

Introduction to *Minitab*

OVERVIEW

In this lab, you will become familiar with the general features of *Minitab* statistical analysis software, as well as some specialized features for conducting introductory statistical analysis and graphing. The skills learned in this laboratory will be important for future laboratory activities.

OBJECTIVES

By the end of the laboratory, you will be able to

- Enter data in *Minitab*.
- Open and save both **Projects** and **Worksheets**.
- Use *Minitab's* pull down menus and the submenus.
- Calculate with columns of data.
- Use *Minitab* to calculate descriptive statistics.
- Draw histograms, boxplots, and scatterplots.

EQUIPMENT



- PC with *Minitab*
- Computer diskette to save files

BACKGROUND MATERIAL

Minitab is a statistical analysis software. It can be used for learning about statistics as well as statistical research. Statistical analysis computer applications have the advantage of being accurate, reliable, and generally faster than computing statistics and drawing graphs by hand. *Minitab* is relatively easy to use once you know a few fundamentals.



Minitab Lesson

Note: The computer icon, , indicates you will need to complete the procedures on the computer. The book icon, , indicates that you will need to read the information.

OPENING MINITAB IN WINDOW 95, 98 OR NT



Open Minitab following the steps below.

- Click the **Start button** in the bottom left hand corner of the screen.
- Select **Programs >Minitab for Windows>Minitab** (or **Minitab 12 Student**).
- **Minitab** will open.

GENERAL LAYOUT



When you first open *Minitab*, you will see **two windows**, a *Session window* and a *Worksheet window*.

- **Session Window:** The area that displays the statistical results of your data analysis. (Also used to enter commands and macros.)
- **Worksheet Window:** A grid of rows and columns used to enter and manipulate the data. Note: This area looks like a spreadsheet, but will not automatically update the columns when entries are changed.

Other windows include

- **Graph Window:** When you generate graphs, each graph is opened in its own window.
- **Version 13, Report Window:** Version 13 has a report manager that helps you to organize your results in a report.
- **Other Windows:** *History* and *Project Manager* are other windows. See *Minitab* help for more information on these if needed.

DATA TYPES



- **Numerical:** Numerical data is the only type *Minitab* will use for statistical calculations. Numerical data is aligned on the right side of the column. *Minitab* will not recognize numbers with commas as numbers, but as text.
- **Text:** Text cannot be used for computations. Though “text” generally means words or characters, numbers can be classified as text. If column 1 has text in it, the column label will change from C1 to C1-T. Data types can be changed. See the details in Data Manipulations, below.
- **Date/Time:** *Minitab* recognizes 3/5/00 as a date, but will store this internally as a number so you can manipulate it. The column label will indicate a date by C1-D and a time by C1-T.

ENTERING DATA



You can enter your data going down or across. In the top left corner of the **Worksheet window**, there is a cell with an arrow in it. Click this cell to change the action of the **Enter key**.

- If the arrow is pointing down, then when you press Enter, the cursor will go down the column.
- If the arrow is pointing to the right, then when you press Enter, the cursor will go across the row, to the next column.



Enter the data from the scenario below.

Scenario

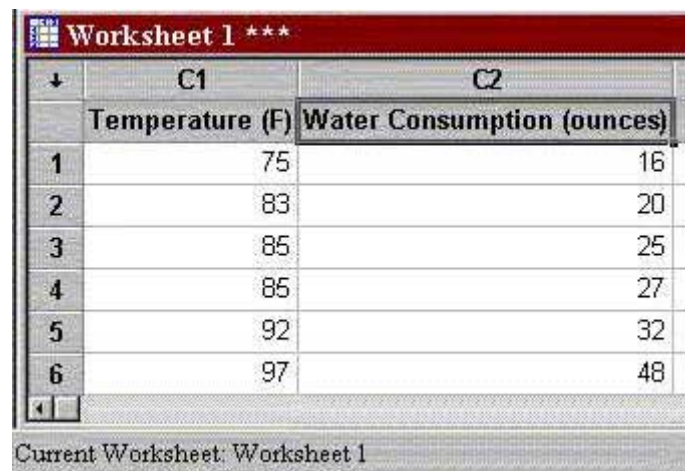
An individual took measurements of the temperature and the amount of water s/he consumed during a three-hour period outside. The data was collected for seven random days during the summer.

Temperature (F)	Water Consumption (ounces)
75	16
83	20
85	25
85	27

92	32
97	48
99	48

Entering data is really two steps: Entering the column headings and then entering the data itself.

1. **Enter the column headings.** Column headings must be entered above Row 1
 - Enter “Temperature (F)” in the first cell in Column 1. *The first cell is above Row 1.
 - Enter “Water Consumption (ounces)” in first cell in Column 2. *The first cell is above Row
2. **Enter the data.** Enter the corresponding temperatures and water consumption in the appropriate column as shown. Do not change the order of the items. Make sure the items were entered as numbers not text.



	C1	C2
	Temperature (F)	Water Consumption (ounces)
1	75	16
2	83	20
3	85	25
4	85	27
5	92	32
6	97	48

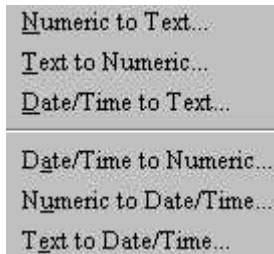
Current Worksheet: Worksheet 1

Usually, it is best to take time to think about how you will be analyzing the data before you enter it. That can save trouble later. However, if your data is not entered in the best format the first time, you can manipulate it and may not have to re-enter it.

MANIPULATING DATA



Minitab can change data types within limits. You cannot change a column that contains people’s names to numeric values, but if you have a column of numbers that accidentally was entered as text, you can change those to numeric values. *Minitab* makes the following types of transformations.



To make these changes in *Minitab*, from the main menu select **MANIP > CHANGE DATA TYPE**. Then select the option that you want, and fill in the dialog box.



Check to make sure that the temperature/water data has been entered as numbers. If not, change the data to numeric using the **MANIP> CHANGE DATA TYPE** menu.

CALCULATING WITH DATA

You can add columns together, calculate the sum of a column or each row, or convert a column to their Z-scores. These and other calculations can be completed under the main menu item of **CALC**.



Assume that the data collector for the temperature/water example learned that the thermometer that was used gave incorrect readings. In fact, the thermometer read the temperature ten degrees too low. Therefore, we want to create a column called "Temp plus 10" and have Minitab add ten degrees to the temperature in column C1.

1. Label column 3 as "**Temp plus 10.**"
2. Select **CALC > CALCULATE**.
3. In the "**Store result in variable box**", select **C3 (Temp plus 10)**.
4. In the "**Expression**" box, we want to put the expression that tells Minitab to add ten to the contents in the temperature column. To do that, Select **C1 (Temperature)**, then click on "+" (the plus sign) found next to the number 9 on the Calculator, then enter the number "10." The result in the expression box should look approximately like '**Temperature**' + 10.
5. Click **OK**.
6. Look in the worksheet window. Column C3 should contain seven temperatures that are ten degrees higher than the temperatures in column C1.

SAVING DATA



You can save two different things in *Minitab*. You can save the worksheet by itself, or the entire project. Saving the worksheet as a separate file is a very good habit. That way you have the data stored in a place where you can always go back to it, even if the data you are working with in a given project is corrupted. To save the data in a worksheet by itself,

1. Select **FILE > SAVE CURRENT WORKSHEET AS**.
2. Use the arrow beside the **Save in** field to select the **Floppy (A)** or location of your diskette.
3. In the **File Name** field type the name of the worksheet. *Minitab* will automatically add the extension **MTW** for *Minitab* worksheet.
4. Click **Save**.

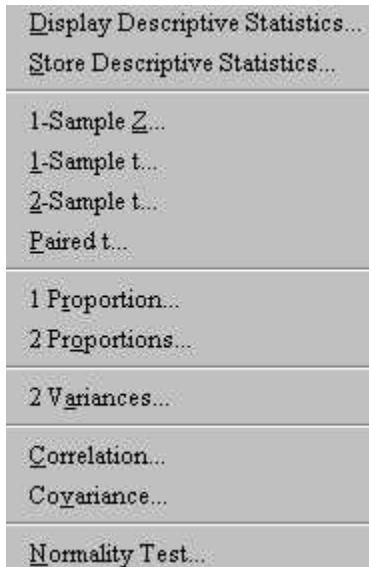
STATISTICAL ANALYSIS



Minitab will conduct a variety of statistical calculations. These are found under the main menu option of **STAT**. A menu of the statistics categories is shown below. Each category also has subcategories.

<u>B</u> asic Statistics	▶
R <u>e</u> gression	▶
<u>A</u> NOVA	▶
<u>D</u> OE	▶
<u>C</u> ontrol Charts	▶
<u>Q</u> uality Tools	▶
R <u>e</u> liability/Survival	▶
<u>M</u> ultivariate	▶
T <u>i</u> me S <u>e</u> ries	▶
<u>T</u> ables	▶
<u>N</u> onparametrics	▶
<u>E</u> DA	▶
<u>P</u> ower and Sample Size	▶

In this introduction, we are interested in the **Basic Statistics**. The subcategories for Basic Statistics are shown in the figure below.



For the temperature/water data, find the mean and standard deviation.

You should have the temperature in column C1 and the water consumption in column C2. For this exercise, we will ignore the values in C3.

1. Select **STAT > BASIC STATISTICS > DISPLAY DESCRIPTIVE STATISTICS.**
2. In the Variables box, select **C1 (Temperature).**
3. Click **OK.**
4. Look in the Session window. You should see the following display.

Descriptive Statistics: Temperature

Variable	N	Mean	Median	TrMean	StDev	SE Mean
Temperat	7	88.00	85.00	88.00	8.47	3.20

Variable	Minimum	Maximum	Q1	Q3
Temperat	75.00	99.00	83.00	97.00

Terms in the output and some definitions

- **N** = number of data items in the sample that
- **N*** = number of items in the sample that are missing data (**N*** does not show up when all the items in the sample have data, as in our example.)
- **Mean** = "average"
- **Median** = "middle number"
- **TrMean** = the 5% Trimmed Mean
- **StDev** = standard deviation
- **SE Mean** = standard error of the mean = standard deviation divided by the square root of the sample size

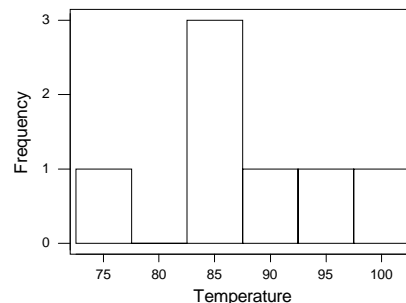
- **Minimum** = smallest data value
- **Maximum** = largest data value
- **Q1** = 25th percentile = first quartile
- **Q3** = 75th percentile = third quartile

GENERATING GRAPHS

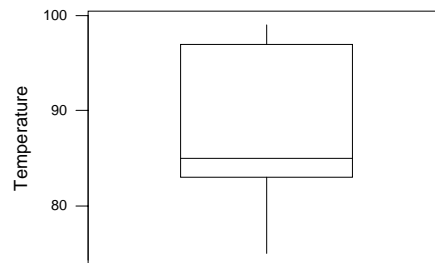


For this example, we will draw a histogram and box plot of the temperature data and scatterplot of the water consumption vs. the temperature.

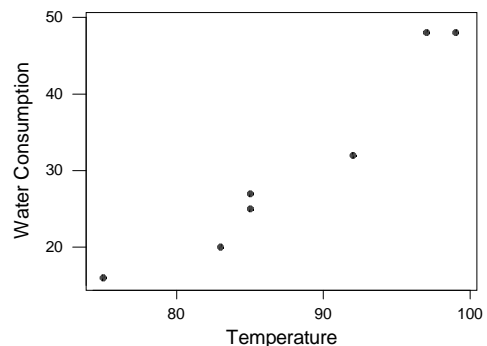
1. To draw a histogram, select **GRAPH > HISTOGRAM**
2. In the **Graph Variables** box, select **C1 (Temperature)**.
3. Click **OK**.
4. Compare your answer with a resulting histogram below. You can change the settings for the width of the bars in the histogram by clicking the **Frame** down arrow on the histogram dialog box and making the desired changes.



5. To draw a **boxplot**, select **GRAPH > BOXPLOT**.
6. In the **Graph Variables** box under the **Y**, select **C1 (Temperature)**.
7. Click **OK**
8. Compare your answer with a resulting boxplot below. Note: The X column is for categories. For example if you were graphing GPA by Gender, you would get two box plots, one for each gender. Our data is not broken down into categories, so this option is not relevant for this example.



9. To graph a scatterplot for the water consumption based on the temperature, select **GRAPH > PLOT**.
10. In the **Graph variables** box, under the **Y**, select **C2 (Water Consumption)** and under the **X**, select **C1 (Temperature)**.
11. Click **OK**.
12. Compare your graph with the graph shown below.



SAVING THE DATA AND ANALYSIS AND GRAPHS (SAVING THE PROJECT)



Save the project, including graphs on your diskette with the filename *thirstydata*.

- Select **FILE > SAVE CURRENT WORKSHEET AS**.
- Use the arrow beside the **Save in** field to select the **Floppy (A)** or location of your diskette.
- In the **File Name** field type the name of the worksheet. *Minitab* will automatically add the extension **MTW** for *Minitab* worksheet.
- Click **Save**.



Assignment

Find the mean and standard deviation using Minitab for the "water consumed" sample data given in this laboratory. Also, draw a histogram and boxplot of the water consumption data. Draw a scatterplot of the temperature based on the water consumption. (i.e. Let temperature be the y variable and water consumption be the x variable.) Compare the two scatterplots. What do you notice? Which scatterplot is more representative of the original scenario? Why?

Note:

You will be using *Minitab* for the rest of the labs in this book. You may want to refer back to this chapter as a reference.