5. Excel Fundamentals

Excel is a software product that falls into the general category of spreadsheets. Excel is one of several spreadsheet products that you can run on your PC. Others include 1-2-3 and Quattro Pro.

A **spreadsheet** (including Excel) is a highly interactive computer program that consists of a collection of rows and columns displayed onscreen in a scrollable window. The intersection of each row and column is called a **cell**, which can hold a number, a text string, or a formula that performs a calculation by using one or more other cells. Copying and moving cells and modifying formulas are easy with a spreadsheet.

The most significant advantage of an electronic spreadsheet is that the formulas recalculate their results if you change any of the cells that they use. As a result, after you set up your spreadsheet by defining formulas, you can use this "model" to explore different possibilities, with very little additional effort.

5.1 Evolution of Excel

There are quite a few versions of MS Excel. Excel 2003 is the most current version.

Excel 2 was the original version of Excel for Windows, which first appeared in late 1987. It was labeled Version 2 to correspond to the Macintosh version, which was the original Excel. Because Windows wasn't in widespread use at the time, Version 2 included a run-time version of Windows—a special version with just enough features to run Excel and nothing else.

At the end of 1990, Microsoft released Excel 3 for Windows. This was a significant improvement in both appearance and features. It included toolbars, drawing capabilities, worksheet outlining, add-in support, 3D charts, workgroup editing, and lots more.

Excel 4 hit the streets in the spring of 1992. This version made quite an impact in the marketplace, because Windows was becoming more popular. It had lots of new features, many of which made it easier for beginners to get up to speed quickly.

In early 1994, Excel 5 appeared on the scene. This version introduced tons of new features, including multi-sheet workbooks and the new Visual Basic for Applications (VBA) macro language. Like its predecessor, Excel 5 took top honors in just about every spreadsheet comparison that was published in the trade magazines.

Technically, the Excel 6 was called Excel for Windows 95 (there was no Excel 6). It began shipping in the summer of 1995. On the surface, this version wasn't that much different from Excel 5, and included only a few major new features. But Excel 7 was

significant, because it was the first version to use the more advanced 32-bit code. Excel 7 and Excel 5 used the same file format.

Excel 8 (officially known as Excel 97) was probably the most significant Excel upgrade ever. The toolbars and menus had a great new look, online help took a dramatic step forward, and the number of rows available in a worksheet quadrupled. Developers were pleased to discover that Excel's programming language (VBA) improved significantly in Excel 97. Excel 9 (better known as Excel 2000) is the topic of this book. Excel 2000 has quite a few enhancements, but its most significant advancement is the capability to use HTML as a standard file format. Excel 2003 is the most current version of MS Excel spreadsheet.

6.2 Navigating through Excel

The files that Excel uses are known as ***workbooks***. A workbook can hold any number of sheets, and these sheets can be either worksheets (a sheet consisting of rows and columns) or chart sheets (a sheet that holds a single chart). A ***worksheet*** is what people usually think of when they think of a spreadsheet.

Figure 1 shows Excel with three workbooks open, each in a separate window. Worksheet windows can overlap so that the title bar of one window is a different color. That's the window that contains the ***active workboo*k**. The workbook windows that Excel uses work much like the windows in any other Windows program. Excel's windows can be in one of the following states: maximized, minimized, and restored.

Every worksheet consists of rows (numbered 1 through 65,536) and columns (labeled A through IV). After column Z comes column AA; after column AZ comes column BA, and so on. The intersection of a row and a column is a single cell. At any given time, one cell is the ***active cell***. You can identify the active cell by its darker border, as shown in Figure 2. Its ***address*** (its column letter and row number) appears in the Name box. Depending on the technique that you use to navigate through a workbook, you may or may not change the active cell when you navigate.

Consider how big a worksheet really is. It has 256 columns and 65,536 rows. Do the arithmetic and you'll find that this works out to 16,777,216 cells. Remember, this is in just one worksheet. A single workbook can hold more than one worksheet —hundreds, if necessary.

There are two types of menus you can use to manipulate data and other items with Excel. The regular menu is on the menu bar and lists all the functionalities the Excel has. The other type of menu is called shortcut menu. A shortcut menu is context-sensitive — its contents depend on what you're doing at the time. Shortcut menus don't contain *all* the relevant commands, just those that are most commonly used for whatever is selected. You can display a shortcut menu by right clicking just about anything in Excel.
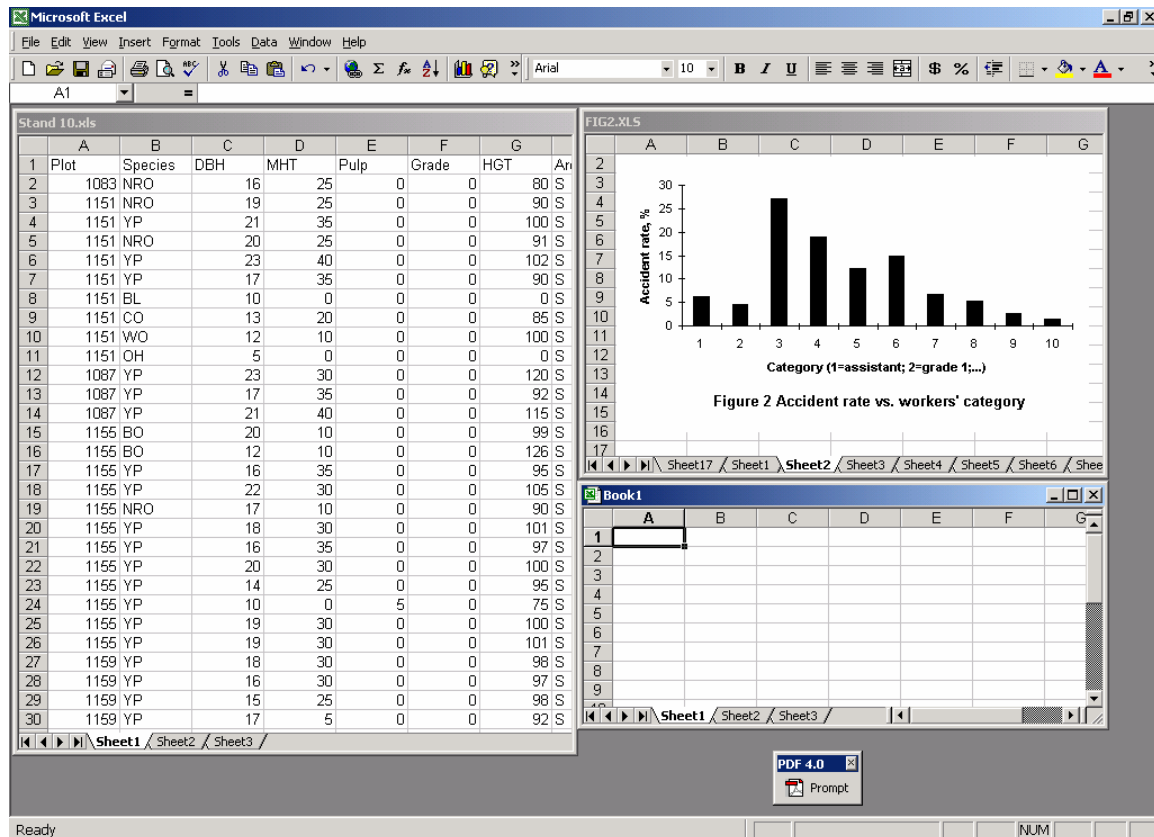
Figure 1. Excel with three workbooks open.

Hiding or showing toolbars

        To hide or display a particular toolbar, choose View ->Toolbars, or right-click any
toolbar. Either of these actions displays a list of common toolbars (but not all toolbars).
The toolbars that have a check mark next to them are currently visible. To hide a toolbar,
click it to remove the check mark. To display a toolbar, click it to add a check mark.
        If the toolbar that you want to hide or show does not appear on the menu list,
select View -> Toolbars -> Customize (or select Customize from the shortcut menu that
appears when you right-click a toolbar). Excel displays its Customize dialog box, shown
in Figure 3. The Toolbars tab of this dialog box shows a list of all toolbars that are
available —the built-in toolbars, plus any custom toolbars. The toolbars that have a
check mark next to them are currently visible. To hide a toolbar, click it to remove the
check mark. To display a toolbar, click it to add a check mark. When you're finished,
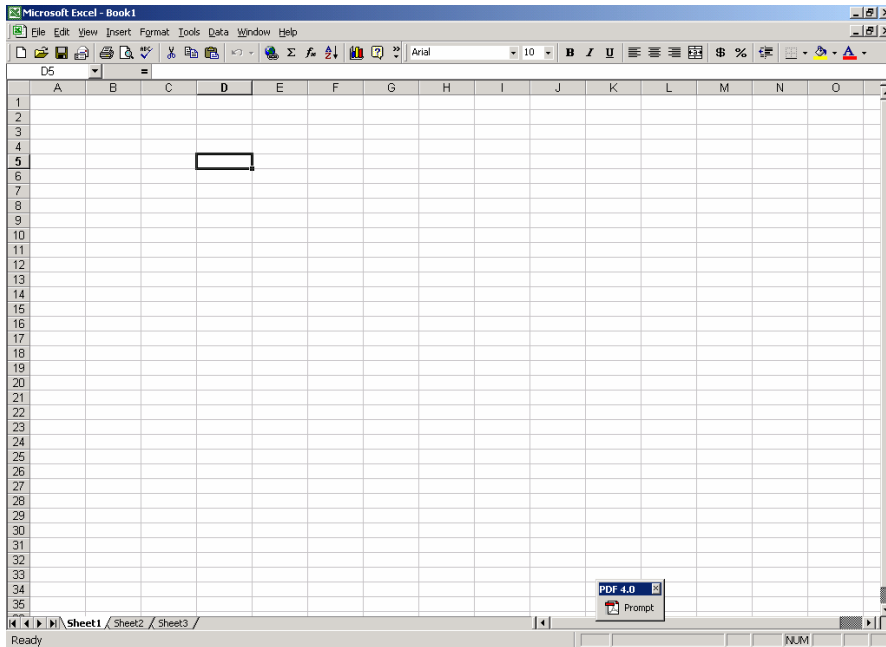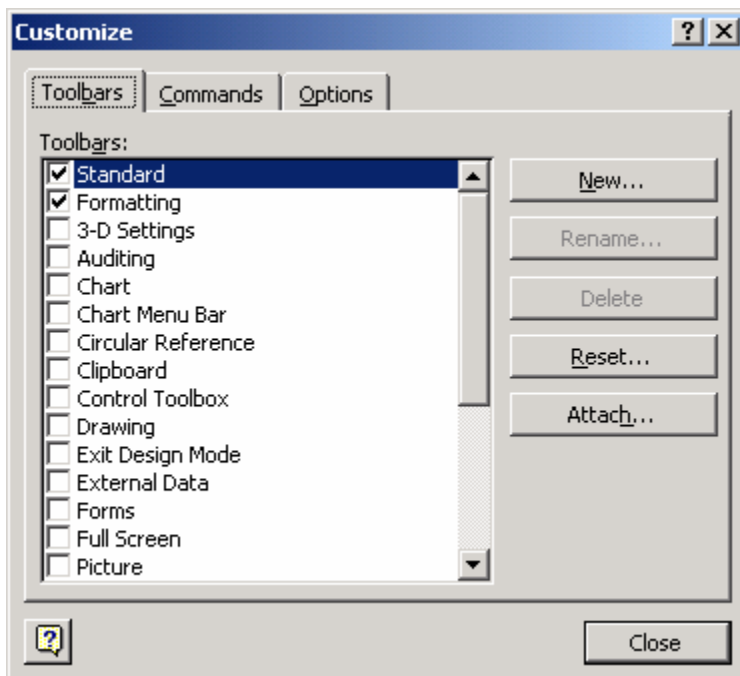click the Close button.

Figure 2. An active cell D5.

Figure 3. Toolbar customization.

6.3 Working with Files

Excel's primary file type is called a *workbook* file. When you open a workbook in Excel, the entire file is loaded into memory, and any changes that you make occur only in the copy of the file that's in memory. If the workbook is large, your system may not have

enough memory to hold the file. In such a case, Windows uses disk-based virtual memory to simulate actual memory (this slows things down consider-ably). When you save the workbook, Excel saves the copy in memory to your disk, overwriting the previous copy of the file.

The following is a summary of various types of files that Excel supports directly:

BAK Backup file
XLA Excel add-in file (several add-ins are supplied with Excel, and you can
      create your own add-ins)
XLB Excel toolbar configuration file
XLC Excel 4 chart file
XLL Excel link library file
XLM Excel 4 macro file
XLS Excel workbook file
XLT Excel template file
XLW Excel workspace file

Although Excel's default file format is an XLS workbook file, it also can open files generated by several other applications. In addition, Excel can save workbooks in several different formats. A list of file formats that Excel can read and write is as follows:

WKS 1-2-3 Release 1 spreadsheet format
WK1 1-2-3 Release 2 spreadsheet format
WK3 1-2-3 Release 3 spreadsheet format
WK4 1-2-3 for Windows spreadsheet format
WQ1 Quattro Pro for DOS spreadsheet format
WB1 Quattro Pro for Windows spreadsheet format**
DBF dBASE database format
SLK SYLK spreadsheet format
WB1 Quattro Pro for Windows spreadsheet format
HTM/HTML Hypertext Markup Language files
CSV Comma-separated value text file format
TXT Text file format

Excel's workbook files are subject to the same rules that apply to other Windows files. A filename can be up to 255 characters, including spaces. This enables you (finally) to give meaningful names to your files. You can't, however, use any of the following characters in your filenames:
\ (slash)
? (question mark)
: (colon)
* (asterisk)
" (quote)
< (less than)
> (greater than)

| (vertical bar)

You can use uppercase and lowercase letters in your names to improve readability. The file names aren't case-sensitive, however. The Save As dialog box has a drop-down menu labeled Tools. When you click this menu, one of the options displayed is labeled General Options. Selecting this item displays the Save Options dialog box, shown in Figure 4. This dialog box enables you to set the following options:

Always create backup: If this option is set, the existing version of the workbook is renamed as a BAK file before the workbook is saved. Doing this enables you to go back to the previously saved version of your workbook. Some users like to use this option because it adds another level of safety. Just be aware that your worksheet files will take up about twice as much disk space, so it's a good idea to delete the backup files occasionally.

Password to open: If you enter a password, the password is required before anyone can open the workbook. You're asked to enter the password a second time to confirm it. Passwords can be up to 15 characters long and are case-sensitive. Be careful with this option, because it is impossible to open the workbook (using normal methods) if you forget the password.
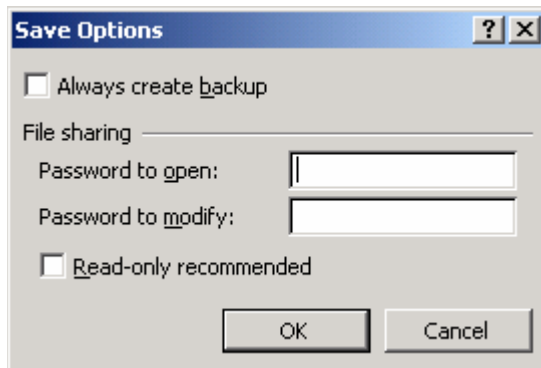

Figure 4. The save options dialog box.

Password to modify: This option enables you to specify a password that will be required before changes to the workbook can be saved under the same filename. Use this option if you want to make sure that changes aren't made to the original version of the workbook. In other words, the workbook can be saved with a new name, but a password is required to overwrite the original version.

Read-only recommended: If this option is checked, the file can't be saved under its original name. This is another way to ensure that a workbook file isn't overwritten.

6.4 Editing Worksheet Data

(1) Types of Worksheet Data
As you know, an Excel workbook can hold any number of worksheets, and each worksheet is made up of cells. A cell can hold any of three types of data:

- o Values
- o Text
- o Formulas

A worksheet also can hold charts, maps, drawings, pictures, buttons, and other objects. These objects actually reside on the worksheet's *draw layer,* which is an invisible layer on top of each worksheet. We will not discuss the draw layer in this lecture.

Here is an Excel workbook with three types of data on it (Figure 5).

Figure 5. Excel data types.

New users often are curious about the types of values that Excel can handle. In other words, how large can numbers be? And how accurate are large numbers? Excel's numbers are precise up to 15 digits. For example, if you enter a large value, such as 123,123,123,123,123,123 (18 digits), Excel actually stores it with only 15 digits of precision: 123,123,123,123,123,000. This may seem quite limiting, but in practice, it rarely causes any problems.

(2) Formatting Values

Values that you enter into cells normally are unformatted. In other words, they simply consist of a string of numerals. Typically, you want to format the numbers so that they are easier to read or are more consistent in terms of the number of decimal places shown.

Figure 6 shows two columns of values. The first column consists of unformatted values. The cells in the second column have been formatted to make the values easier to read. If you move the cell pointer to a cell that has a formatted value, you find that the formula bar displays the value in its unformatted state. This is because the formatting affects only how the value is displayed in the cell.
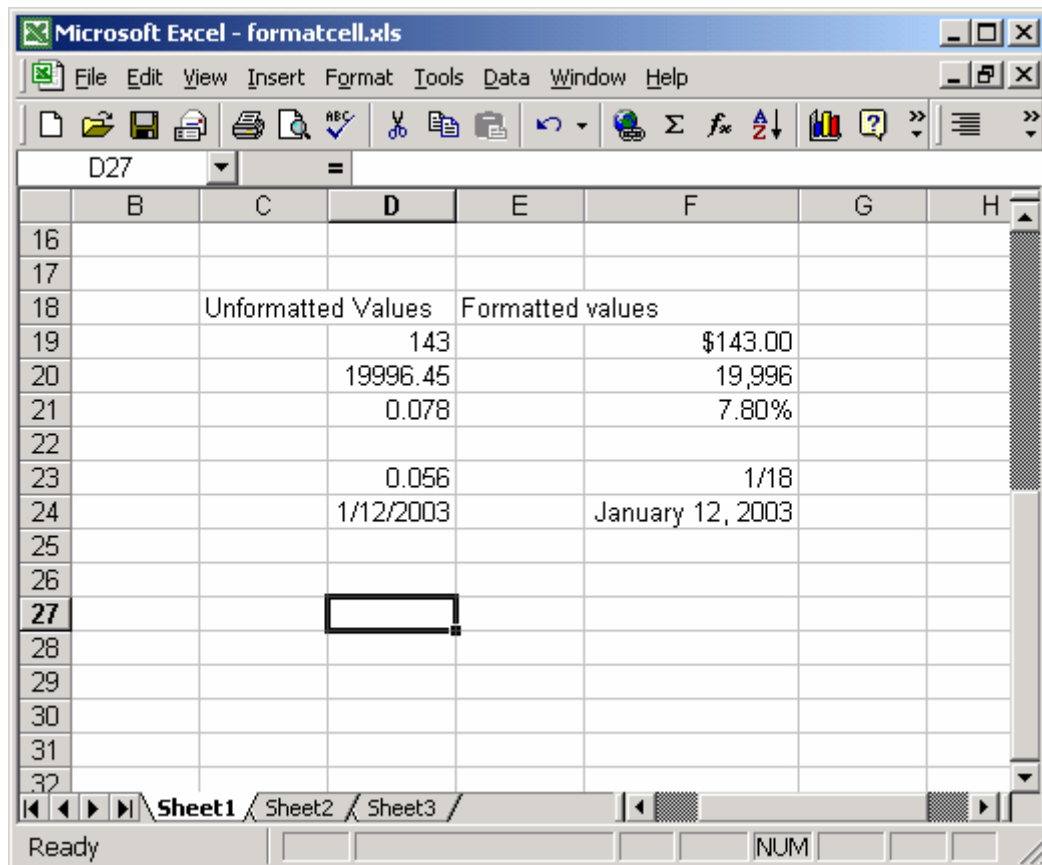

Figure 6. Value formats.

A very convenient way to format values is via using the Excel's Format Cells dialog box (Figure 7). This is a tabbed dialog box. For formatting numbers, you need to use the tab labeled Number. Several ways exist to bring up the Format Cells dialog box. Start by selecting the cell or cells that you want to format and then do the following:

- o   Select the Cells to be formatted.
- o   Right-click and choose Format Cells from the shortcut menu.
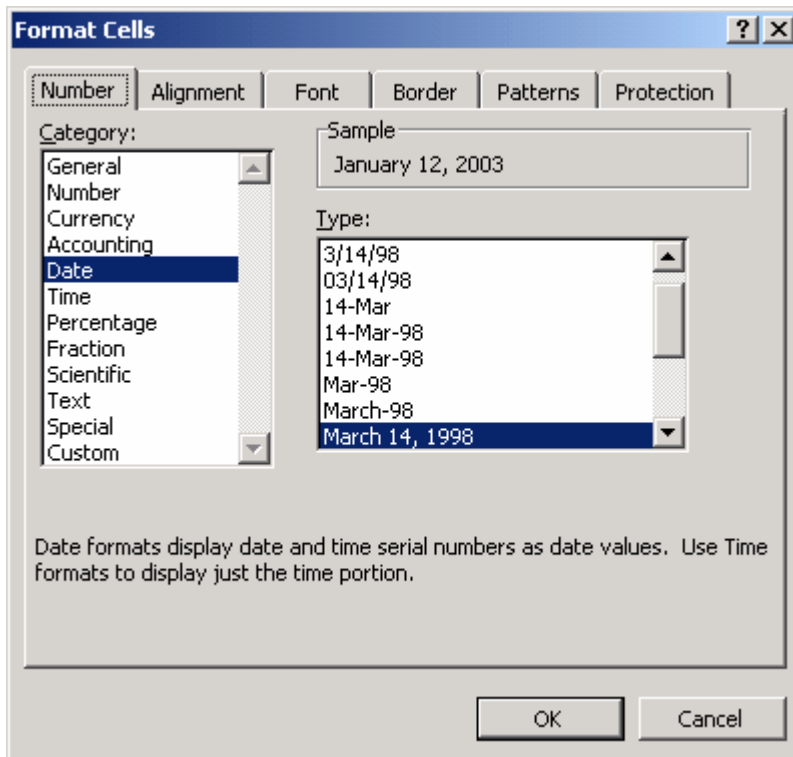- o   A dialog box will be displayed (Figure 7).

Figure 7. The number tab of the format cells dialog box.

The Number tab of the Format Cells dialog box displays 12 categories of number formats from which to choose. When you select a category from the list box, the right side of the tab changes to display appropriate options. For example, Figure 8 shows how the dialog box looks when you click the Number category.

The Number category has three options that you can control: the number of decimal places displayed, whether to use a comma for the thousand separator, and how you want negative numbers displayed. Notice that the Negative numbers list box has four choices (two of which display negative values in red), and the choices change depending on the number of decimal places and whether you choose to use a comma to separate thousands. Also, notice that the top of the tab displays a sample of how the active cell will appear with the selected number format. After you make your choices, click OK to apply the number format to all the selected cells.
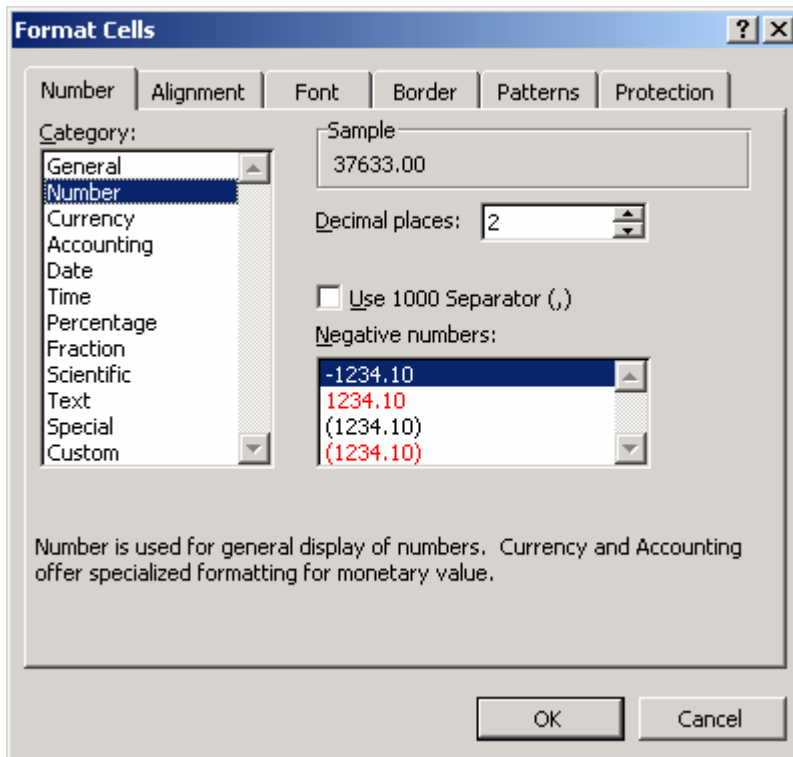
Figure 8. Options for the number category.

The following are the number-format categories, along with some general comments (Figure 9):

- o **General:** The default format; it displays numbers as integers, decimals, or in scientific notation if the value is too wide to fit in the cell.
- o **Number:** Enables you to specify the number of decimal places, whether to use a comma to separate thousands, and how to display negative numbers (with a minus sign, in red, in parentheses, or in red and in parentheses), as shown in Figure 8.
- o **Currency:** Enables you to specify the number of decimal places, whether to use a dollar sign, and how to display negative numbers (with a minus sign, in red, in parentheses, or in red and in parentheses). This format always uses a comma to separate thousands.
- o **Accounting:** Differs from the Currency format in that the dollar signs always line up vertically.
- o **Date:** Enables you to choose from 15 date formats.
- o **Time:** Enables you to choose from eight time formats.
- o **Percentage:** Enables you to choose the number of decimal places and always displays a percent sign.
- o **Fraction:** Enables you to choose from among nine fraction formats.
- o **Scientific:** Displays numbers in exponential notation (with an E): 2.00E+05 = 200,000. 2.05E+05 = 205,000. You can choose the number of decimal places to display to the left of E.

o **Text:** When applied to a value, causes Excel to treat the value as text (even if it looks like a value). This feature is useful for items such as part numbers.
o **Special:** Contains four additional number formats (Zip Code, Zip Code +4, Phone Number, and Social Security Number).
o **Custom:** Enables you to define custom number formats that aren't included in any of the other categories. Custom number formats are described in the next section.
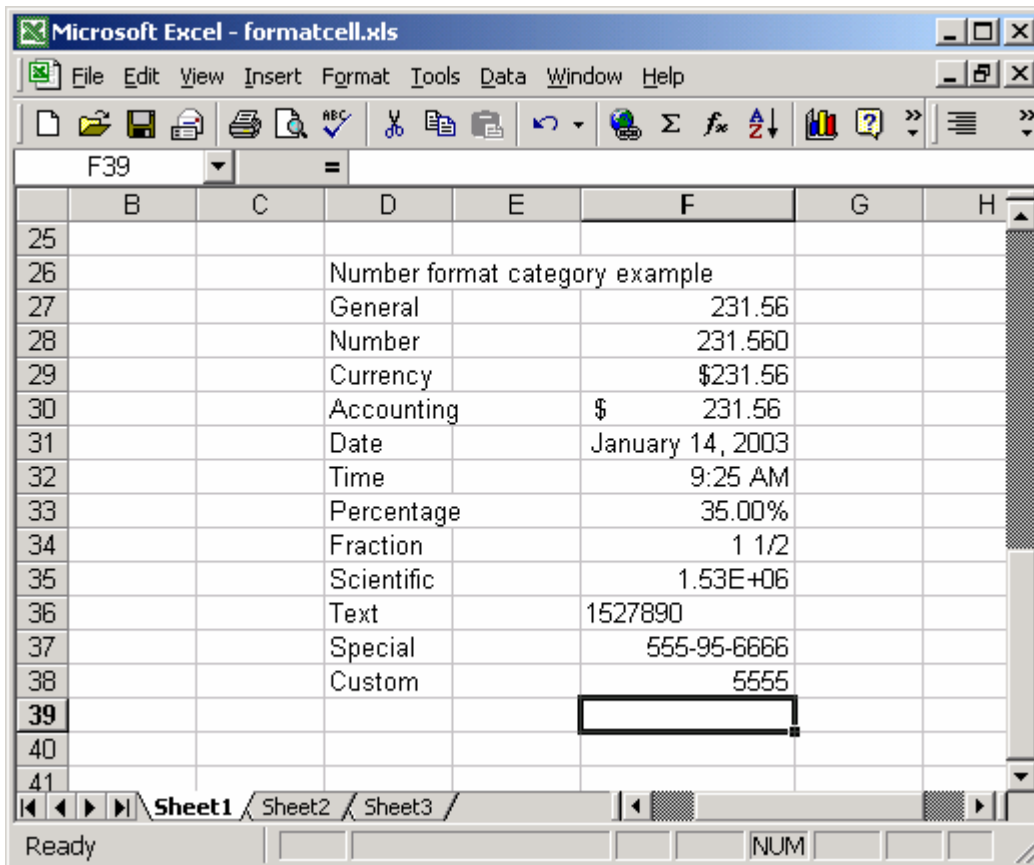

Figure 9. Value format category.

(3) Alignment

When you enter text in a cell, Excel aligns the text with the left edge of the cell. Values, on the other hand, are displayed right aligned in the cell. To change the alignment of a cell's contents, select the cell and then click the appropriate button on the Formatting toolbar. The relevant buttons are as follows:

o Left
o Center
o Right
o Merge and center

(4) Validating Data Entry

In Excel 2000, you can specify the type of data that a cell or range should hold. For example, you might develop a spreadsheet that will be used by others. Assume that the worksheet has an input cell that is used in a formula. This particular cell might require a value between 1 and 20 to produce valid results in the formula. You can use the data-validation feature to display a message if the user enters a value that does not fall between 1 and 20.

To set up data validation, select the cell or range of cells that you want to validate and then choose Data -> Validation. Excel displays the Data Validation dialog box, with its three tabs (Figure 10). For example, if a 21 is entered for this cell, an error message will be popped out (Figure 11).
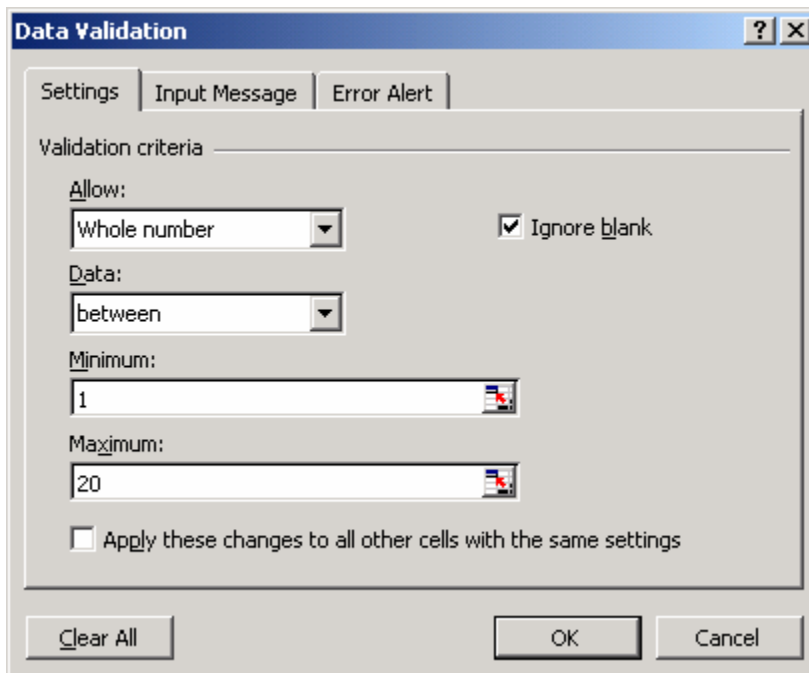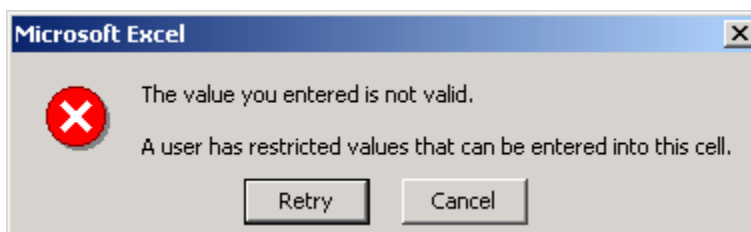

Figure 10. Data validation a cell or range.

Figure 11. Message box a data validation.

Class Exercises
    (1) Formatting cell values – Figure 6 on page 8 and Figure 9 on page 11.
    (2) Data validation – Figure 10 on page 12.

References

Walkenbach, J. 1999. Microsoft Excel 2000 Bible. IDG Books Worldwide, Inc. Foster City, CA.