Intro to Excel spreadsheets

What are the objectives of this document?

The objectives of document are:
1. Familiarize you with what a spreadsheet is, how it works, and what its capabilities are;
2. Using the concepts introduced earlier in the course, apply certain mathematical manipulations to data;
3. Provide you with the tools to make decisions that are more informed and present reports to interested stakeholders in your respective offices.

Before we start…

Throughout the following pages, we will reference several menu options and how you can get to them. In order to do this, we will use the following convention: when you see the following, View→Zoom, the first word (View) refers to a menu option usually found in the top left, under the title bar. The word that follows (Zoom) is a menu choice found under the first option you made.

What is a spreadsheet?

A spreadsheet is the computerized equivalent of a <u>general ledger</u>. It has taken the place of the pencil, paper, and calculator. Spreadsheet programs were first developed for accountants but have now been adopted by anyone wanting to prepare a budget, forecast sales data, create profit and loss statements, compare financial alternatives and any other mathematical applications requiring calculations.

The electronic spreadsheet is laid out similar to the paper ledger sheet in that it is divided into <u>columns</u> and <u>rows</u>. Any task that can be done on paper can be performed on an electronic spreadsheet faster and more accurately.

The problem with manual sheets is that if any error is found within the data, all answers must be erased and recalculated manually. With the computerized spreadsheet, formulas can be written that are automatically updated whenever the *data* are changed.

What can a spreadsheet do?

In contrast to a word processor, which manipulates text, a spreadsheet <u>manipulates numerical data and text.</u> Using a spreadsheet, one can create budgets, analyze data, produce financial plans, and perform various other simple and complex numerical applications.

By having formulas that automatically recalculate, either built by you, the user, or the built-in math functions, you can play with the numbers to see how the result is affected. Using this "what-if?" analysis, you can see what affect changing a data value or calculation can have on your monitoring program.

Spreadsheets can also be used for <u>graphing data points</u>, reporting data analyses, and organizing and storing data.

Starting Excel

You are encouraged to start using MS Excel as you read through the following materials to familiarize yourself with the topics and procedures.

1. Click the **Start button** on the Windows taskbar.
   a. The Start menu opens
2. Point to **Programs**
   a. The Programs menu opens
3. Click **Microsoft Excel**
   a. Excel opens a new workbook

Note: an icon for MS Excel may be located either on the desktop or on the Office toolbar.

Figure 1

1. The Start button

2. Programs

3. MS Excel
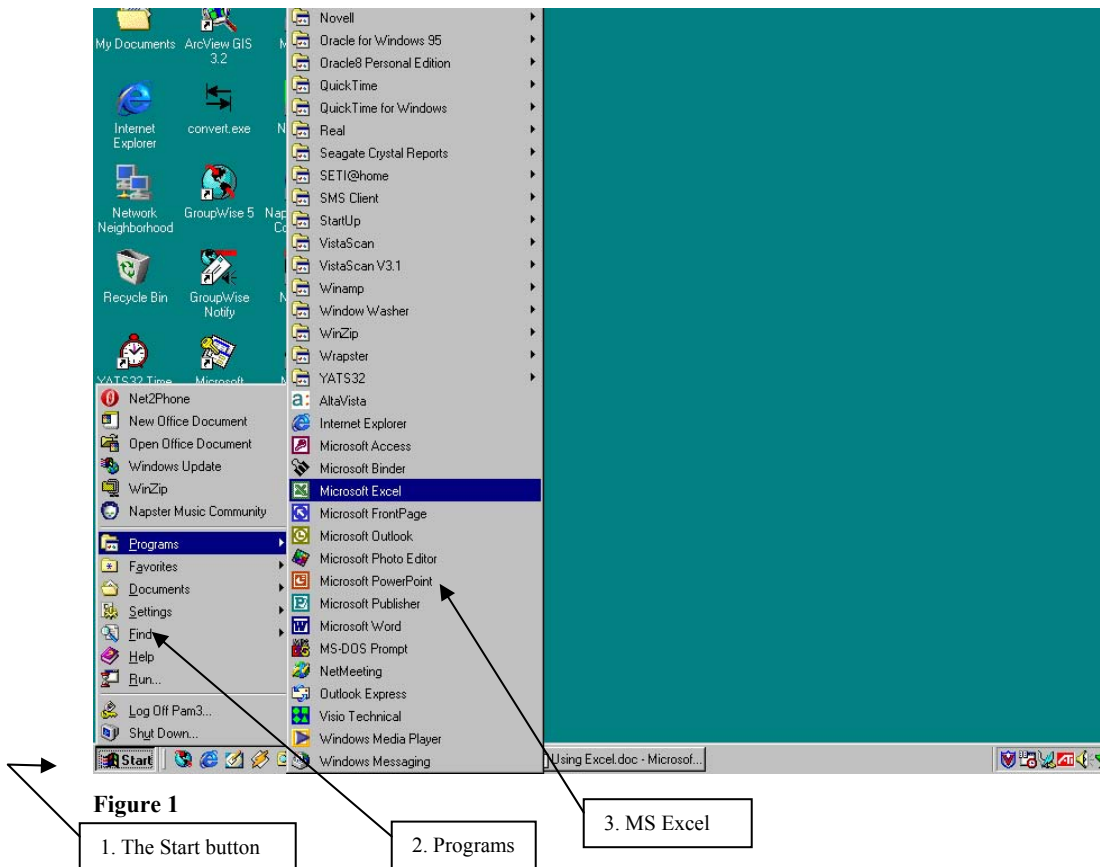
The Excel Screen

The screen in Excel looks different than those used in other types of applications.
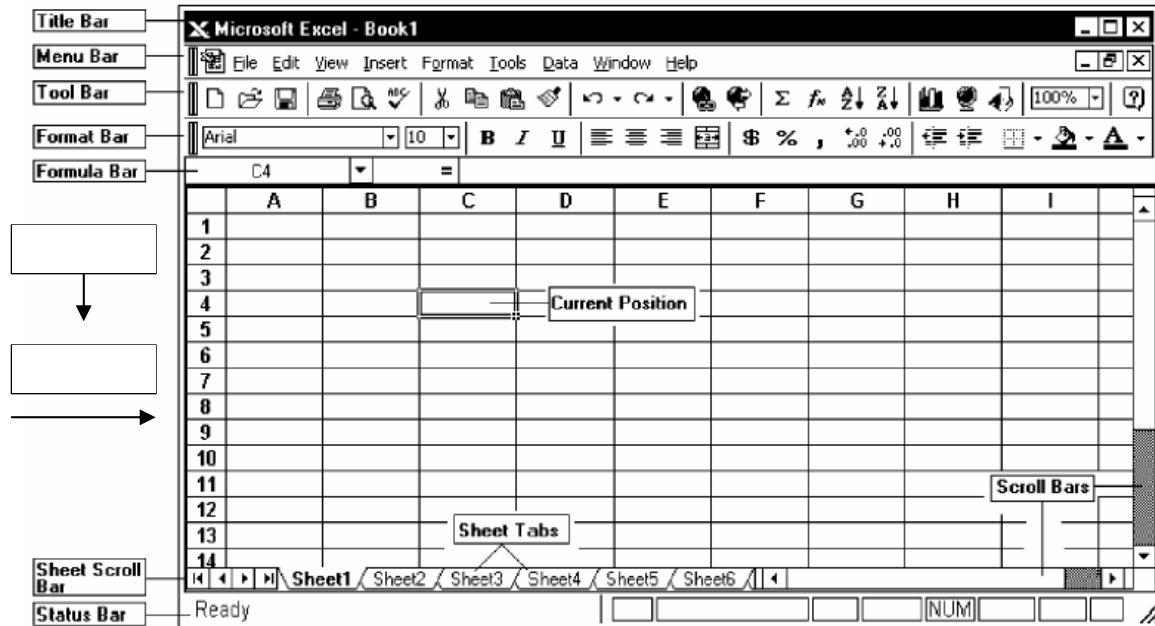

Figure 2

The large window, labeled "Microsoft Excel" may take up the entire screen. This is referred to as the **Application Window**. The top line is called the **Title Bar** and has three buttons **(Minimiz**e, **Restore**, and **Clos**e) to the right. These buttons are used to size the window and close it. This title bar is standard in all Windows programs.

The second line is called the **Menu Bar**. Notice that one character of each selection is highlighted or underlined. This menu bar is also standard in all Windows programs.

The next two lines contain buttons with text or images and are referred to as the **Standard** and **Formatting Toolbars**. If you have a mouse, these toolbars allow you to enhance your worksheet without accessing the menu. Keep in mind that these may not be in the exact same place as on the illustration above. All toolbars can be customized to display any buttons you desire.

The next line is the **Formula Bar** and displays the current cell address (see below) and contents. As you move from cell to cell, Excel will keep track of the current cell address for you. The Formula Bar can also be used to edit the text (contents) or formulas contained in the cell.

Columns and Cells and Rows…oh my!

The horizontal bar across the top of the worksheet area is filled with letters, beginning with A. Each letter represents a **column** while the vertical bar on the left side of the worksheet filled with numbers refers to **rows**.

The intersection between a column and a row is referred to as a **cell**. A cell is similar to a box that can be used to store pieces of information. Each piece of information could be a word or group of words, a number or a mathematical formula.

Each cell has its own **address**. This address is used in formulas for referencing different parts of the worksheet. The address of a cell is defined by the letter of the column in which it is located and the number of the row. For example, the address of a cell in column B, row 5 would be referred to as **B5**. The column is always listed first followed by the row without any spaces between the two.

The outlined cell (the one with the dark borders) within the worksheet is referred to as the **active cell**. Each cell may contain text, numbers, or dates. You can enter up to 32,000 characters in each cell (Equivalent to a 44 page report!).

These cell addresses are useful when entering formulas. Instead of typing actual values in your equations, you simply type the cell address where the value is stored. Then, if you need to go back and change one of the values the spreadsheet automatically updates the result of the formula based on the new data.

For example, instead of typing 67*5.4 you could enter C5*D5. The number 67 is stored in cell C5 and the number 5.4 is stored in cell D5. If these numbers change next month or next year, the formula remains correct because it references the cells - not the actual values. With the second formula, you can change the numbers stored in cells C5 and D5 as often as required and see the result recalculated <u>immediately</u>.

The next section of the screen lists the columns and rows within the current worksheet. As mentioned, columns are lettered and rows are numbered. The first 26 columns are lettered A through Z. Excel then begins lettering the 27th column with AA and so on. In a single Excel worksheet there are 256 columns (lettered A-IV) and 65,536 rows (numbered 1-65,536), totaling 16,777,216 individual cells.

Sheets and Workbooks

Towards the bottom of the worksheet is a set of small **Tabs** that identify each sheet in the workbook (file). If there are multiple sheets, you can use the tabs to easily identify what data is stored on each sheet. For example, the top sheet could be "Expenses" and the second sheet could be called "Income". When you begin a new workbook, the tabs default to being labeled **Sheet1, Sheet2**, etc.

At the bottom of the screen is another bar called the **Status Bar**. This bar is used to display various information about the system and current workbook.

The left-hand corner of this line lists the **Mode Indicator,** which tells you what mode you are currently working in.

The **Zoom** button 100% (located on the toolbar at the top of the screen) allows you to change the size of the viewing area. This does not affect the actual printing of the file. Click on the down arrow located to the right side of the current zoom factor. Scroll through the available zoom choices. When you select a zoom factor, Excel will zoom in or out of the worksheet area - as specified in the Zoom. You can also access the **View → Zoom** menu. In addition, you can hide everything except the worksheet and the menu (which will increase your working area) by accessing the **View → Full Screen** menu.

Using "Help"

Excel, along with many of the Microsoft applications, has its own online help menu. There are several ways to access help. Either press F1 on the keyboard or choose Help → Microsoft Excel Help from the Menu bar. A window will appear as shown in figure 3.
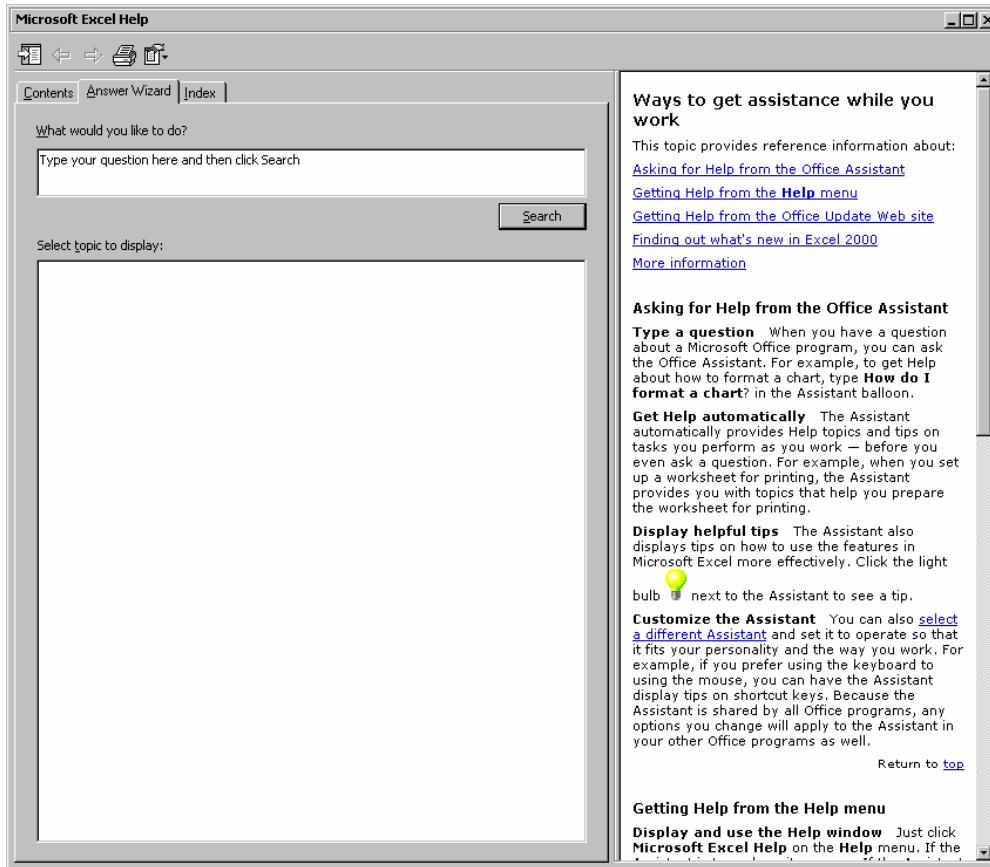

Figure 3

Moving around in Excel

When Excel starts, a new worksheet opens. What is currently visible is only a small portion of what is available for you to use. In order to move to areas that you cannot see, you can:

- Use the scroll bars
- Use the keys described in table 1

Keystroke	Result
Arrow key	Move one cell in the direction of the arrow
Ctrl + arrow key	Move in the direction of the arrow to the last cell before a blank cell, or to the edge of the worksheet if all cells are blank
Page Up	Moves up one screen
Page Down	Moves down one screen
Home	Moves to the beginning of the row
Ctrl + Home	Moves to cell A1
Ctrl + End	Moves to the last cell containing data (in the bottom right of the worksheet

Table 1

Data Entry

In the following section, you will learn how to enter sample data, edit that sample data, and delete & undelete that data. You should create a sample spreadsheet so you can practice the following procedures.

Entering data is as simple as beginning to type.
1. Click once on the cell you want to use for data entry and begin typing
2. The following keys can be used to update the contents of the cell: *Enter*, *Tab*, or any of the directional arrows

Editing data is simple as well. There are several options for doing this:
1. Highlight the cell, type in a completely new amount (caution: this will overwrite any data already in the cell)
2. Double-click the cell and a flashing insertion point (cursor) appears in the cell
3. Use the formula bar
4. Highlight the cell to edit and press F2 on your keyboard

Deletion of data can be relatively straightforward. You can:
1. Select a cell or range of cells (click and hold your mouse or use the shift-click method) and press delete
2. Select a cell or range of cells and **Edit → Clear →** then choose from **All**, **Contents**, or **Formatting** from the menu bar
3. To actually remove the cells instead of just clearing the data, select a cell or range of cells and **Edit → Delete…**; you are given the option of shifting the remaining cells a direction or deleting the entire row or column.

Undoing an action can save both time and headache. In the toolbar, you will find two arrows. Using these arrows,   you can either undo (arrow pointing left) the last action or series of actions you just   completed, or Redo (arrow pointing right) an action such as formatting or deleting; you can even Redo an action that was undone.

Let Excel enter data for you

Excel can help you enter series of numbers, dates or times. For instance, if you want to fill a column with a list of consecutive or patterned dates or numbers, instead of typing dates or numbers in each cell of the column you can use the "Series" command or you can click and drag the "fill handle" on a cell. Both of these methods are described below. You can use a pre-determined series using the series command that you can customize (for instance, date fills can be weekly instead of daily), or you can enter several logical pieces of the series by hand and when selecting cells, include your custom series. Excel will fill the cells with a series based on the cells in the original series selection

Using the Series command.

Select the cell that contains the first date or number. Use your mouse to drag the selection box down the number of rows that you wish to fill. Go to the **Edit** menu, and select **Fill**, then **Series**. The Series window will appear. For this example, chose "Date" on the Type list and "Day" on the Date Unit list. Click on OK and the selected cells will be filled with consecutive dates.
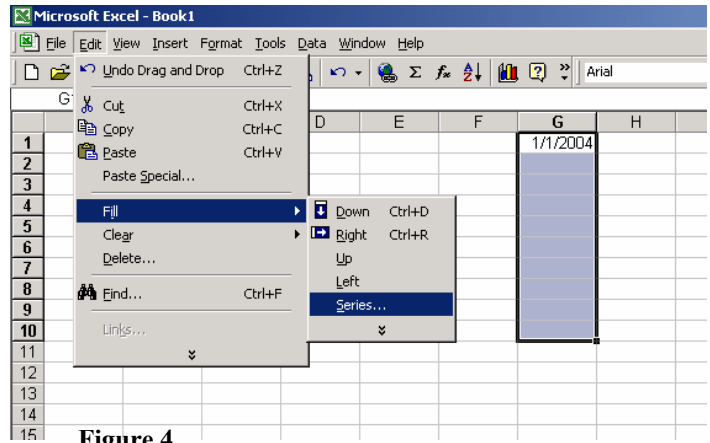

Figure 4

Using the Fill Handle

When you select a cell, a small black square appears in one corner of the selection. When you point to the fill handle, the pointer changes to a black cross. Left click with the black cross and hold it down while you drag the selection box over the cells that you want to fill. When you release the mouse button, the boxes will fill automatically.
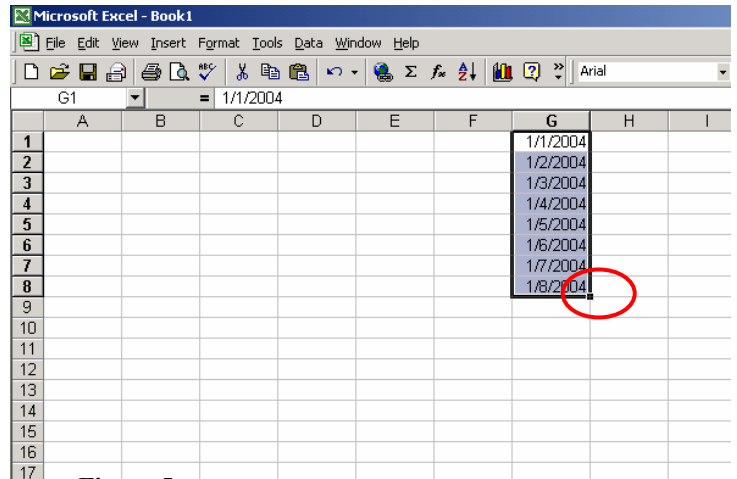

Figure 5

Formatting

Once you have created your worksheet, you will want to format it to make it as clear as possible. Formatting is the structure and layout of a worksheet and its individual parts. Using some of the tools available, you can change the alignment, font size and weight, the way numbers display, even add borders and shading to your finished product.

Column Width
Sometimes the data you enter does not fit the default cell width of 8.43 characters. When this happens, you will see either ##### or see a number expressed in scientific notation (2.34E+08). To fix this, you will have to adjust the cell width. There are two options available to do this:
1. Make sure the highlighted cell is in the column that you want adjusted. Choose **Format →
    Column → Width** from the menu bar. Then type in a new width and press enter.
2. Using the mouse, position the pointer at the right-most end of the column you wish to re-size (in the column header area where the letters are). Your pointer will turn into a vertical bar with two small arrows on either side. You can then drag and drop to the desired column width.
3. Double-click on the right-most edge of the column header.

Row Height
In the same respect, some of the data you enter will not fit the height of the cell and/or row it is in. In order to change the row height, follow the following steps:

1. Point to the bottom edge of the row number boundary to get the two-headed arrow
2. Drag upward or downward to desired height
3. You can also highlight the row and use the **Format → Row → Height** menu options

If you have only certain cells that are too wide or too tall, you can select the "wrap text" option. Select the row or column to be adjusted, use the **Format→Row**(or column) and select the Alignment tab for the option of "wrap text."

Inserting & Deleting

If you decide that you need another column in between your existing values, or that you want to insert a row or rows between existing values, you should use the following methods:

- Inserting a single column: click on the column to the right of where you want the new column, then choose **Insert → Columns**
- Inserting a single row: click a cell in the row below where you want the new row and choose **Insert → Rows**
- Deleting a row or column: select a cell in each row or column to be deleted and choose **Edit → Delete**

Numbers

To format the way your cells display numbers, select the cells you would like to format. Choose **Format → Cells → Number Tab** from the menu bar. The format cells dialog box appears, looking similar to figure 6
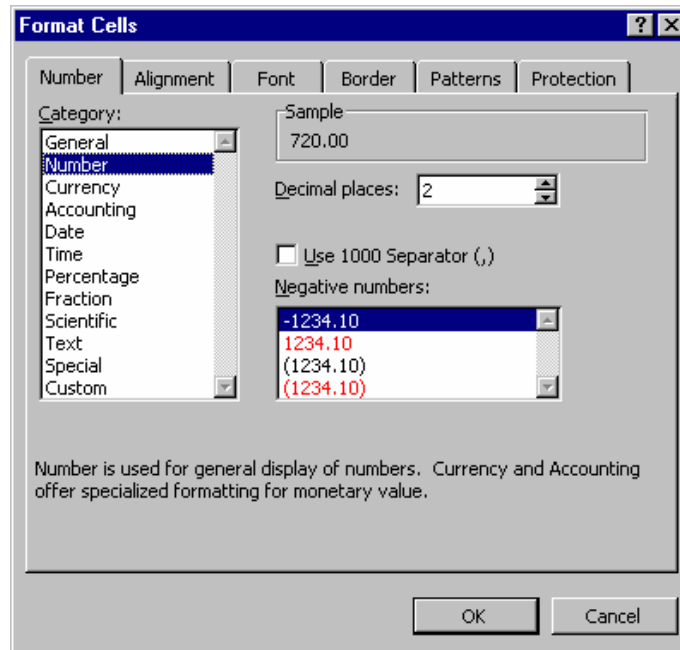

Figure 6

Using this dialog box, you can choose the way that your numbers look, from the number of decimal places (rounding) to scientific notation, currency, and percentages. The Sample section of the dialog box will show you what your data might look like after you format it. Use caution when formatting your data to a different type than General or Number—for instance, if you have the value "10" in your cell and you want to change the formatting to percentage, your resulting value will be 1000%; you would have to enter 0.10 for it to equal 10%! You can always revert your formatting and the original values will be restored.

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Formula Creation & Math Functions

Excel provides several built-in math functions, as well as provides you the opportunity to create your own custom formulas. To use a built-in function:
1. Click in the cell where you want the results to appear.
2. Click the paste function on the standard toolbar   *f*
3. The Paste Function dialog box appears. Select a category in the *Function category* list. All of the associated functions are listed in the *Function name*, with a description listed below.
4. Click OK to close the dialog box and open the Formula Palette.
5. After defining your arguments, click ok and the formula palette will close.

You can also create your own formula by either typing it or selecting cells to use in performing a calculation. There are a few tips you need to keep in mind when creating your own formulas:
- Order of operations: **P**arenthesis, **E**xponentials, **M**ultiplication & **D**ivision first, **A**ddition and **S**ubtraction second, from left to right (aka PEMDAS)
- All formulas must start with an equals sign
- Use a blank cell as your active cell to avoid errors

Arithmetic operators   To perform basic mathematical operations such as addition, subtraction, or multiplication, combine numbers or produce numeric results, use the following arithmetic operators.

Arithmetic operator	Meaning	Example
+ (plus sign)	Addition	3+3
– (minus sign)	Subtraction	3–1
	Negation	-6
* (asterisk)	Multiplication	3*3
/ (forward slash)	Division	3/3
% (percent sign)	Percent	20%
^ (caret)	Exponentiation	3^2 (the same as 3*3)

Reference operators   Combine ranges of cells for calculations with the following operators.

Reference operator	Meaning	Example
: (colon)	Range operator, which produces one reference to all the cells between two references, including the two references	=AVG(B5:B15)
, (comma)	Union operator, which combines multiple references into one reference (used when referencing cells that are not consecutive)	=SUM(B5:B15,D5:D15)

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The Difference Between Relative and Absolute References

Relative references When you create a formula, references to cells or ranges are usually based on their position relative to the cell that contains the formula. In the following example, cell B6 contains the formula =A5; Microsoft Excel finds the value one cell above and one cell to the left of B6. This is known as a relative reference.

	100	
	200	=A5

When you copy a formula that uses relative references, Excel automatically adjusts the references in the pasted formula to refer to different cells relative to the position of the formula. In the following example, the formula in cell B6, =A5, which is one cell above and to the left of B6, has been copied to cell B7. Excel has adjusted the formula in cell B7 to =A6, which refers to the cell that is one cell above and to the left of cell B7.

	A	B
5	100	
6	200	=A5
7		=A6

Absolute references If you don't want Excel to adjust references when you copy a formula to a different cell, use an absolute reference. For example, if your formula multiplies cell A5 with cell C1 (=A5*C1) and you copy the formula to another cell, Excel will adjust both references. You can create an absolute reference to cell C1 by placing a dollar sign ($) before the parts of the reference that do not change. To create an absolute reference to cell C1, for example, add dollar signs to the formula as follows: =A5*C1

Switching between relative and absolute references If you created a formula and want to change relative references to absolute (and vice versa), select the cell that contains the formula. In the formula bar, select the reference you want to change and then press F4. Each time you press F4, Excel toggles through the combinations: absolute column and absolute row (for example, C1); relative column and absolute row (C$1); absolute column and relative row ($C1); and relative column and relative row (C1). For example, if you select the address A1 in a formula and press F4, the reference becomes A$1. Press F4 again and the reference becomes $A1, and so on.

Creating charts

Charts can emphasize important points or trends in your data and make them easier to understand. Using charts, you are able to get your point across efficiently and quickly, embedding them in reports or presenting them to interested audiences.

What do different graphs represent?
The following table illustrates what some of the different graphs illustrate.

Name	Description of Use
Column	Compares values across categories
Bar	Compares values across categories
Line	Displays a trend over time
Pie	Displays parts of the whole
XY (Scatter)	Compares pairs of values
Area	Shows the trends of value over time

Table 2

To create a chart, you must first have data in your worksheet. Included with this data, it is helpful to have labels in the column to the left of the data to indicate categories, labels across the row above the data that indicate the type of data or the time over which the data will be analyzed, data all formatted the same way, and data in cells that are next to each other.
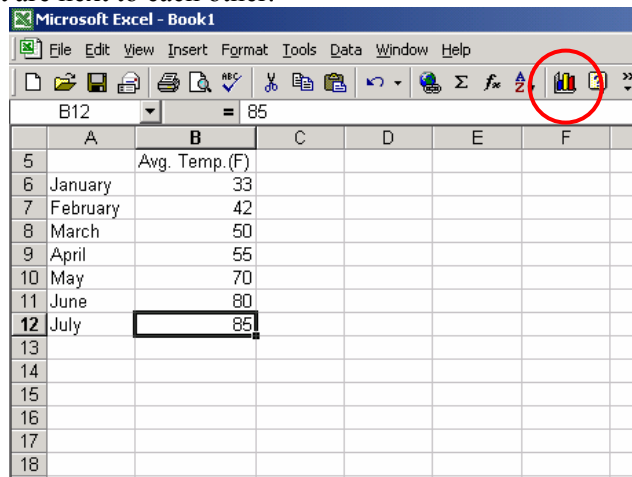

Figure 7

First, determine the type of chart that will display the data most effectively. Second, select the cells that contain the data that you want charted – this is the **data range**.

Chart Wizard
Click the Chart Wizard button (circled in Figure 7) from the standard toolbar. The wizard will then open up and prompt you for choosing chart types, data ranges, plotting methods, titles, legend placement, and chart placement.
1. Choose the type of chart you would like to create; Click Next
2. Make sure the chart looks like you expect it to; if not, you may need to tell Excel to analyze the data in rows instead of columns or vice-versa; Click Next
3. The third step has a series of tabs with options for adjusting how your chart looks; Click Next after you have adjusted options on all desired tabs

a. Titles: type a meaningful heading in any desired area (for instance, a chart title may not be sufficient, but the axes may need to be labeled as well)
b. Axes: select or deselect showing the axis values
c. Gridlines: select or deselect the gridlines on the chart to make it easier to read
d. Legend: choose whether or not to show the chart legend and where to place it
e. Data Labels: choose whether to include data labels, values, percents, etc.
f. Data Table: choose whether or not to include the table of values from your worksheet

4. The final step is to select where to place the chart; select As a New Sheet [Chart 1] for the chart to be placed on a new worksheet in your workbook or select As Object In [Sheet1] for the chart to be placed within a spreadsheet. Selecting As a New Sheet will yield a chart that is easier to export to other applications such as MS Word or PowerPoint

Formatting the Chart
Once your chart is created, you may decide there are some things you need to change about how it looks or how the data are displayed.

Scale: To adjust the scale of the chart for bar or line graphs, highlight the axis to adjust and go to **Format→Selected Axis** (or double-click on the selected axis). Depending on which axis you select, you'll get different options. Typically the x-axis (vertical) is the one you'll want to adjust. You can uncheck the "Auto" boxes and set the values at your own levels. **Minimum** is the lowest value displayed on the x-axis. Typically, this is zero, but it may at times be negative or you may want to start it at 1000, depending on how your data are distributed. **Maximum** is the highest value displayed, and is usually set at the most logical value based on your highest data point. You may want to adjust this value in order to change the distribution of the points on the graph. **Major and minor unit** refer to how the gridlines are displayed on the chart and how the numbers are displayed on the x-axis. If the major unit is 10, then the values on the axis will be something like: 10, 20, 30, 40, 50; unless you have minor gridlines shown (an option in the chart wizard), then the minor unit value will not affect the chart appearance.

Colors, Patterns and Fonts
To make your chart even more stunning visually, you can adjust the colors of the background, foreground, borders, fonts, axes, bars, lines, pie slices, etc., etc. Just double-click on the object you want to format and the color palette will open for you to express your artistic creativity. Patterns come in useful when you are relying on black-and-white displays of multiple parameters because you can more easily distinguish one bar or one line from another.

When working with Pie Charts, be careful to select the piece of the pie you to which you want to apply a color or pattern (the first click will select the pie itself, the second click will select a piece of the pie) and then double-click on it. Otherwise you will change the color or pattern for the entire pie instead of each piece.

You can also adjust the size and style of the font for different pieces of your chart by double-clicking on the desired text or section. (Note: if you change the font for a value on the x-axis, for instance, all values on the x-axis will change formatting).

3-D Charts: If you have created a chart using a 3-D chart type, you can modify the angles at which the chart is portrayed. Click once on the Chart so the black handles are selecting the entire chart. Go to **Chart→3-D View** to change the depth or angle.

Once a chart has been created, you can also go and change the style of chart or other options that were set in the Chart Wizard. Go to the **Chart** menu for a list of options.

Text Import Wizard

Some types of air monitors supply data in a text format. These files are often identified by the .txt suffix (example: february00.txt). Text files contain lines of characters, including both numbers and letters. To divide these lines of text into columns of data, characters such as commas or tabs are inserted to separate each field or column of data. Text data can also be in a fixed width format, where the fields are aligned in columns with spaces between each field. Excel's Text Import Wizard can import both of these text file data formats. The Text Import Wizard takes the lines of characters and converts them into data contained within the columns and rows of an Excel file.

Chose **Data → Get External Data→ Import Text File** from the menu bar. The import text dialog box appears. Choose the text file that you would like to import from Excel and double click on it <u>or</u> single click the file name, then click the **Import** button. Follow the instructions given by the Text Import Wizard dialog boxes that follow.

Printing

Previewing
Before you print a worksheet, click **Print Preview** to see how the sheet will look when you print it. The way pages appear in the preview window depends on the available fonts, the resolution of the printer, and the available colors.

Page setup
<u>Change the page orientation</u>
1. Click the worksheet.
2. On the **File** menu, click **Page Setup**, and then click the **Page** tab.
3. Under **Orientation**, click **Portrait** or **Landscape**.

<u>Print a worksheet on a specified number of pages</u>
1. Click the worksheet.
2. On the **File** menu, click **Page Setup**, and then click the **Page** tab.
3. Click **Fit to**.
4. Enter the number of pages on which you want to print the work.

<u>Notes</u>
- Excel ignores manual page breaks when you fit the worksheets on a specified number of pages.
- When you change the values for **Fit to**, Excel shrinks the printed image or expands it up to 100 percent, as necessary. To see the how much the image will be adjusted for your new values, click **OK**, and then click **Page Setup** on the **File** menu. The **Adjust to** box on the **Page** tab shows the percentage that the printed size will be adjusted.

<u>Print row and column labels on every page</u>

1. Click the worksheet.

2. On the **File** menu, click **Page Setup**, and then click the **Sheet** tab.

3. To repeat column labels on every page, click **Rows to repeat at top**, and then enter the rows that contain the column labels.

   To repeat row labels on every page, click **Columns to repeat at left**, and then enter the columns that contain the row labels.

Note   Microsoft Excel prints repeating row and column labels only on the pages that include the labeled rows or columns. Pages for rows below the labeled rows or columns to the right of the labeled columns are printed without the repeating labels.