

MINITAB TUTORIAL

by

Dr. Tim Zgonc

Thiel College

August 1996

Eighth Edition

Revised for Minitab Version 17
and Windows 7

by

Dr. Mervin E. Newton & Dr. Jeonghun Kim

Thiel College

August 2015

Table of Contents

COPYRIGHT.....	iv
DEDICATION.....	v
PREFACE.....	vi
LESSON 1 - INTRODUCTION.....	1
ENTERING MINITAB	1
WINDOWS.....	1
ACTIVATING A WINDOW	1
MAXIMIZING AND MINIMIZING A WINDOW.....	2
THE DATA WINDOW	2
MANUAL DATA ENTRY.....	2
SAVING A WORKSHEET.....	3
RETRIEVING A WORKSHEET	4
THE SESSION WINDOW	5
DISPLAY DATA.....	5
PRINTING THE SESSION WINDOW	6
SAVING THE SESSION WINDOW	6
SAMPLING	6
SAVING AND OPENING PROJECTS	7
EXITING MINITAB	8
RESTARTING MINITAB.....	8
INSTRUCTIONS FOR ALL MINITAB ASSIGNMENTS.....	8
MINITAB ASSIGNMENT 1.....	9
LESSON 2 - FREQUENCY DISTRIBUTION	10
MINITAB ASSIGNMENT 2.....	11
LESSON 3 - INTRODUCTION TO GRAPHING.....	12
GRAPH WINDOWS	12
PRINTING GRAPHS	13
EDITING GRAPHS.....	13
CONTROLLING HISTOGRAMS	15
FINDING GROUPED FREQUENCIES	18
POLYGONS	18
SAVING A GRAPH.....	19
MINITAB ASSIGNMENT 3.....	20
LESSON 4 - ADVANCED GRAPHING.....	21
DOT PLOTS.....	21

SEPARATING BY VARIABLE	22
PIE CHARTS.....	22
STEM AND LEAF PLOTS.....	23
MINITAB ASSIGNMENT 4.....	25
LESSON 5 - MEASURES OF CENTRAL TENDENCY.....	26
SEPARATING STATISTICS BY VARIABLES	26
MINITAB ASSIGNMENT 5.....	28
LESSON 6 - MEASURES OF VARIATION	29
MINITAB ASSIGNMENT 6.....	31
LESSON 7 - BOX-AND-WHISKER PLOTS.....	32
MINITAB ASSIGNMENT 7.....	35
LESSON 8 - DISCRETE DISTRIBUTIONS.....	36
MEAN AND VARIANCE	37
MINITAB ASSIGNMENT 8.....	38
LESSON 9 - BINOMIAL DISTRIBUTIONS.....	39
CREATING A PROBABILITY TABLE FOR $X \sim B(n, p)$	39
CREATING A HISTOGRAM FOR $X \sim B(n, p)$	40
SAMPLE PROBLEM.....	41
MINITAB ASSIGNMENT 9.....	44
LESSON 10 - CENTRAL LIMIT THEOREM	45
NORMALITY OF SAMPLE MEANS.....	46
MINITAB ASSIGNMENT 10.....	48
LESSON 11 - CONFIDENCE INTERVALS.....	49
MINITAB ASSIGNMENT 11.....	52
LESSON 12 - HYPOTHESIS TESTING; σ KNOWN	53
MINITAB ASSIGNMENT 12.....	56
LESSON 13 -HYPOTHESIS TESTING; σ UNKNOWN	57
ANDERSON-DARLING NORMALITY TEST	57
ONE SAMPLE t - TEST.....	60
OUTLIER EXAMPLE.....	60
SUMMARY DATA.....	62
MINITAB ASSIGNMENT 13.....	63

LESSON 14 - HYPOTHESIS TESTING; INDEPENDENT SAMPLES, σ_1 and σ_2 UNKNOWN	64
MINITAB ASSIGNMENT 14.....	67
LESSON 15 - HYPOTHESIS TESTING; DEPENDENT SAMPLES	68
MINITAB ASSIGNMENT 15.....	70
LESSON 16 - REGRESSION AND CORRELATION	71
CORRELATION	71
REGRESSION ANALYSIS	71
GRAPH.....	72
PREDICTION.....	73
SAMPLE WRITE-UP	75
MINITAB ASSIGNMENT 16.....	76
LESSON 17 - CONTINGENCY TABLES	77
SAMPLE WRITE-UP	78
MINITAB ASSIGNMENT 17.....	79
LESSON 18 - ANOVA.....	80
SAMPLE WRITE-UP	82
MINITAB ASSIGNMENT 18.....	83
LESSON 19 - SIGN TEST	84
MINITAB ASSIGNMENT 19.....	85

8 COPYRIGHT 2007

by

Mervin E. Newton & Jeonghun Kim

All rights reserved.

DEDICATION

This document is dedicated to the memories of

TIMOTHY ZGONC

1950 - 1998

and his wife

KATHLEEN ZGONC

1949 - 2004

Loyal servants and good friends of Thiel College
and of the Greenville, Pennsylvania community.

PREFACE

This material is used as part of the Elementary Statistics course at Thiel College. The main text used in that course is *Elementary Statistics* Sixth Edition by Larson and Farber, published by Pearson Education. All references in this document about page and problem numbers are based on that book. The order in which the chapters are covered in the course is 1, 2, 4, 5, 6, 7, 8, 9, 10, and 11. (Note that the chapter 11 can only be found in the e-text in MyStatLab); but not every section of every chapter is included. The numbering of the lessons in this document is dictated by that chapter ordering. The table to the right indicates the section numbers from the text that provides the prerequisite statistical background for each lesson.

The current authors would like to thank Professor Jennifer Curry, Professor Jerry Amon, Professor Max Shellenbarger, Dr. Jie Wu, Professor Noah Salvaterra, Dr. Russell Richins, Sara Franco Newton, Melanie Jovenall '00, Tammy Smith '04, Sharon Heilbrun '06, John Svirbly '06, Lesley Bobak '07, Bess Moran '07, Lee Grable '08, Tiffany Banas '08, Amber Pouliot (visiting student), Punit Upadhyaya '10, and Ashley Heben '11 for their help in proof reading this and/or earlier versions of this document.

Thanks also to Dr. Karl Oman who suggested many improvements for this and earlier revisions.

This document was printed from the WWW. The URL is:

<http://resources.thiel.edu/mathproject/Mintb/Default.htm>


Last revised : August 1, 2015

Lesson	Section
1	1.3
2	2.1
3	2.1
4	2.2
5	2.3
6	2.4 & 2.5
7	2.5
8	4.1
9	4.2
10	5.4
11	6.1
12	7.2
13	7.3
14	8.2
15	8.3
16	9.1, 9.2 & 9.3
17	10.2
18	10.4
19	11.1

LESSON 1 - INTRODUCTION

NOTE: It is recommended that you create a folder called something like "MintabWork" on your hard drive or J:\ drive before you start this tutorial. You will need to store many files as you work your way through this course, and this will give you a handy place to save them all.

ENTERING MINITAB

To install Minitab double click on the installation package "Setup" in the K:\Minitab17 directory and follow instructions. If the installation is successful, you will find the logo  on your desktop.

NOTE: This is only a shortcut to the program. Even if the shortcut is on your computer's desktop, you must still be logged onto the Thiel network to use it.

WINDOWS

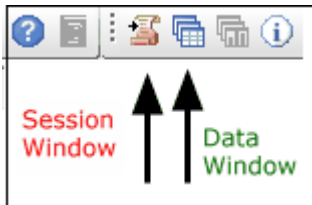
You will encounter three types of windows in MINITAB. The **session window** contains comments, tables, descriptive summaries, and inferential statistics. The **data window** consists of all the data and variable names. **Graph windows** contain high resolution graphs. There is only one session window but there may be many data and graph windows. Data windows and the session window are discussed below; graph windows will be introduced in Lesson 3.

Upon entering the program, two windows appear. The session window occupies the upper portion of the screen and the data window is below it.

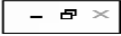
Although many windows may be shown at once, only one window is active at any time. You will know a window is active when its title bar at the top of the window is highlighted. When you first enter Minitab, the session window is active. Notice that the name of the data window is Worksheet 1.

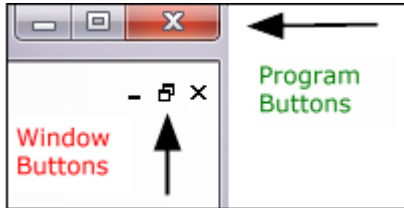
ACTIVATING A WINDOW

Use the mouse to move the cursor anywhere in the window you wish to activate and click the mouse once. Try this with the data window. Click the mouse while the cursor is anywhere in the data (bottom) window, and notice that Worksheet 1 is activated. Now click anywhere in the session window and notice that "Session" is activated. You may also activate a window by clicking the appropriate icon on the tool bar. A third method is by using the Window pull down menu from the very top of your screen. Click on Window. A submenu pops up. Click on Session in the submenu. Note that the submenu disappears and that the session window is now active. (A sequence of menu choices such as this will be abbreviated: e.g. Window > Session > 3 Worksheet 1)



MAXIMIZING AND MINIMIZING A WINDOW

The following buttons  which appear at the right end of the title bar of each window, control the size of the window. The button on the left minimizes the window so it is no longer visible. It can be restored by using the Window menu as discussed above. The middle button is a toggle that alternates between maximizing a window and restoring it to its intermediate size. The right button closes a window. If the contents have not been saved they are lost forever. Notice that there is also a similar set of buttons at the very top of the screen that apply



to the Minitab program. When you want to give a command to a particular window, make sure you are clicking on the window buttons and not on the Minitab program buttons. This is particularly important when you are working with a maximized window because the window buttons are much smaller than the program buttons as shown in the image to the left.

Maximize the data window then restore it by clicking on the middle button. Minimize the session window by clicking the left button then restore it using the Window menu.

THE DATA WINDOW

Each time you enter Minitab, the session window is active and it contains a date/time stamp and a welcome message, and the data window is empty. You will use one of two data entry methods: manually entering data or retrieving an existing file.

MANUAL DATA ENTRY

A new data set which has not been saved may be entered manually and then saved for future use. For example, the following are data collected on eight college freshmen:

STUDENT	SEX	HIGH SCHOOL GPA	H. S. CLASS RANK (% FROM TOP)	NUMBER OF SIBLINGS
1	M	2.65	46	2
2	M	3.72	18	0
3	F	2.95	37	1
4	F	3.59	20	1
5	F	3.05	41	4
6	M	3.10	32	2
7	F	2.85	51	6
8	M	3.86	9	1

Each column represents a variable. In Minitab, each variable name may be as many as 31 characters long, but we shall stick to about eight so that the fields don't get too wide. We will abbreviate the last three variable names as H.S.GPA, H.S.RANK, and SIBS.

Before entering a new data set by hand, be sure that the data window is empty. If you have just entered Minitab, this is the case. Otherwise click on the close button on the top of the data window and you will get a dialog box that will ask you if you want to save the current data window. Click "NO" and you will have a new data window with which to work. It is also a good idea to maximize the data window while you are working on it. Do that now.

Enter the variable names at the tops of the columns first. Click on the gray cell below C1 and type SEX. Use the <→> direction key to move to the top of succeeding columns and type the variable names. Your Data Window should look like the figure below.

↓	C1	C2	C3	C4
	SEX	H.S.GPA	H.S.RANK	SIBS
1				
2				

Each row is called a **record**. When the data set consists of several variables (columns), it is a good idea to enter the data record by record (row by row.) The direction of data entry is then →. Each use of the <Enter> key moves the cursor one cell to the right.

When you reach the end of a record, use the <Ctrl> and <Enter> keys simultaneously to return to the beginning of the next record.

You could also enter data column by column (variable by variable.) In this case the

direction of data entry is ↓. You change the direction of data entry by clicking on the arrow in the upper left corner of the data window. Each use of the <Enter> key moves the cursor one cell down. When you reach the bottom of a variable column, use the <Ctrl> and <Enter> keys simultaneously. The cursor will move to cell 1 of the next column.

→	C1-T	C2	C3	C4
	SEX	H.S.GPA	H.S.RANK	SIBS
1	M	2.65	46	2
2	M	3.72	18	0
3	F	2.95	37	1
4	F	3.59	20	1
5	F	3.05	41	4
6	M	3.10	32	2
7	F	2.85	51	6
8	M	3.86	9	1

Enter the data for the eight freshmen row by row, that is, one record at a time. Your data window should now look like the figure in the left.

The contents of your data window is called a **WORKSHEET**.

Restore the window to its intermediate size by clicking the middle box in the upper right corner of the data window.

SAVING A WORKSHEET

Once data has been entered or changed, you should save it to your own hard drive or J: drive. If you make a mistake, if the system crashes, or if you need the data at a later time for a different project, it can be retrieved. (SEE RETRIEVING A WORKSHEET below).

Click on File>Save Current Worksheet As. You will get a dialog box similar to those on most software. Navigate to the location where you would like to save the file, give it a name (let's call it STUDENTS) and click the save button. Your worksheet will be saved as STUDENTS.MTW. Minitab provides the .MTW extension automatically.

WARNING: All saves and retrieves for worksheets must be done through the File menu with Open Worksheet, Save Current Worksheet, and Save Current Worksheet As... . The open and save icons on the tool bar are for opening and saving projects (discussed later in this lesson).

RETRIEVING A WORKSHEET

Data which was previously entered and saved may be retrieved from an existing file. Minitab refers to such a file as a WORKSHEET. It contains data and variable names only. There are no graphs, statistical summaries, or analyses in a WORKSHEET.

Let's close your data window and reload the data we just saved. Click the close button at the top of the data window to get a clean data window. Click on File > Open Worksheet. A dialog box similar to the previous one appears. Notice that it is at the location where we just saved our worksheet. Now click on the file STUDENTS.MTW and then on OPEN. (NOTE: If you have exited Minitab then come back to it, Minitab will be looking in the default location and you will need to navigate to the place you saved your file.)

Now close the data window again and let's retrieve a worksheet that comes with the Minitab program. It is on drive K:\, directory Minitab17 and subdirectory Sample Data. The file is Trees.MTW (All Minitab worksheets have the extension .MTW).

Click on File > Open Worksheet and navigate to Applications on 'Thiel_data' K:\Minitab17\Sample Data. Scroll to the right until you find the file Trees.MTW. Click on the desired file then click OPEN.

Maximize the Data window and examine it. Each column is for a different variable. You may refer to it by column number, such as C2, or by its name, such as HEIGHT. Each row is a different record. In this case, a record is a tree. So tree 4 has diameter 10.5, height 72, and volume 16.4.

For a complete description of any of the files provided by Minitab, click Help > ? Help, then on the "index" tab. Type "sam" where it says "Type in the keyword to find." Double click the line that says "Sample data sets." On the right you will now see a list of all of the available data sets. Trees is quite far down the list, so click on the "T" button at the top of the page, then click on "TREES." The description of the file will now be displayed. See the figure below.

The diameter, height, and volume of 31 black cherry trees in Allegheny National Forest are recorded in this file.

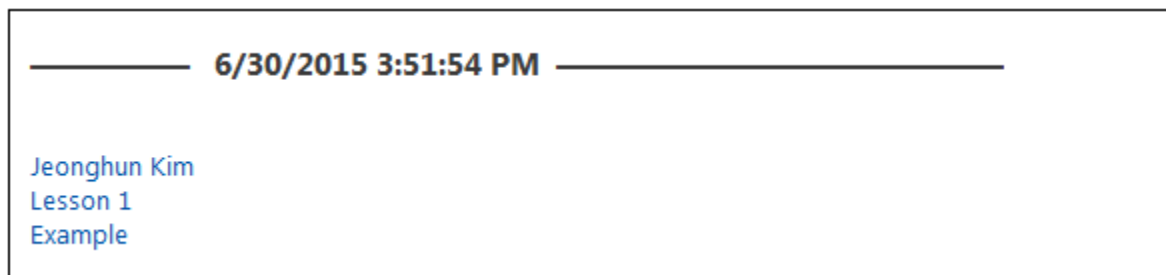
Column	Name	Count	Description
C1	Diameter	31	Diameter of tree in inches (measured at 4.5 feet above ground)
C2	Height	31	Height of tree in feet
C3	Volume	31	Volume of tree in cubic feet

Restore the Data window to its original size and close it.

THE SESSION WINDOW

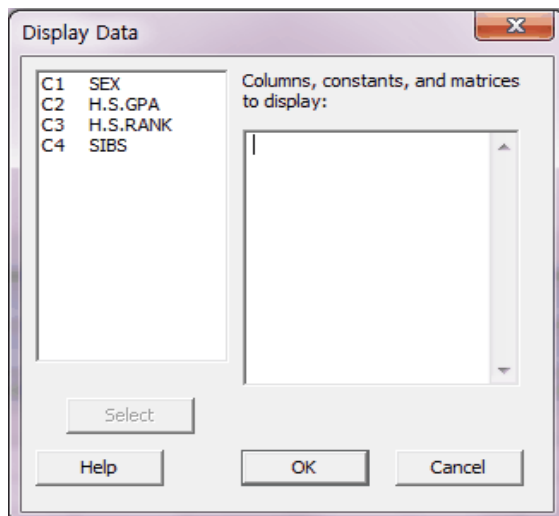
Comments and all of your statistical work other than graphs will appear in the session window. While the session window is active, you may edit its contents as you would in a word processor and later print it. The editing commands such as Backspace, Delete, Cut/Copy/Paste, etc. all work exactly as in most word processors.

Retrieve the file STUDENTS.MTW that we saved earlier. We will now delete all text except the date/time stamp from the session window. First, activate the session window by clicking anywhere in it, then maximize it. Highlight the text to be deleted by dragging the mouse across it with the left button depressed. Click on Edit > Define from the top menu or simply hit the delete key on the keyboard. Type your name on the line below the date/time stamp, type "Lesson 1" on the next line, and "Example" on the next. Your session window should now look like the figure below.



DISPLAY DATA

We will now have Minitab display the contents of the data window on the session window. Click on Data > Display Data..., and you will see the dialog box below on the left. The cursor should be blinking in the box labeled "Columns, constants, and matrices to display:" Highlight all four variables from the Data Window by dragging the mouse down the list in the box on the left. Click "Select" then "OK". You should see the data from the data window displayed on the session window as shown in the figure below on the right.



Results for: Students.MTW

Data Display

Row	SEX	H.S.GPA	H.S.RANK	SIBS
1	M	2.65	46	2
2	M	3.72	18	0
3	F	2.95	37	1
4	F	3.59	20	1
5	F	3.05	41	4
6	M	3.10	32	2
7	F	2.85	51	6
8	M	3.86	9	1

PRINTING THE SESSION WINDOW

You may print the session window while in Minitab. First, be sure that the Session Window is active. Click on File>Print Session Window or click on the Printer icon on the tool bar. A dialog box similar to what you see when printing from a word processor will appear. It will look different depending on the printer you are using. Check that all settings are as you want them, then click on "OK". In particular, be sure the orientation is set to Portrait. The session window should **always** be printed as Portrait and graphs should **always** be printed as Landscape. Minitab will usually make the right choice automatically, but you should always check your printed output to make sure it is correct.

SAVING THE SESSION WINDOW

You may save the session window as a text file on your hard drive or J: drive so that it can be imported into a word processor such as Microsoft Word. First, be sure that the session window is active. Click on File > Save Session Window As... then proceed the same as you did in saving the data window above. Your session window will be saved with the name you specify and Minitab will assign the extension .TXT.

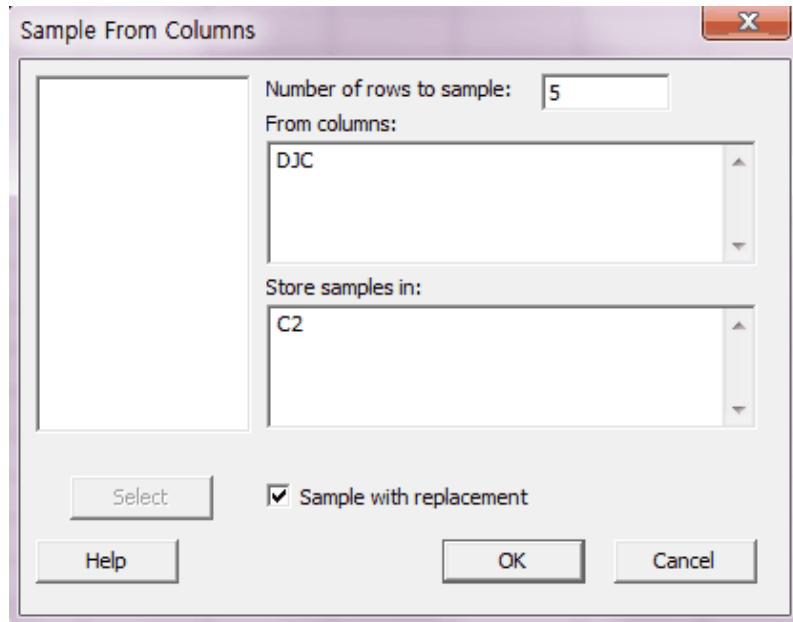
Unfortunately, the above process destroys the formatting. A better way to get your session window into a word processor is to simply copy/paste. That way the formatting will be preserved. That is how the samples of the session window above were placed into this document.

SAMPLING

As has been discussed in class, it is frequently desirable to look at a sample rather than the whole population. This is also possible in Minitab. Retrieve the worksheet K:\Minitab16\Sample Data\Student14\DJC20012002.mtw. The variable C2, DJC, gives the closing Dow Jones Composite index for each working day of 2001 and 2002. C1 is the date and C3 - C32 are the closing prices of the thirty stocks that make up the index. The only variable with which we will be working is C2 DJC. Click at the top of that column to highlight the column. Now click Edit > Copy Cells to send a copy of this column to the clipboard. Now click File > New > (Minitab Worksheet should already be highlighted) > 'OK' to open a new worksheet. Finally, click Edit > Paste Cells to copy the data into the new worksheet. Use File > Save Current Worksheet As to save your new worksheet in your MinitabWork folder. Call it DowJones.

Now suppose we want a sample of 5 values from DJC. Click on Calc > Random Data > Sample From Columns to open the necessary dialog box. Enter 5 into the "Number of rows to sample:" box. This is the size of the desired sample. Now click in the box below that one and the box on the left will show the available variables, (only C1 DJC in this case). Click on C1 DJC to highlight it, then click Select. Now click in the box "Store samples in:" and type "C2". Minitab allows us to take a sample with or without replacement by checking or not

checking the check box "Sample with replacement". In most real life applications we would want to sample without replacement, but we will need to sample with replacement in future lessons, so check the box. The dialog box should now look like the figure on the right. Click "OK" and look at C2 to see a sample of size 5. Click in the gray box below C2 and label this variable "Sample1". Now click Calc > Random Data > Sample From Columns again to get back into the sample dialog box and change the content of "Store sample in:" box to C3 and click "OK" to create another sample in column 3. Create 3 more samples of size 5 in C4, C5 and C6, then label these variables "Sample2", ..., "Sample5".



Finally, click Data > Display Data, select C2, ..., C6 and click OK to display these samples on your session window (See the section "DISPLAY DATA" on page 5 above). Your display should look like the figure below, but the numbers will be different since you are not likely to get the same random samples the author obtained.

Data Display					
Row	Sample1	Sample2	Sample3	Sample4	Sample5
1	10591.2	8473.4	10031.3	8579.1	10415.9
2	9893.8	10229.5	10623.6	10864.1	8386.0
3	10174.1	9751.0	8743.3	8836.8	9274.9
4	8450.2	10176.1	8456.2	7841.8	9923.0
5	10035.3	11175.8	9850.0	8511.3	10735.0

Use the Save Current Worksheet As command to save your work sheet as DJSS5 (Dow Jones Sample Size 5). You will need it again in Lesson 5.

SAVING AND OPENING PROJECTS

It is never necessary to save a project, but it is advisable to do so at frequent intervals. If your computer crashes you can reopen your project and continue from where you last saved instead of from the beginning. To save a project the first time you must click on File > Save Project As..., navigate to the desired location, give it a name, and click the Save button.

Minitab will assign the extension .MPJ. For subsequent saves or to open a previously saved project you can use the save and open icons on the tool bar.

EXITING MINITAB

To exit Minitab click the close button in the upper right hand corner of the screen. A window will pop up asking you if you want to save changes to the project. If you have already saved and/or printed everything you want, click "No". If there is something you want to save; click "Cancel", save what you want to save, then repeat the exit command.

RESTARTING MINITAB

The instructions for the problems which follow tell you to start each problem with a new instance of Minitab. To do this it is not necessary to exit and restart. You can click on File > New > Minitab Project > OK. You will get the same window asking if you want to save the current project as mentioned above; click No and Minitab will start you out with a new session window and an empty data window the same as when it first comes up.

INSTRUCTIONS FOR ALL MINITAB ASSIGNMENTS

Do each problem in a new instance of Minitab. Remember that it is not necessary to close and reopen Minitab between problems; File > New > Minitab Project > OK will give you a new project. For each problem please follow the steps listed below:

1. If a saved file is required, retrieve it.
2. Delete everything below the date/time stamp.
3. Type your name below the date/time stamp, type the lesson number on the line below your name, and the problem number on the line below the lesson number.
4. Do the work required by the problem. Your session window should look professional, something you would be proud to turn into your boss if you were hoping for a promotion. In particular, it **should not have**
 - (a) errors
 - (b) excessive blank lines
 - (c) unrequested data, analysis, comments, etc..
 - (d) things penciled in because you forgot to type them before you printed the results.
5. Print all graphs (if any) and the session window properly oriented. (See page 5.)
6. Staple the pages with the session window on top and the graphs in order.
7. Turn in your printed work on the day the assignment is due.

MINITAB ASSIGNMENT 1

See instructions on page 8.

1. Open the worksheet **Cereal.MTW** in **K:\Minitab17\Sample Data**.
Display all the data.

2. Open the Worksheet **E-Mail.MTW** in **K:\Minitab17\Sample Data \Student14**.
We will only use the data in C3, the number of emails received. Copy this variable into a new worksheet and save it as **EmailsIn**. Create 5 samples with replacement of size 8 from this data. Save them in C2, ..., C6, name the columns **Sample1**, ..., **Sample5**, and display them in the session window. Save your worksheet with the samples as **EISS8**. You will need this file again in Lesson 5.

SUGGESTION: It is always a good idea to save a project at regular intervals, especially right after you have created a new worksheet - **EVEN IF YOU DON'T THINK YOU WILL EVER NEED IT AGAIN!** (See **SAVING AND OPENING PROJECTS** on page 7.) That way, if a problem arises with your computer, it may save you from having to start over from scratch.