 2-SampTTest…** "
  - Enter requested info as follows: $\bar{x}1$, **Sx1**, **n1** relate to data from the one sample, and $\bar{x}2$, **Sx2**, **n2** relate to data from the one sample
  - Choose **μ1** as follows: If doing a 2-tailed test choose ≠ **μ2**; if doing a left-tailed test choose < **μ2**; if doing right-tailed test choose > **μ2**. Press [**ENTER**] to select your option.
  - Choose "**No**" for the "**Pooled**" option. (This is because you assume that the standard deviations are unequal.)
  - Highlight "CALCULATE" and press **[ENTER]**. The results displayed are as follows:
    - *t* is the test statistic
    - **p** is the P-value for the test
    - Other data is straightforward

- **To Calculate Confidence Interval for Differences of Means from Independent Samples (Standard Deviations Unknown & Assumed Unequal)**
  - Press **[STAT]** then move to the **TESTS** submenu, then select "**0: 2-SampTInt…** "
  - Enter requested info as indicated above.
  - Highlight "CALCULATE" and press **[ENTER]**. The results displayed are as follows:
    - (*a*, *b*) is the confidence interval. If the confidence interval includes zero (0), then there is not significant difference between the means.

- **To Test Hypothesis About Mean of Differences for Matched Pairs**
  - Create a list L_1 with the values for the first sample. Create a list L_2 with the matched values (be sure that matched values are in the same relative positions in the lists).
  - Clear the screen and create List L_3 as follows: In the List Editor (the same in editor in which you created L_1 and L_2) , highlight L_3 and enter: $L_1 - L_2$. This will create L_3.
  - Press **[STAT]** then move to the **TESTS** submenu, then select "**2: T-Test…** "
  - Select the "**Data**" option and enter requested info as follows: μ_0**:** 0; List: L_3; Freq: 1
  - Choose **μ** as follows: If doing a 2-tailed test choose ≠ μ_0; if doing a left-tailed test choose < μ_0; if doing right-tailed test choose > μ_0. Press [**ENTER**] to select your option.
  - Highlight "CALCULATE" and press **[ENTER]**. The results displayed are as follows:
    - *t* is the test statistic
    - **p** is the p-value for the test
    - Other data is straightforward

- **To Calculate Confidence Interval for Mean of Differences for Matched Pairs**
  - Create list $\mathbf{L_3}$ as described above.
  - Press **[STAT]** then move to the **TESTS** submenu, then select "**8: TInterval…** "
  - Enter requested info into the "**Data**" input option, using list $\mathbf{L_3}$ and Freq: 1.
  - Highlight "CALCULATE" and press **[ENTER]**. The results displayed are as follows:
    - (a, b) is the confidence interval. If the confidence interval includes zero (0), then there is not significant difference between the means.

Chapter 10 – Correlation and Regression

- **To Test Calculate Coefficient of Regression, p-Value, and Regression Equation**
  - Create lists $\mathbf{L_1}$ for your X-values and $\mathbf{L_2}$ for Y-values (be sure that matched values are in the same relative positions in the lists).
  - Press **[STAT]** then move to the **TESTS** submenu, then select "**F: LinRegTTest…** "
  - Enter requested info. Leave the "RegEQ:" option blank
  - Choose **β & ρ** as follows: If doing a 2-tailed test choose **≠ 0**; if doing a left-tailed test choose **< 0**; if doing right-tailed test choose **> 0**. Press [**ENTER**] to select your option.
  - Highlight "CALCULATE" and press **[ENTER]**. The results displayed are as follows:
    - **a** and **b** correspond to the y-intercept $\mathbf{b_0}$ and the slope $\mathbf{b_1}$ (respectively) of the linear regression equation (**y = a + bx** on the calculator). **r** is the linear correlation coefficient, and $\mathbf{r^2}$ is the proportion of the variation of y that is explained by the relationship between x and y.

- **To Create a Scatter Plot of Data**
  - Create lists $\mathbf{L_1}$ for your X-values and $\mathbf{L_2}$ for Y-values (be sure that matched values are in the same relative positions in the lists).
  - Press **[2ND]** then [**Y=**] (which accesses the [**STAT PLOT**] option)
  - Select "**1: Plot 1…**". In the first line, select "**On**" and press [**ENTER**]. Ensure that the appropriate lists are indicated (if not, change to the appropriate values).
  - Press [**ZOOM**] and select "**9: ZoomStat…** " to view the graph fitted to the data.

Clearing Lists and Resetting Calculator Memory

- **To Clear all lists**
  - Press **[2ND]** then [**+**] (which accesses the [**MEM**] option)
  - Select "**4: ClrAllLists**". Press [**ENTER**] at the view screen. "**Done**" appears when the lists are cleared.

- **To Reset Memory**
  - Press **[2ND]** then [**+**] (which accesses the [**MEM**] option)
  - Select "**7: Reset…**". Select "**1: All RAM…**". On the **RESET RAM** Menu select "2**: RESET…**"
  - "**RAM Cleared**" appears when memory is reset.