8 Session One: MINITAB Basics

Overview of Session One

The story

Clones are genetically identical cells descended from the same individual. Researchers have identified a single poplar clone that yields fast-growing, hardy trees. These trees may one day be an alternative energy resource to conventional fuel.

Researchers at The Pennsylvania State University planted Poplar Clone 252 on two different sites: one site was by a creek with rich, well-drained soil, and the other site was on a ridge with dry, sandy soil. They measured the diameter in centimeters, height in meters, and dry weight of the wood in kilograms of a sample of three-year-old trees. These researchers want to see if they can predict how much a tree weighs from its diameter and height measurements.

Congratulations! You have been hired as data analyst for the project, and you will be performing the statistical analysis.

What you will learn

In Session One you will learn how to:

- open a worksheet
- enter and edit data
- save data
- compute some basic statistics
- perform arithmetic
- plot the data
- compute a correlation coefficient
- edit and add comments to the output
- print and save your results

Time required

About 30 minutes.

Step 1: Start MINITAB

To start MINITAB:
From the Taskbar, choose **Start ➤ Programs ➤ Minitab 13 for Windows ➤ Minitab**.

Step 2: Open a Worksheet

When you start MINITAB, you begin with a new, empty project. You can add data to your project in many ways, but the most common way is to open a worksheet. Note that you are only copying the data from the worksheet to the project; any changes that you make to the data added to your project will not affect the original file.

In this session, you will use the file POPLAR1.MTW. This file is one of the dozens of worksheets that are shipped with MINITAB. Most of these worksheets are in the Data subdirectory or folder.

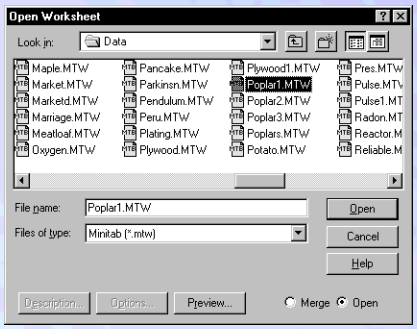
1 Activate the Project Manager by choosing **Window ➤ Project Manager**, by pressing Ctrl+I, or by clicking the button on the Toolbar.

2 Right-click on the Worksheets folder in the Project Manager and choose **Open Worksheet**.

3 Make sure the file type is **Minitab (*.mtw)** and the current subdirectory is Data.

4 Click on POPLAR1.MTW and click **Open**.

5 If the Data window is not already visible, open it to view the columns in your worksheet: choose **Window ➤ POPLAR1.MTW** or press Ctrl+D.



This worksheet contains three variables, labeled Diameter, Height, and Weight. Each variable contains 15 observations—all the data collected so far.

Poplar1.mtw ***

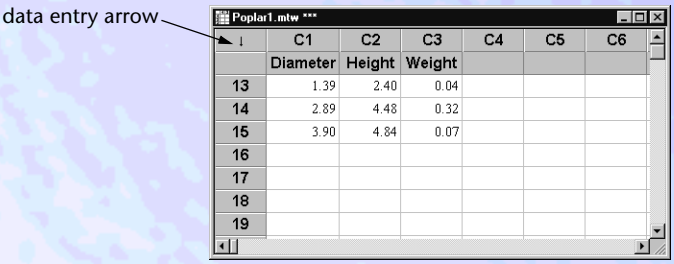
	C1	C2	C3	C4	C5	C6	C7
	Diameter	Height	Weight				
1	2.23	3.76	0.17				
2	2.12	3.15	0.15				
3	1.06	1.85	0.02				
4	2.12	3.64	0.16				
5	2.99	4.64	0.37				
6	4.01	5.25	0.73				

Step 3: Enter Data from the Keyboard

The worksheet POPLAR1 contained the data collected so far, but you just received new observations from the field, and there are five new rows to enter.

1 Press ↓ until you reach the first blank cell in row 16 or, with your mouse, click on the first blank cell in row 16.

The Data window should look like this:



2 Make sure the data entry arrow points to the right. If it does not, click on it to change its direction.

3 Type the following from left to right across each row:

1.52	Enter	*2.9*	Enter	*.07*	Ctrl+Enter
4.51	Enter	*5.27*	Enter	*.79*	Ctrl+Enter
1.18	Enter	*2.2*	Enter	*.03*	Ctrl+Enter
3.17	Enter	*4.93*	Enter	*.44*	Ctrl+Enter
3.33	Enter	*4.89*	Enter	*.52*	Ctrl+Enter

Tip **If you make a mistake**: click on or move to a cell (the contents will be automatically selected), type the correct value, and press Enter.

Step 4: Enter Patterned Data

You can always type data in the Data window, but if your data follow a pattern, there is an easier way to enter your data.

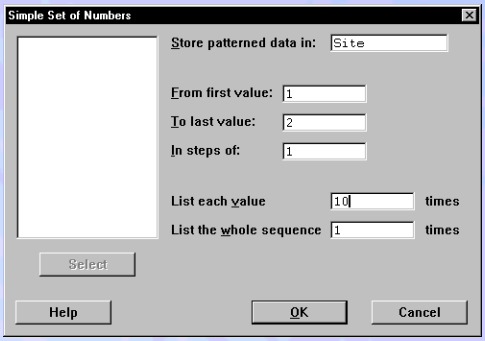
You now want to create a new variable that will indicate whether an observation was taken from the site with rich, well-drained soil (1), or from the site with dry, sandy soil (2). This new variable, called Site, will contain ten 1's followed by ten 2's.

1 Choose **Calc ➤ Make Patterned Data ➤ Simple Set of Numbers**.

2 To store the new data: in **Store patterned data in**, type *Site*. MINITAB will automatically assign this new variable to the first empty column—in this case, C4.

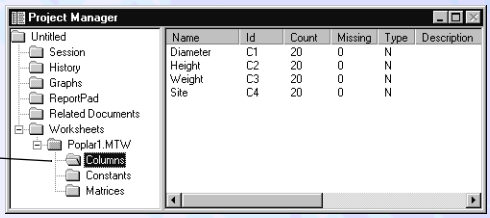
3 To indicate the beginning and end of the sequence: in **From first value**, type *1*; In **To last value**, type 2.

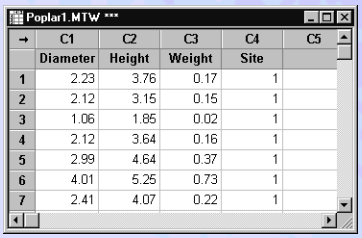
4 Since you want ten 1's and ten 2's, in **List each value**, type *10*. Then click **OK**.



The new Site column appears in the Data window and in the Columns folder in the Project Manager:

To view column information, click on the Columns folder in the Project Manager.





Step 5: Save Your Project

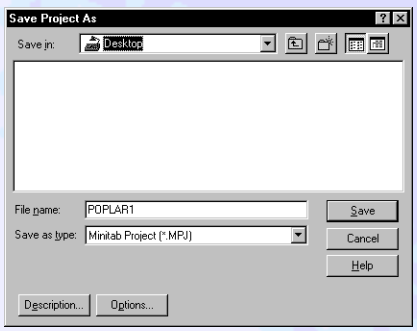
It is a good idea to save your work frequently. Now is probably a good time to save, since you have just entered new data.

1 Choose **File ➤ Save Project**.

2 In **File name**, enter *POPLAR1* for the name of your project. If you omit the extension .MPJ, MINITAB will automatically add it once you save the document.

3 Click **OK**.

4 If you see a message box asking if you want to replace an existing file, click **Yes**.



Step 6: Compute Descriptive Statistics

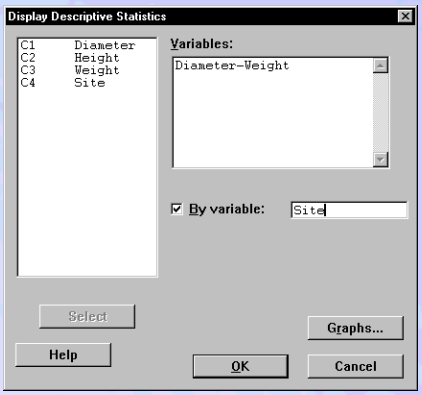
MINITAB offers a wide array of basic statistics to help you analyze your data, such as descriptive statistics, t-tests, z-tests, and correlations. You decide to produce summary tables and boxplots describing the variables Diameter, Height, and Weight for the trees at each site.

1 Choose **Stat ➤ Basic Statistics ➤ Display Descriptive Statistics**.

2 In the variable list box, click *Diameter* and drag the mouse so that you highlight *Diameter*, *Height*, and *Weight*. Then click **Select**.

3 Check **By variable**, and enter *Site*.

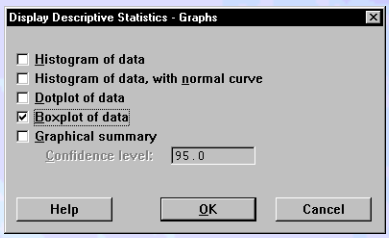
Checking **By variable** tells MINITAB to generate separate statistics for Diameter, Height, and Weight for each level of the variable Site.



Note When you select a series of columns, MINITAB uses a dash to abbreviate the series. In this example, Diameter–Weight means the variables Diameter, Height, and Weight.

4 Click **Graphs**.

5 Check **Boxplot of data** and click **OK** in each dialog box.



MINITAB displays text output in the Session window and each graph (three, in this case) in its own Graph window.

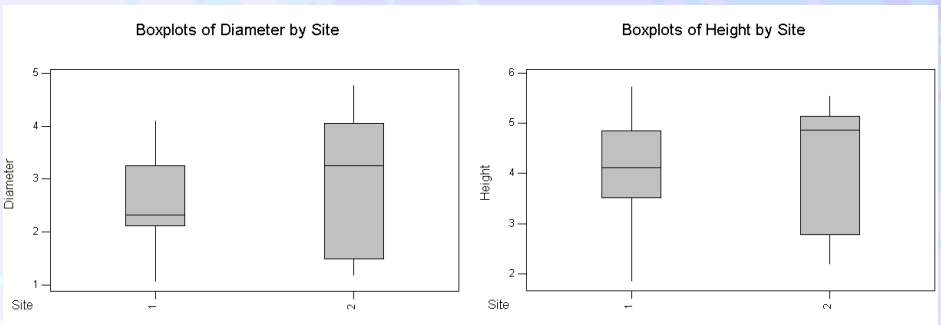
Session window output

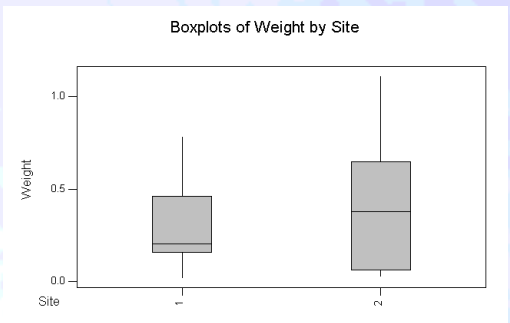
Descriptive Statistics: Diameter, Height, Weight by Site

Variable	Site	N	Mean	Median	TrMean	StDev
Diameter	1	10	2.598	2.320	2.604	0.916
	2	10	3.028	3.250	3.041	1.284
Height	1	10	4.098	4.120	4.175	1.103
	2	10	4.255	4.865	4.351	1.254
Weight	1	10	0.3090	0.2050	0.2863	0.2528
	2	10	0.399	0.380	0.356	0.366

Variable	Site	SE Mean	Minimum	Maximum	Q1	Q3
Diameter	1	0.290	1.060	4.090	2.120	3.245
	2	0.406	1.180	4.770	1.488	4.053
Height	1	0.349	1.850	5.730	3.518	4.853
	2	0.396	2.200	5.540	2.775	5.143
Weight	1	0.0800	0.0200	0.7800	0.1575	0.4600
	2	0.116	0.030	1.110	0.063	0.648

Graph window output





Tip You can tile the graphs to view all of them at one time on your screen: (1) press Ctrl+I and (2) click on the Graphs folder in the left pane of the Project Manager. The names of all the graphs will appear in the right pane. (3) Hold down Ctrl while selecting the desired graphs. (4) Right-click on your selection and choose **Tile**.

Judging from the boxplots, poplars grown at Site 2 are larger than those grown at Site 1. The Session window data confirm that the median values for Diameter, Height, and Weight of the

poplars are larger for Site 2 than for Site 1. Also, the variable Weight has a very large standard deviation relative to its mean. At Site 2, the minimum weight is only 0.03 kg while the maximum is 1.11 kg. It appears that some of our poplars are doing very well, while others are barely alive.

Step 7: Perform Arithmetic

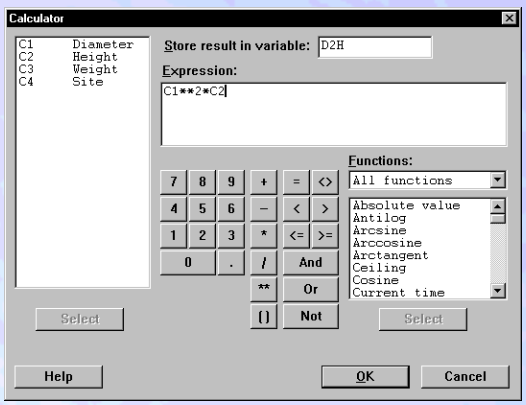
Now on to the task of predicting how much the trees weigh. Based on previous work, the researchers have found that the weight of a tree is closely related to the square of its diameter multiplied by its height. Since you have diameter and height data, you can calculate this new variable using MINITAB's calculator. The calculator performs the equation you enter and puts the result in the variable you specify.

1 Choose **Calc ➤ Calculator**.

2 You decide to call the new variable "D2H" for diameter squared times height. In **Store result in variable**, type *D2H*.

3 In **Expression**, type *C1**2*C2*. Click **OK**.

This expression tells MINITAB to square the variable Diameter (C1), multiply by the variable Height (C2), and put the result in a new variable called D2H.



Tip You could also use the mouse to create the equation: (1) select *Diameter* from the variable list, (2) click the **, 2, and * buttons on the calculator, and (3) select *Height* from the variable list.

The Data window shows the new variable D2H that you just created:

Poplar1.MTW ***

	C1	C2	C3	C4	C5	C6	C7
	Diameter	Height	Weight	Site	D2H		
1	2.23	3.76	0.17	1	18.698		
2	2.12	3.15	0.15	1	14.157		
3	1.06	1.85	0.02	1	2.079		
4	2.12	3.64	0.16	1	16.360		
5	2.99	4.64	0.37	1	41.482		
6	4.01	5.25	0.73	1	84.421		
7	2.41	4.07	0.22	1	23.639		

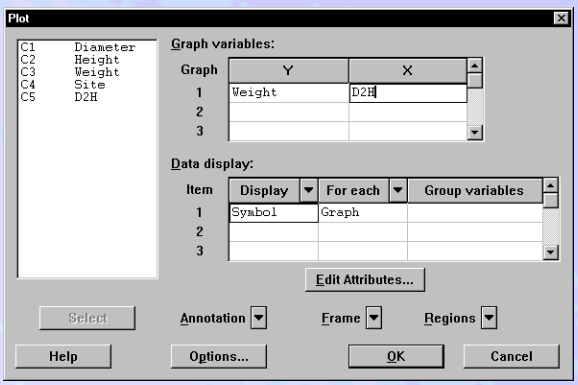
Now save the project changes.

4 Choose **File ➤ Save Project**, or press Ctrl+S.

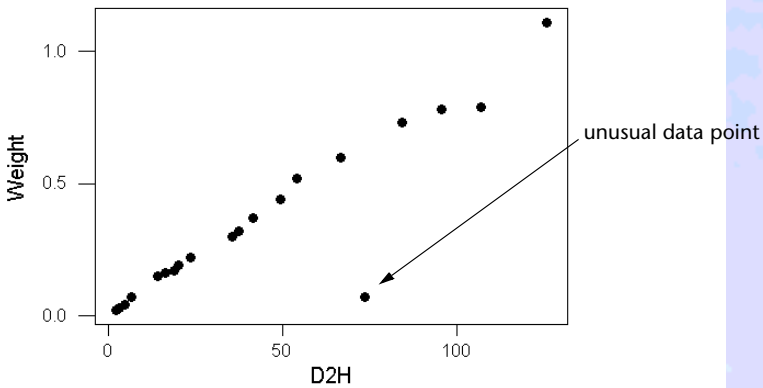
Step 8: Create a Scatter Plot

The researchers have determined that there is a relationship between weight and D2H. You want to see if your poplars' data exhibit this relationship as well by plotting Weight by D2H on a scatter plot:

1. Choose **Graph ➤ Plot**.
2. In **Y** (the vertical axis), enter *Weight*.
3. In **X** (the horizontal axis), enter *D2H* and click **OK**.



Graph window output



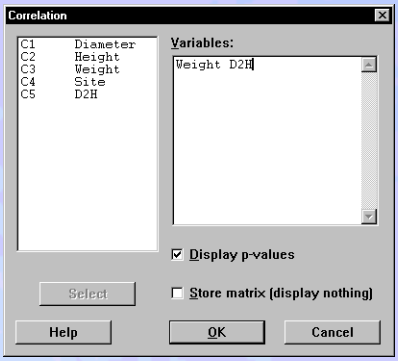
You see a positive linear relationship between Weight and D2H. That is, as D2H increases, so does Weight. You also notice an unusual data point—a tree that has a very low weight for a relatively high D2H value. For now, you decide to ignore it, but it is something you may want to check on later. Next, you will compute the correlation between these two variables to quantify the relationship.

Step 9: Compute a Correlation Coefficient

From the scatter plot, you have seen that as D2H increases, so does Weight. Now you want to measure the association between these two variables by computing a correlation coefficient.

1 Choose **Stat ➤ Basic Statistics ➤ Correlation**.

2 In **Variables**, enter *Weight* and *D2H*. Click **OK**.



Session window output

Correlations (Pearson)

```
Correlation of Weight and D2H = 0.913, P-Value = 0.000
```

The correlation coefficient measures the linear relationship between two variables and assumes a value between −1 and +1. The high positive correlation coefficient of 0.913 is close to 1, thus quantifying the relationship that you already saw in the scatter plot—there is a strong linear association between Weight and D2H (diameter squared times height) for the trees in our sample.

Step 10: Edit the Session Window Output

It is time to create a report of your results: the text results, such as the summary descriptive statistics you computed, and the graphs, such as the scatter plot.

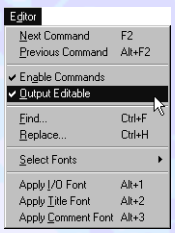
First you will edit the text output in the Session window to make it more appropriate for a report. You can edit text in MINITAB's Session window the same way you edit with a word processor, even finding and replacing text and changing fonts.

By default, the Session window is *read-only*, so that you cannot accidentally delete results. To begin editing, you will have to make the Session window editable:

1 Press Ctrl+M to make the Session window active.

2 Pull down the **Editor** menu.

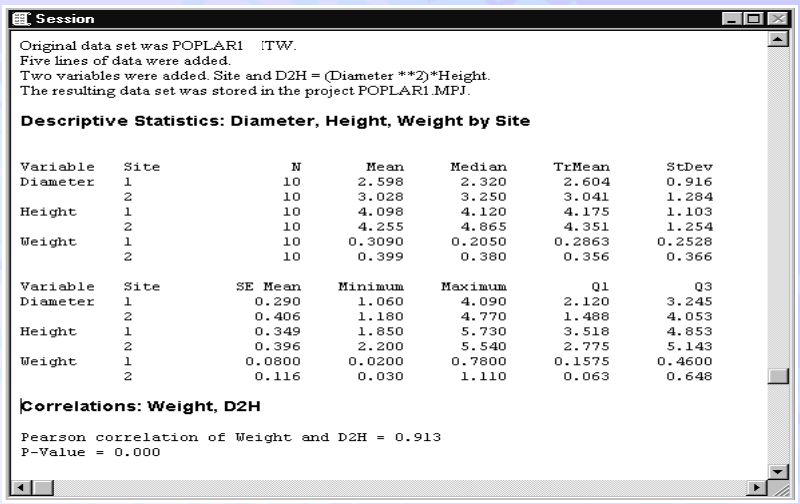
- If there is no check mark next to **Output Editable**, then select it to enable Session window editing.
- If there is already a check mark next to **Output Editable**, then Session window editing is already enabled. Press Esc twice to close the menu.



Now you can edit your output.

3 Delete all the text above the Descriptive Statistics output and all the text between the Descriptive Statistics output and the Correlation output. Select the text by dragging over it with your mouse, then delete it by choosing **Edit ➤ Cut** or pressing Delete.

4 Scroll to the top of the Session window and type four comment lines as shown below:



5 Save your work. Choose **File ➤ Save Project**.

The Session window is ready to print.

Step 11: Print Your Work

You will first print your output from the Session window, and then your graphs from the Graph windows.

1 With the Session window active, choose **File ➤ Print Session Window**, then click **OK**.

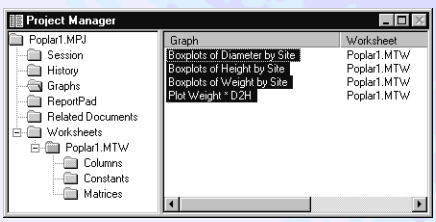
You could go to each Graph window and print them separately, but if you have more than one graph there is a faster way.

2 Press Ctrl+I.

3 Click on the Graphs folder in the left pane of the Project Manager.

4 Click below the graph titles in the right pane of the Project Manager and drag up to select the four graphs you have created.

5 Right-click anywhere on the highlighted graphs and choose **Print**. Click **OK**.



Step 12: Save Your Work

When you save your project, you save all your work at once: all the data, all the output in the Session window, and all the open Graph windows. When you reopen the project, all that information will be waiting for you, right where you left it.

1 Choose **File ➤ Save Project**.

More

If you want to use output or data in another application or another MINITAB project, you can save your Session window output, data, and graphs as separate files. These separate files are copies of what is currently in your project—the contents of your project are not changed in any way.

Step 13: Exit MINITAB

If you want to take a break before continuing to another session, you can exit MINITAB.

1 Choose **File ➤ Exit**.

2 MINITAB may ask if you want to save changes to your project. Since you already saved your project above, there is no need to do it again here. Click **No**.