A QUICK INTRODUCTION TO MINITAB 15

Useful also for Minitab 14 and Student Minitab

The Stern School Statistics Group uses Minitab Release 15 for Windows® as its course software. This program was chosen specifically for use with course B01.1305.

Courses C22.0103, C22.0001, and C22.0003 will use Student Minitab, which is based on release 14. Student Minitab is limited in total spreadsheet size and in the number of worksheets that may be kept within a project file, but these limitations should not present material difficulties in these courses.

The ***Formulas*** section (page 17) applies only to Minitab 15, not to Student Minitab or Minitab 14.

Minitab Release 15 for Windows® must run under Windows® 2000, XP, or Vista. When running Minitab, do **Help** ⇒ **About Minitab**; this will show you the release number (currently 15.1).

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This document was prepared by the Statistics Group of the IOMS Department. It is intended primarily as a quick introduction, including discussions of some common situations encountered in course work with B01.1305, C22.0103, C22.0001, and C22.0003. If you have comments or suggestions, please send them to gsimon@stern.nyu.edu.

Preliminary Remarks

In this document, we will use Windows® (with the name registration ® symbol) to refer to the Microsoft operating system.

Student Minitab is compatible with Vista.
Minitab 14 is not compatible with Vista.
Release 15.1 is compatible with Vista. If you have an release 15.0, please go to www.minitab.com to get a patch for Vista.

We will use windows (lowercase, with no registration symbol) to refer to the rectangular working areas that are set up on your computer screen.

Words and phrases which appear on Minitab screens will be written here in boldface. Sequences of clicks will be separated by the double-line arrow. Thus, the notation **File ⇒ Open Worksheet** indicates that you should click on **File** and then click on **Open Worksheet**. The underscores give the keyboard shortcuts. For example, the keystroke Alt-F is equivalent to clicking on **File**. The sequence **File ⇒ Open Worksheet** can be done as Alt-F, W.

Minitab uses several screen windows, but only one window can be active at any time. The color of the title bar indicates which window is active. Clicking the mouse cursor within any window makes that window active. In Minitab, you can use **Window** to select what you want to be active.

You get to assign the colors for the title bars. This is a feature of Windows®, and it's obtained through Start ⇒ Control Panel ⇒ Display.

Dealing with Different Minitab Releases

There are four major sources for confusion among the Minitab releases.

[1] Student Minitab, based on release 14, has most of the capabilities of Minitab 14 and Minitab 15, but there are limitations.

Student Minitab

* limits the number of worksheets that can be kept within a project (5)
* limits the total number of cells per worksheet (10,000)
* will not do the general linear model (GLM)
* will do neither nominal nor ordinal logistic regression
* will not do all the features of design of experiments, multivariate analysis, survival analysis, and reliability analysis

These limitations (as well as others not listed here) should not be a problem for the core courses C22.0103, C22.0001, C22.0003, and B01.1305. The limitations however may be important for higher-level courses. See http://www.minitab.com/products/minitab/Compare.aspx for full details of the distinctions among Student Minitab, Minitab 14, and Minitab 15.

[2] Minitab 15 uses ***Formulas*** that are not available in Minitab 14 or in Student Minitab. See page 17. Minitab 15 is otherwise very similar in function to Minitab 14.

[3] Minitab 15 project files (*.mpj) are not downward compatible to Minitab 14 or to Student Minitab.

All file types are downward compatible *except* project files. (The file types are described in the section ***Worksheets and Projects*** below.) In Minitab 15, the command **File ⇒ Save Project** will cause the project to be saved in a form that can only be read by Minitab 15. You can work around this very easily. Use **File ⇒ Save Project As** and select the file type "Minitab 14 Project." A few non-critical features new to Minitab 15 will be lost.

[4] The Microsoft Vista operating system is compatible with Student Minitab and Minitab 15.1, but not with Minitab 14 or with Minitab 15.0. If you have release 15.0, please see www.minitab.com to get an upgrade patch.

Data Files

Minitab uses the word *worksheet* in exactly the way that other programs would use *spreadsheet*.

Minitab uses two basic file types for worksheets:

*.mtw	Minitab default worksheet format (encrypted)
*.mtp	Minitab portable worksheet format (readable as text)

In addition, Minitab can read and write Excel, Quattro Pro, Lotus 1-2-3, dBase, Spreadsheet XML, and text (*.txt). Minitab can also read data files (*.dat), which it treats similar to text.

Formats *.dat and *.txt are in text form (ASCII, character), but file layout details need to be communicated to Minitab; see the section ***Reading Worksheet Data into Minitab***.

Minitab uses also project files (*.mpj). These are saved as any number of spreadsheets (including zero) along with previously-created graphical items, statistical calculations, and comments.

Project files are *not* downward compatible; this means that project files created in Minitab 15 cannot be read by previous releases of Minitab and cannot be read by Student Minitab. See page 3 for the work-around solution.

Some recommendations for managing worksheets and projects appears below in the section ***Worksheets and Projects***.

Worksheets and Projects

For many uses of Minitab, we work with single worksheets and save any changes as single worksheets. The forms used to save worksheets are *.mtp (text) and *.mtw (encrypted).

Minitab allows the user to keep data as Minitab project files. These files are encrypted, meaning that you can't read them outside of Minitab, and they are identified with the file name extension *.mpj. Project files are very powerful:

A project can keep multiple worksheets together.
Projects can hold user-created descriptions and comments. (See the section on ***Project and Worksheet Descriptions***.)
Projects retain the contents of the session window. (See the section on ***Minitab's Windows***.)
Projects can hold graphical output.
Reports can be assembled on the ReportPad and saved with the project.
Every information panel of Minitab will retain the instructions from its most recent use.

If you use projects, be sure to find the project manager icon on the toolbar. It's the set of cascading windows, identified with the tag **Show Worksheets Folder**.

Project files require careful management, as they can easily grow to contain large quantities of output with less than perfect annotation.

In managing your data files, you should be careful about distinguishing the original forms of the files from any edited versions. For example, in working through a problem you may make modifications in the data, and you should be aware that saving the modified form with the same file name will cause you to lose the original form of the data. Most users handle this problem by saving modified versions as either separate files with new names *or* as separate worksheets within a project. Page 13 tells you how to copy one worksheet to another worksheet within a project.

Project and Worksheet Descriptions

Within Minitab, you can create descriptions for projects or for individual worksheets within projects.

> The command **File ⇒ Project Description** will allow you to create a description for the project. You can also use this to edit a current description.
>
> The separate worksheets within a project can have their own descriptions, through **Editor ⇒ Worksheet ⇒ Description**. This can only be done for an active worksheet. As usual in Windows®, the taskbar color will indicate whether a worksheet is active. (Note that this uses **Editor** and not **Edit**.)

Worksheet descriptions cannot be used for worksheets saved in *.mtp or *.mtw format. These descriptions are only available for individual sheets within projects saved in *.mpj format.

If you wish to rename a worksheet, click on the **Show Worksheets Folder** icon, or do **Window ⇒ Project Manager,** and then move the cursor to the folder icon for the worksheet. Click the right mouse button for the worksheet you wish to rename.

Minitab's Windows

Minitab works through two basic windows but has additional windows to deal with other features of your work. The two basic windows are these:

> **Session window**…All textual (non-graphical) output will appear in the session window. As appropriate, headings will reflect the commands that you have actually created. Sometimes this window will also show the text of the Minitab commands (preceded by >) equivalent to your mouse clicks. While the session window is active, click on **Editor** and then either select or deselect **Enable Commands**.
>
> **Data window**…The data window holds the spreadsheet form of the data. This includes the data that you've read into the program, and it may also include other variables (columns) or additional data points (rows) that were created or entered during your work. A *project* will have one data window for each of its worksheets, but only one can be active at a time.

Among other windows are these:

Project manager window…The project manager window shows either

a schematic layout of all the work currently active (click on **Show Worksheets Folder**, the icon with cascading windows)

or

details about all the columns in the active worksheet (click on ⓘ, the **Show Info** icon)

Graph windows will be created as needed.

The **History window** can be accessed by clicking on the **Show history** icon on the toolbar. This is the chevron symbol on a spiral notebook. This window provides a log of the activities, and it will include the command forms equivalent to all the mouse actions that you have done.

The **ReportPad window** provides a place in which you can compose and edit details about all the work. You can reach this by clicking on the **Show ReportPad** icon, which is the red letter *A* on a spiral notebook. You can cut and paste from the session window to the reportpad, and you can also paste graphical output into this location.

You might like to explore some of the other features on the toolbar.

As with any Windows® applications, you can use the double-headed cursor arrows to resize these windows. Click on the **Window** command to get a list of available windows.

Wiping Minitab Clean

When you first start up Minitab, all its work areas will be empty. If you have finished working on a particular task and wish to start another, first be sure that you have saved the results in a form that you want. Then do **File** ⇒ **New** and select **Minitab Project**. This act will empty out all the working areas.

This action will always get the question "Save changes to the project 'Untitled' before closing?" even if there is nothing to be saved.

Reading Projects into Minitab

If you wish to use a project previously assembled by Minitab, use command **File** ⇒ **Open Project**. There are no choices or options in reading projects, so this process is very simple.

Reading Worksheet Data into Minitab

Suppose that you would like to read a single worksheet into Minitab. Single worksheets were either previously assembled by Minitab (and simple to read) or assembled outside of Minitab (and require some care to read properly).

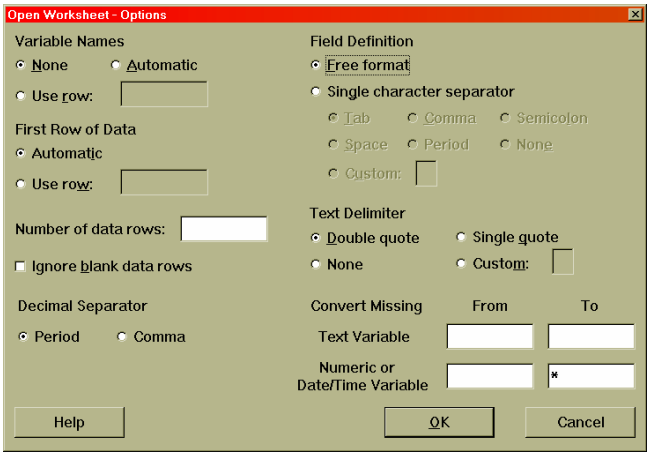
> First note whether a project is currently active. If so, any worksheet that you bring in will become part of this project. This may, at times, be exactly what you want. If you want the new file separated from other data, please see the section ***Wiping Minitab Clean***.

Begin with **File** ⇒ **Open Worksheet**.

> If the file is of type *.mtw, then **Files of type** must acknowledge *.mtw. (The Minitab default is ***.mtw, *.mpj** and thus *.mtw will be automatic.) If *.mtw does not show, click on the drop-down symbol ∃ to display all the file types; then select *.mtw.
>
> If the file is of type *.mtp, then **Files of type** must acknowledge *.mtp. Click on the drop-down symbol ∃ to display all the file types; then select *.mtp.

If your file has a format other than *.mtw or *.mtp, you will need to provide information so that Minitab knows how to read it. You might find it helpful to examine your file in a text processor such as WORD or WordPad or NotePad.

> If the file is of type *.txt, then **Files of type** must acknowledge *.txt. Click on the drop-down symbol ∃ to display all the file types; then select *.txt. (Type *.dat is similar.)
>
> > This sequence will activate the **Options** feature, and clicking on **Options** will lead you to this panel:



You will need to examine the files to see what formatting details need to be supplied to Minitab. Watch out for

* whether or not the file has a row of variable names
  This is related to the **Variable names** section.
  Select **None** if there are no names and the data values begin in row 1.
  Select **Automatic** if there is a header row with the names of the variables (columns).
* the strategy by which the file separates fields (open space for "free format," tabs, commas, or other characters)
  This is related to the **Field definition** section.
  Select **Free format** if data values are separated by one or more blanks spaces and rows end with hard carriage returns.
  Select **Single character separator** if a particular character is used to separate values. The most commonly used separators are tabs, commas, and single spaces.
* whether or not alphabetic information contains internal blanks that might conflict with spaces used as separators
  This is related to the **Text delimiter** section. You might need to put city name "Los Angeles" in quotes so that it will be interpreted as a single item of information. (It is usually easier to use tab-separated fields to prevent this problem.)
* the technique that is used to denote missing data
  This is related to the **Convert missing** section. Minitab uses the asterisk * as its missing data marker. If, for example, your input file uses NA for missing data, you should ask to convert NA to *.

Now click **OK** and then supply the file name. You can use **Preview** to see if the file will be read as anticipated.

Important note: The **Options** panel becomes available when you do one of these:

select a file with extension *.dat or with extension *.txt
use the drop-down symbol ∃ to select the **Data (*.dat)** file type or to select the **Text (*.txt)** file type

If you read a file without variable names, you should supply names based on your understanding of the data. Save the file in storage space that you control.

At times, the data read this way can end up as the wrong type (text rather than numeric). This issue is addressed as the final item on page 19.

Managing the Minitab Screen

Minitab always has its two basic windows, but it often creates many other windows as well. Screen management is highly idiosyncratic, in that computer users seem to have very different opinions about what a screen layout should look like. Most users are reasonably familiar with windows management.

Minitab, like other Windows® programs, can arrange its own screen. Click on **Window** at the top of the screen and see what happens when you select any of the choices **Cascade, Tile,** or **Minimize All**.

The two basic Minitab windows can be made full screen, partial screen, or reduced to icons, but they cannot be closed. These windows are only closed when you quit Minitab.

Use the **Show graphs folder** icon on the toolbar to manage your graphs. This symbol is the pale-colored set of cascading windows. The sequence **Window** ⇒ **Close All Graphs** will let you eliminate all graph windows at once.

Saving Minitab's Output

You will of course want to save the results of your work. The usual methods are to cut and paste to another Windows® application or to save to file. Minitab also allows you to save to the Minitab ReportPad.

Text output is moved through the copy or cut-and-paste methods common to Windows® applications. If you are working with a project file (*.mpj) then you can also paste the selected text in the ReportPad. This is accessed through the icon which is the red letter *A* on a spiral notepad.

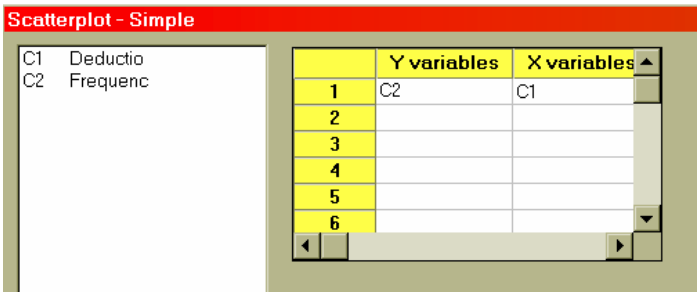
If a graph window is active, you can use **Edit** ⇒ **Copy graph** or Ctrl+C to place the image on the Windows® clipboard. The image can than be pasted in another document or placed on the Minitab ReportPad.

Pressing Alt+PrtScr copies a bitmap of the active window onto the Windows® clipboard. This can be useful if you wish to describe how you did something in Minitab. The figures in this document were produced in exactly this way.

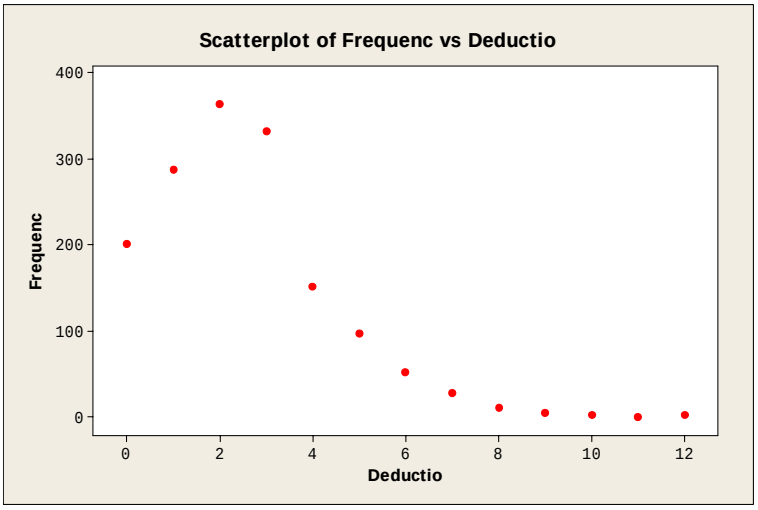
If the active window is a dialog box, Alt+PrtScr copies just the dialog box to the Clipboard. If the active window is Minitab itself, Alt+PrtScr copies the Minitab frame window and all visible subwindows (such as the Data window and Graph windows) to the clipboard.

Preparing a Minitab Graph

The data in this illustration are from Exercise 3.69 of Hildebrand, Ott, and Gray, file Ex0369.mtw. The data set notes the numbers of tax forms making various numbers of deductions, ranging from 0 to 12. We'd like our graph to have deductions on the horizontal axis and frequencies on the vertical axis. Use **Graph** ⇒ **Scatterplot**, then select **Simple**. and then put this into the resulting panel:



If you take the default settings, you'll get this:



There are many ways in which Minitab will allow you to change the appearance of this graph. Suppose that you wanted to replace the circles with another symbol. When the graph window is active, click on **Editor** ⇒ **Select Item** ⇒ **Symbols**. (Note that **Select** is also a choice.) Then do **Editor** ⇒ **Edit Symbols**, and select the **Attributes** tab. You can then change the shape, size, and color of these symbols.

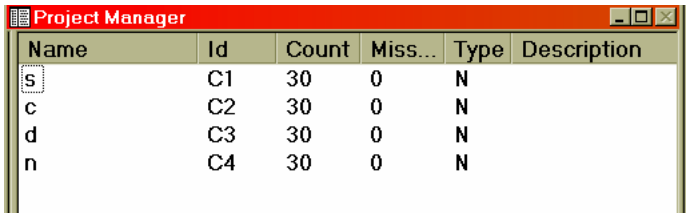
If you double-click on any item (title, horizontal axis, variable name, ...) you will then be able to edit that item.

You can get additional editing power through **Tools** ⇒ **Toolbars** ⇒ **Graph Annotation Tools**. Editing features such as text insertion, lines, circles, ellipses, and so on will then be available on the Minitab toolbar when graph windows are active.

Using Minitab to do a Regression

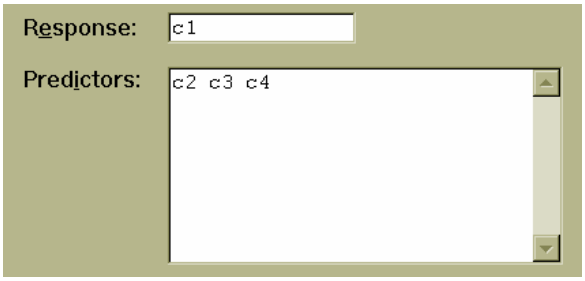
Let's illustrate the use of regression through the file XM1216.mtw from Hildebrand, Ott, and Gray. This is a Minitab worksheet file, and it can be read easily by Minitab. Please see the instructions given in the section ***Reading Worksheet Data into Minitab***.

The Project Manager window (obtained by clicking on ⓘ, the **Show info** icon on the toolbar) will have this information**:**



This is summary information about the data set. It gives the variable names, the corresponding Minitab columns, number of values in each column (and how many of those are missing) and also the variable type. Here N stands for numeric. Column C1 is named s (for *sales*) and this will be the dependent variable in our example regression.

To start the regression, do **Stat** ⇒ **Regression** ⇒ **Regression**. Set up the next panel to show this:



Click on **Graphs**, and then select **Residuals versus fits** and **Residuals versus order**. Return by clicking **OK**, and then click on **Options**; choose **Variance inflation factors** and **Durbin-Watson statistic**. Click **OK**. This will return you to the main regression panel, and you click **OK** again.

This action selects C1 as the dependent variable, with the other three variables used as independent variables. This has also asked to see two graphs and some incidental calculations as well.

The numerical output will appear in the session window, and you will also get two graphs. A little screen management will be needed to examine all of these.

Regression is a fairly intense operation, and there are many secondary calculations and displays that are of some interest. We'll discuss a few of these.

Suppose that you wanted to list the individual residuals for your data set. The initial procedure would include an additional step from the panel reached by **Stat** ⇒ **Regression** ⇒ **Regression**. That step consists of clicking on **Storage** and then selecting **Residuals**.

When the regression is completed, a new column RESI1 will appear in the data window. (Subsequent uses will create RESI2, RESI3, and so on.)

Suppose that your work with the data set has indicated that you might want to omit certain data points (rows) from the analysis. Perhaps such data points were destructive outliers or were simply miscoded. You'd prefer not to delete the rows completely, since you might want to restore them later. A plausible solution (but not the only solution) is to create a copy of the worksheet so that you can delete selected rows in the copy. Once you've created multiple worksheets, the work should be saved in project *.mpj format.

You can make a copy by doing **File ⇒ New ⇒ Minitab worksheet**. At this point a blank worksheet will appear. Now go to the original worksheet and place the cursor in the name box for the first column, C1. Hold down the shift key and use the arrow keys to mark the entire worksheet as a block. Go to the blank new worksheet, place the cursor in the name box for the first column and press Ctrl+V. A copy will now appear in the new worksheet, and you can edit it as appropriate. You can give a name to this copy; access the name by clicking on the **Show Worksheets Folder** symbol on the toolbar. Then click with the right mouse button on the icon, and select **Rename**. It is strongly recommended that you leave yourself a description as to exactly how this new worksheet differs from the original. Use **Set Description** to write notes about this worksheet.

If you wish to delete a row in the copy, you use **Data ⇒ Delete Rows**. Be extremely careful if you are deleting more than one row. Each use of **Data ⇒ Delete Rows** will cause the remaining rows to be renumbered! If you want to delete multiple rows, it's recommended that the operation be done all-at-once, rather than one row at a time.

Creating New Variables through Transformations

There will be many occasions in which you need to create new variables which are functions of other variables. For example, you might need to create log(SALES), the base-*e* logarithm of the variable SALES, which is in C1. Click on **Calc ⇒ Calculator**. In the box next to **Store result in variable** type in the name Logsales. (If you type C1 in this spot, the calculation will overwrite the original values.) In the box for **Expression** type in LOGE(Sales) or type in LOGE(C1) and click on **OK**.

As a result of this process, a new column Logsales will appear in the data window. You can of course overwrite an existing column, but then the original information in that column will be lost.

This use of the calculator option is simple, but there are some subtleties:

> You need not remember function identifications such as LOGE for base-*e* logarithms. The **Calculator** has a **Functions** panel that lists the available choices.
>
> If you make an entry-by-entry calculation, as in the example above, then the result is a new column in the spreadsheet. If you calculate a single-valued function of a

column (such as the median), then your transformation will create just one number, occupying one position in the data window spreadsheet.

Logical operations take the values 0 and 1, so that you can use these to make transformations of the "if-then-else" form. Suppose, for example, that you'd like variable C3 to be defined as follows:

$$C3 = \begin{cases} 5 & \text{if } C2 \le 5 \\ C2 & \text{if } C2 > 5 \end{cases}$$

The expression that makes this work is

$$5*(C2 \le 5) \; + \; C2*(C2 > 5)$$

The yes-or-no logical statement ($C2 \le 5$) will either take the value 0 or the value 1, as will the yes-or-no logical statement ($C2 > 5$).

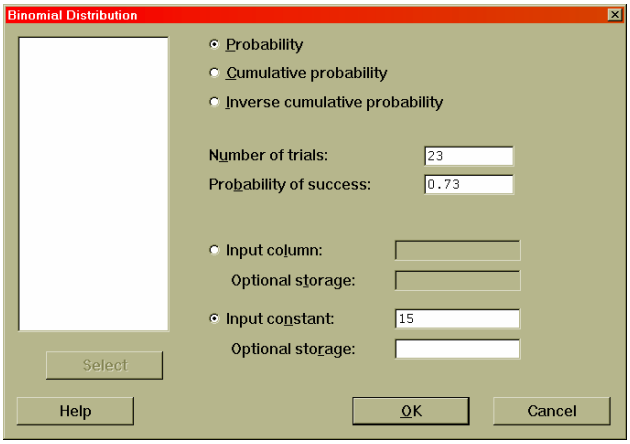
Missing values get passed along as missing. If you are creating a new column C6 from columns C2 and C3, and if a value is missing in row 28 for either C2 or C3, then the row 28 entry for C6 will also be missing, shown as * in the data window.

Invalid calculations end up as missing. Thus LOGE(0) will result in a missing value, as will LOGE(*negative number*). These will be shown as * in the data window. Minitab gives you a warning when you create missing values in this style, and thus you get an opportunity to reconsider the appropriateness of the transformation. (Releases 13 and previous did not give the warning.)

Be sure to see also the section on ***Formulas***, page 17.

Using Minitab to Find Probabilities

You can use Minitab to find many probability calculations. For instance, if you want to find the probability that a binomial random variable with $n = 23$ and $p = 0.73$ takes the value 15, you call up **Calc** ⇒ **Probability Distributions** ⇒ **Binomial**. Then set up the resulting panel as follows:



When you click **OK**, the session window will then show the following:

Probability Density Function

```
Binomial with n = 23 and p = 0.73

 x  P( X = x )
15    0.123375
```

This indicates that your desired probability is 0.123375.

If you had wanted to find the probability of a value *less than* or equal to 15, you'd do exactly the same as the above, except that you would click on the **Cumulative Probability** button.

That result shows up in the session window as

Cumulative Distribution Function

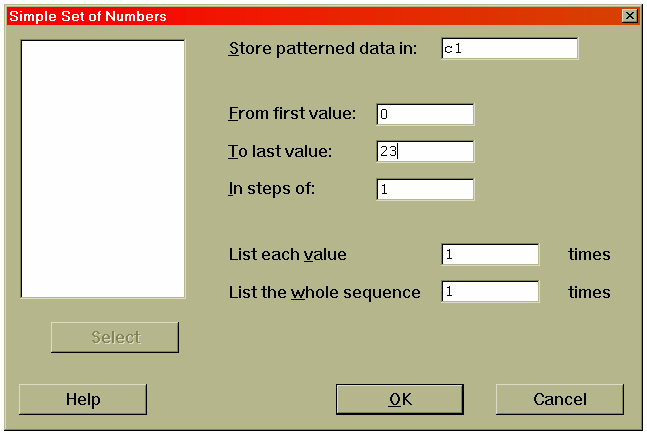
```
Binomial with n = 23 and p = 0.73

 x  P( X <= x )
15     0.265051
```

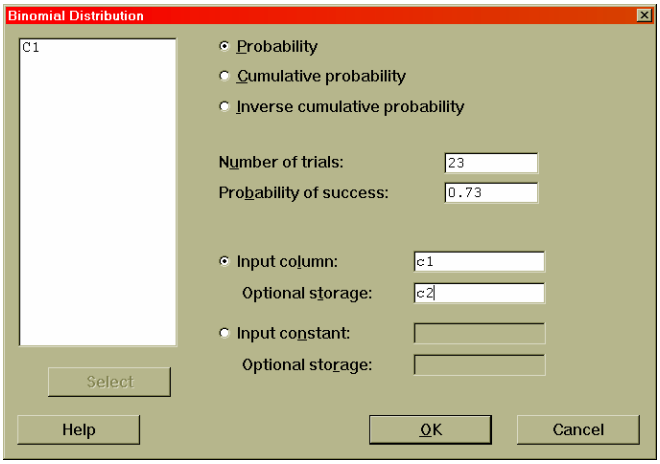
This gives your probability as 0.265051.

It's also possible to give the complete probability distribution. Suppose that you wanted to see the whole set of probabilities for the binomial random variable with $n = 23$ and

$p = 0.73$. This is done by setting up a data column for the integers 0, 1, 2, …, 23. Click on **Calc** ⇒ **Make Patterned Data** ⇒ **Simple Set of Numbers**. Set up the resulting panel as follows:



Then with **Calc** ⇒ **Probability Distributions** ⇒ **Binomial**, set up the panel as indicated:



This illustration assumes that columns C1 and C2 are not being used for other purposes. At the completion of this command, the spreadsheet in the data window would have columns C1 and C2 showing the following information (slightly rearranged here):

0	0.000000	12	0.017214
1	0.000000	13	0.039381
2	0.000000	14	0.076053
3	0.000000	15	0.123375
4	0.000000	16	0.166785
5	0.000000	17	0.185680
6	0.000003	18	0.167341
7	0.000022	19	0.119063
8	0.000117	20	0.064382
9	0.000526	21	0.024867
10	0.001993	22	0.006112
11	0.006367	23	0.000718

Here we can see, for example, that the probability of exactly 15 successes is 0.123375.

The feature **Calc ⇒ Probability Distributions** will allow you to deal with many different probability distributions.

Formulas

Embedded formulas are new to Minitab 15. These are not available in Student Minitab or in Minitab 14 or any earlier releases.

An embedded formula is an Excel-type task, and Minitab and Excel are used in different styles. So be careful. Please be aware that, as noted in Minitab help, "In addition, formulas cannot be imported or exported to or from Excel or other programs."

You can assign formulas only to columns or to constants. (Constants are not discussed in this document.) The formulas are precisely those of **Calc ⇒ Calculator**. Thus, you could assign column C9 as SQRT(C8).

You cannot assign C9 as the residuals from a regression.
Column assignments must be based on all rows.

Let's say that you want C3 to be the sum C1+C2. With the cursor in any cell of column C3, use **Editor ⇒ Formulas ⇒ Assign Formula to Column**. A small + will appear in the header cell for column C3.

Missing data positions in C1 or in C2 become missing positions in C3. If columns C1 and C2 have different lengths, the length of C3 will be the smaller value.

You generally want formulas to be updated automatically. In this example, you would like a change in either C1 or C2 to be reflected instantly in C3. (Here "instantly" means "as soon as the cursor leaves the cell that was changed.") The instant change is Minitab's default strategy, as noted in **Editor ⇒ Formulas ⇒ Calculate All Formulas Automatically**.

If you turn this feature off, then

* A small – will appear in the header cell for a column which needs an update.
* Updating can be done through **Editor ⇒ Formulas ⇒ Calculate All Formulas Now**. This does all updating; you cannot do updating for just one formula column.

You can convert a formula column to an ordinary column. Use **Editor ⇒ Formulas ⇒ Remove Formulas from Selected Columns**.

Formulas are very effective if you might have to correct errors in the input data, as any corrected values will be transformed automatically. Suppose that you have a new data set, with 5 columns and 244 rows. You want to develop a multiple regression of C1 on (C2, $\log_e$(C3), C4, C5). Assign formula LOGE(C3) to column C6. If you repair input errors in C3, the corresponding corrections will be made automatically to the logarithm in C6.

If you copy all or part of a worksheet to a second worksheet, then the columns with formulas become ordinary columns in the second worksheet.

It is also claimed that editing changes will be reflected instantly on graphs, but this feature may or may not be true. It is recommended that graphs be redrawn after data values are changed.

Special Problems

There are a number of problems commonly encountered by users of Minitab. This list may provide some help.

I wanted to delete rows 3, 11, 19, and 21 from my spreadsheet, so I sequentially asked to delete these row numbers. However, Minitab did not remove the rows I wanted.

After each deletion, Minitab will renumber the remaining rows. If you remove row 3, the original row 11 will be moved up to row 10. Minitab will successfully remove the target rows if all are provided in a single operation. See page 13.

The data window was active. The cursor, unknown to me, was in row 14, column C3. As I started to type, I realized that the number originally in row 14, column C3 had disappeared. How do I get it back?

The Escape key will restore the original value.

I just read a text file, and then I discovered that the source used unusual phrases for missing data. The entire column was treated as **Text** and now I can't use it in numerical calculations. How do I recover this?

Click on **Data** ⇒ **Change Data Type** ⇒ **Text to Numeric…** The unusual phrases will be converted to *, the missing data code. You will also receive a message in the session window indicating explicitly how Minitab

did the conversion. The common missing data representations (*, missing, N/A, unknown, ?) will be converted to * automatically. Since the reading of missing data is vulnerable to confusion, the Minitab image of your file should be checked carefully.

I get the message

Save changes to the project 'Untitled' before closing?

but there is nothing to save.

You can this message through **File** ⇒ **New** ⇒ **Minitab project** or **File** ⇒ **Exit**. This is a last question to make sure that you realize that your action will discard material that you might have wanted to save. You can even get this message when the session window and all worksheets are completely empty!

I get the message

"…." is not a valid numerical value

but the entered value is clearly a number.

As you make the first entry into a spreadsheet column, Minitab infers the type (numeric, text, date). If you enter 13.6 in position (C8, row 1), and if this is your first entry into C8, then numeric type will be inferred. If you then enter "more than 20" in position (C8, row 2), this message will appear. The solution is to change the data type. Use **Data** ⇒ **Change Data Type**; use **Text to Numeric** or **Numeric to Text**, according to your situation.

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