

5 MORE ON THE USE OF THE SPREADSHEET

Making changes to existing spreadsheets

LEARNING OUTCOMES

In Lesson 4 you created a grade sheet for a class of 4th graders based on a template you had put together at the beginning of the same lesson. You learned that you can easily adapt a template for use with other classes that you might teach. You learned also about the organization of spreadsheets, about rows and columns, and the cells at the intersection of those rows and columns. You learned how to select cells and how to address cells using row and column coordinates. You learned how to enter formulas into certain cells in order to have *Excel* do calculations for you—totals and percentages in particular.

You filled the rows and columns with labels and grades. You had a first introduction to the idea that a spreadsheet can be a powerful tool for handling numeric data that requires mathematical or statistical processing.

In this tutorial you will have the opportunity to reinforce what you learned in Lesson 4. You also will learn how to maintain a spreadsheet. This you will do by making enhancements to the spreadsheet you created in Lesson 4.

You will also learn about some of the logical processing capabilities of spreadsheets, capabilities which enable you to give an "intelligent" flavor to the applications that you build. Specifically, you will learn about the following features of *Excel*.

- Updating an existing spreadsheet
- Making changes to the look of a spreadsheet
- Using the LOOKUP function
- Creating charts based on spreadsheet data
- Printing the updated spreadsheet
- Making a backup copy of your documents

A caveat before you begin: You'll find it easiest to use the tutorial if you follow the directions carefully. On computers there are always other ways of doing things, but if you wander off on your own be sure you know your way back!

5.1 GETTING STARTED

You're going to work with a Gradebook document very similar to the one you created in Lesson 4. If you completed Lesson 4, for the exercises that follow **DO NOT** USE the Gradebook Template or Grade 4 2016 spreadsheet that you created in that lesson. For the sake of uniformity, and to avoid confusion, you're going to use a Grade Book template and Grade Book spreadsheet specially prepared for use with this lesson.

As an exercise at the end of the tutorial you will have the opportunity to incorporate these changes into your own Gradebook documents (Grade4 2016 and Grades Template) which you created when you completed Lesson 4.

You are going to make some improvements to the layout of the Gradebook, after which you will learn about the LOOKUP function as an introduction to the logic capability of *Excel*. At the end of the lesson you will learn how to create and modify charts of various kinds.

Open Microsoft *Excel* then make sure the **USB drive** on which you have your **Work Files for Office 2016** folder is inserted into a USB port on your computer

You are going to update two documents:

- a grade book template (called *Grades Template*, which is stored in the *Templates* folder inside the *Miscellaneous Files* folder in your *Work Files for Office 2016* folder);
- and an actual grade book filled with data (this document has the name *Gradebook* and is stored in the *Other* folder also inside the *Miscellaneous Files* folder in your *Work Files for Office 2016* folder).

You will work on the Gradebook document first.

By now you should know the steps to open a document, so navigate to your **USB drive > Work Files for Office 2016 > Miscellaneous Files > Other Documents** folder and **Open** the **Gradebook** document

5.2 RECAPITULATION AND REINFORCEMENT

Lesson 4 has Tables of the most useful *Excel* spreadsheet commands. You might like to put a marker at the relevant pages (pp. 140-141) for easy reference while you follow along in this tutorial. Alternatively, you can use the chart that is included at the end of this text (*Office Shortcuts*).

The following sections give you an opportunity to refresh your memory of the basic spreadsheet skills you learned in Lesson 4.

Moving from cell to cell in the spreadsheet

In *Excel* spreadsheet terminology the cell that is selected (surrounded by a heavier border) is called the current (or active) cell.

Take a moment now to reacquaint yourself with the methods for changing the position of the currently active cell.

The **arrow keys** move the current cell to the adjacent cell left, right, above, or below the current cell—press all four of the arrow keys a few times, and watch how the current cell moves around

The **TAB key (forward)** and the **Shift-TAB command (back)** also move the cursor to the adjacent cell, but only in a **horizontal** (right or left) direction—try these two commands now.

The **RETURN/Enter key (down a cell)** and the **Shift-RETURN command (back up)** also move the cursor to the adjacent cell, but only in a **vertical** (up or down) direction—try these two commands now

Use the **horizontal and vertical scroll bars** when you want to move around the spreadsheet without changing the location of the current cell—try this, too

More cell selection commands

Selecting sets of cells in the spreadsheet

You occasionally may want to highlight all the cells in the spreadsheet—in order to change a font, font size, or overall cell background, for example. Here's how you do this.

Click in the **small box with a triangular shape** right above the **Row headings** and to the left of the **Column headings** (Fig. 5.1)

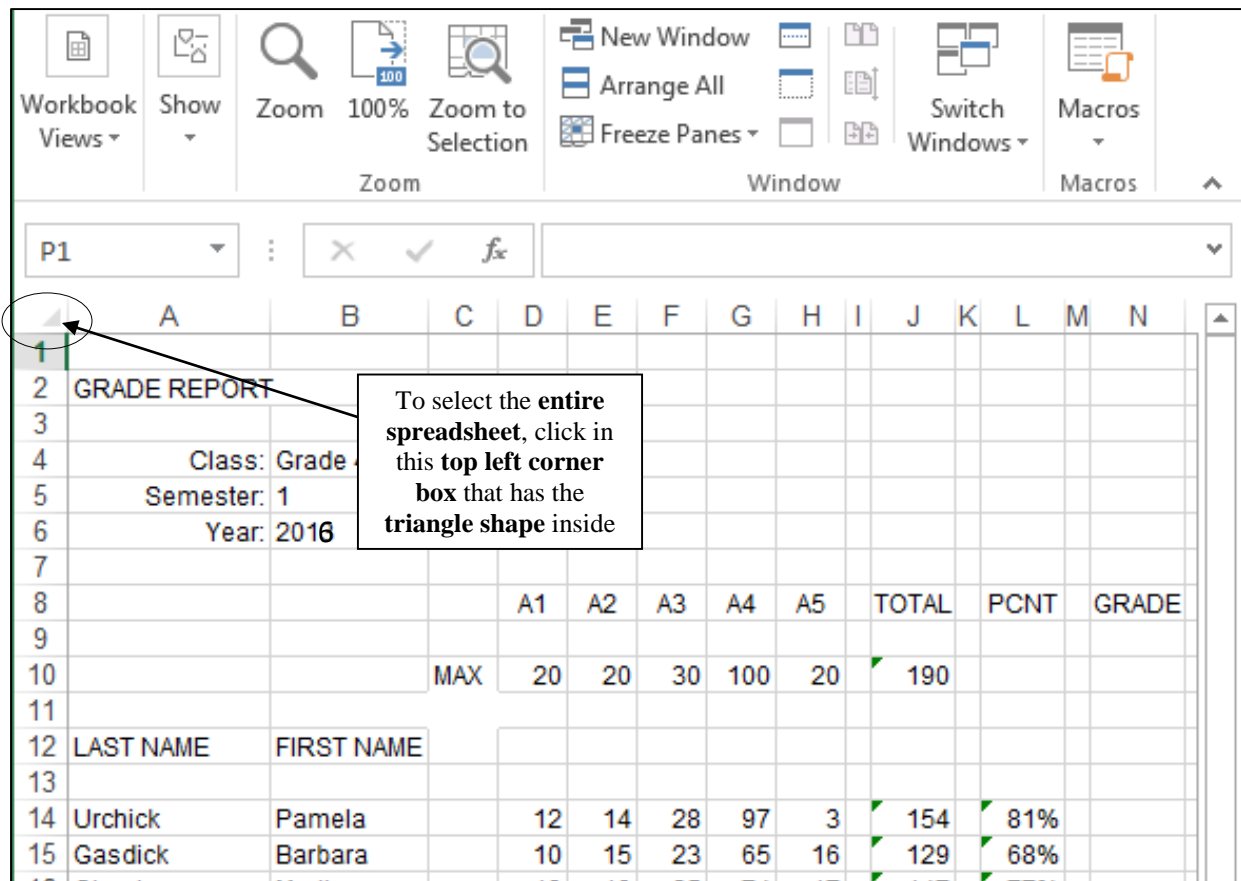


Fig. 5.1 Selecting an entire spreadsheet

The entire spreadsheet is now highlighted. However, perhaps you want to select only the cells that you're working in. There are a couple of ways to do this.

Click anywhere in the spreadsheet to **de-select** the selected cells and now use the mouse to drag diagonally down from cell **A1** to cell **N23**

That's one way. Here's another way of doing the same thing.

Click anywhere to **de-select** the selected cells, then click in cell **A1**, hold down the **Shift** key, and click in cell **N23**

The same set of cells is selected. The Shift key is very useful for selecting an especially large range of *cells* in *Excel*, or a range of *text* in *Word*, or even a range of *slides* in *PowerPoint*, which you'll learn about soon enough. Dragging with the mouse can get tedious and error prone when you have to select hundreds, or even maybe thousands, of adjacent cells, dozens of pages, or scores of slides. Whenever this is the case, click in the first cell of the set you want to select, then scroll to the last cell and, while holding down the Shift key, click in the last cell of the selected cells.

Going to a specific cell anywhere in your spreadsheet

If you are working in a large spreadsheet (consisting of thousands of cells, say) and you know the approximate coordinates of a cell you want to find, it is sometimes quicker to let *Excel* find the cell for you. For example, the following simple steps will show you how to make current (or selected) the cell that intersects Column AJ and Row 423, a location deep inside the spreadsheet and a long way from the first cell, cell A1.

From the **Home Ribbon > Editing Group > Find & Select** menu click on **Go To...** (or simply press **Ctrl+g**) to bring up the **Go To** dialog box (Fig. 5.2)

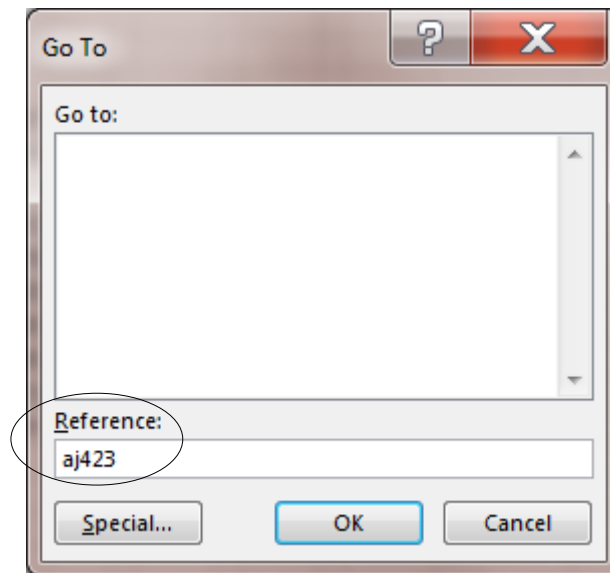


Fig. 5.2 The Go To dialog box

Type **AJ423** (you can use upper case (AJ) or lower case (aj) for the column coordinate), click on **OK**, then visually check that **cell AJ423** has been selected

Remember that the first (alphabetic) coordinate (AJ) is always the column; the second (numerical) coordinate is always the Row.

Press **Ctrl+g** again to bring up the **Go To** dialog box, type **A1**, and click on **OK**

You are now back at the first cell (A1) in the spreadsheet. Some of the options for moving about the spreadsheet are considerably slower than others, which is why you should take the time to familiarize yourself with *all* the different methods for moving around the spreadsheet, especially if you become a regular user of *Excel*.

5.3 UPDATING AN EXISTING SPREADSHEET

The Gradebook document would benefit from some cosmetic changes, such as the following.

1. There should be double lines to set off different parts of the spreadsheet. It is often useful, for example, to include extra space (but not too much space) between the headings above the columns of data and the data itself, and also before summary totals at the bottom of columns of data.
2. It would be useful to include more formulas to increase the information content of the spreadsheet. For example, you could add a formula that calculates an average for each of the sets of grades so that your students can see where they stand in relation to the rest of the class on any particular assignment or test. A highest score and lowest score for each set of grades would also be useful.
3. It would be a good idea to protect cells containing data that you consider especially important. Protecting cells prevents you or someone else from accidentally losing or changing cell contents. It takes time to put together spreadsheet templates and other documents. Some cells will contain functions that are tricky to figure out. Protecting them will make it difficult to lose your work.
4. Finally, *Excel* can do some of the thinking for you if you include a LOOKUP Table to figure out the grades for your students based on their percentage score at the end of a reporting period.

Let's deal with these problems one at a time. In this section you'll learn how to handle the first three improvements. Later in the lesson you'll have the opportunity to learn how to create and use the LOOKUP function.

Dividing up the spreadsheet to make it easier to read

After you have fixed change #1, the Gradebook document will look similar to Fig. 5.3.

The screenshot shows a spreadsheet titled 'GRADE REPORT'. It contains student data with columns for 'LAST NAME', 'FIRST NAME', and five test scores (A1-A5), along with 'TOTAL', 'PCNT', and 'GRADE'. A callout box on the left points to rows 13 and 24, with the text 'Narrow the height of Rows 13 and 24'. The spreadsheet is divided into sections by double lines: one between rows 11 and 12, and another between rows 23 and 24.

			A1	A2	A3	A4	A5	TOTAL	PCNT	GRADE
10		MAX	20	20	30	100	20	190		
12	LAST NAME	FIRST NAME								
14	Urchick	Pamela	12	14	28	97	3	154	81%	
15	Gasdick	Barbara	10	15	23	65	16	129	68%	
16	Giorgio	Marilyn	13	18	25	74	17	147	77%	
17	Mitnick	Teresa	16	15	20	32	15	98	52%	
18	Bond	Patrick	14	13	20	78	18	143	75%	
19	Dane	Stephanie	18	19	19	65	19	140	74%	
20	Bond	Andrew	15	16	21	85	16	153	81%	
21	Fraher	Brigid	18	17	26	95	20	176	93%	
22	Brown	Lyn	20	15	19	73	15	142	75%	
23	Potochar	Charlene	16	20	20	91	13	160	84%	

Fig. 5.3 Gradebook document after update #1

Breaks between sections of a spreadsheet help the eye locate important data when scanning the page, whether on screen or on paper. In *Excel*, the easiest way to do this is to use an extra row or column at the point where you want to create a division between different parts of the spreadsheet,

and then put a border along the edges of the empty row and also reduce the width of the inserted row or column so it appears as a double line (Fig. 5.3). Follow these steps to update the spreadsheet along these lines.

On the left edge of the screen, in **row 13**, click on the **row number (13)** to select the entire empty row

First you want to put a border around the set of cells in Row 13.

Right click on the **Row number 13** and, in the context menu, select **Format Cells...**, then in the **Format Cells** dialog box click on the **Border** tab, then click on the **Outline** tool (Fig. 5.4), and click **OK**

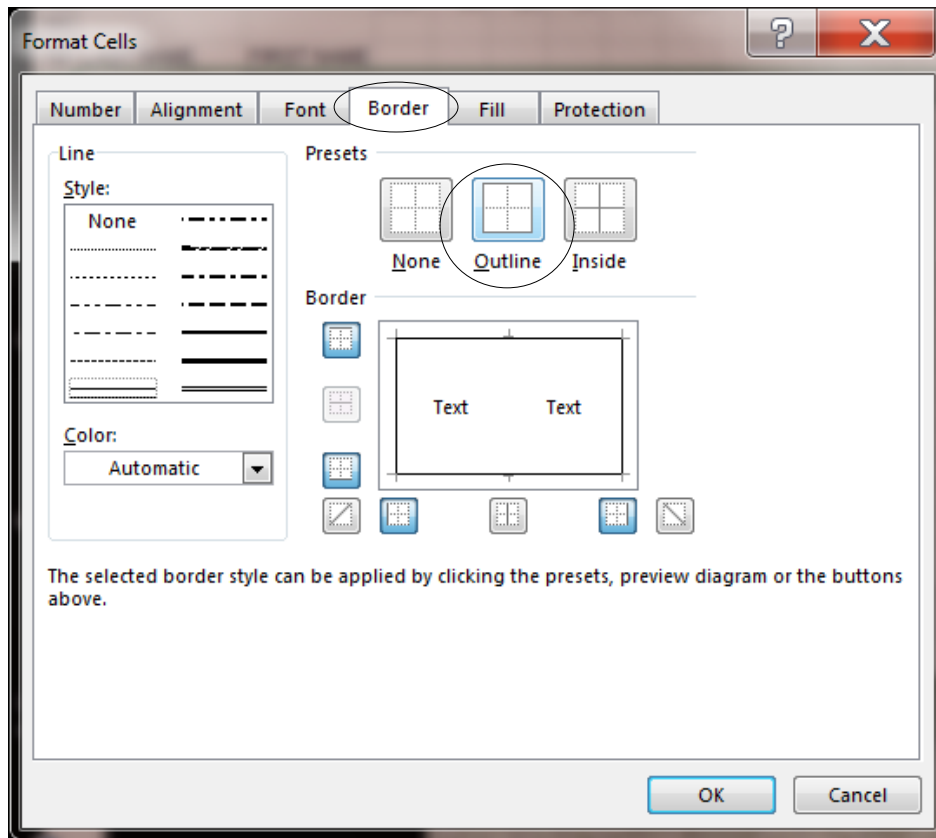


Fig. 5.4 Putting a border around a row of cells

Now you want to reduce the row height of Row 13 so that the whole row looks like a double line between Rows 12 and 14.

Again **right click** on the row number **13** and, in the context menu, select **Row Height...**, then in the **Row/Height** dialog box type the value **3** to replace the default height, and click **OK**

You need to create a similar dividing line after Row 23, which holds the data for the last student in the roster. This is because you are shortly going to include new formulas in Rows 25 thru 27.

Right click on the **Row number 24** and, in the context menu, select **Format Cells...**, then in the **Format Cells** dialog box click on the **Border** tab, then click on the **Outline** tool (Fig. 5.4 above), and click **OK**

Right click again on the row number **24** and, in the context menu, select **Row Height...**, then in the **Row/Height** dialog box type the value **3** to replace the default height, and click **OK**

Adding formulas to the spreadsheet

As you learned in Lesson 4, *Excel* comes with many built-in functions for the spreadsheet, divided into a dozen or more categories. Let's take a look at some of the built-in functions again now so that you know how to find them when you need them.

Start this exercise by clicking in cell **A1**, at the top left of the spreadsheet then, in the **Formulas Ribbon** > **Function Library** click on **Financial** and, in the **drop down menu**, check out the more than 50 functions available to you there

You'd have to be an accountant to want to use even half of these financial functions, but there are one or two that will prove useful for our Grade Book spreadsheet.

In the **Formulas Ribbon** > **Function Library** do the same with the **Logical**, **Text**, **Date & Time**, **Lookup & Reference**, **Math & Trig**, and, under **More Functions**, the **Statistical**, **Engineering**, **Cube**, and **Information**, **Compatibility** and **Web** sets of *Excel 2016* built-in Functions (Fig. 5.5)

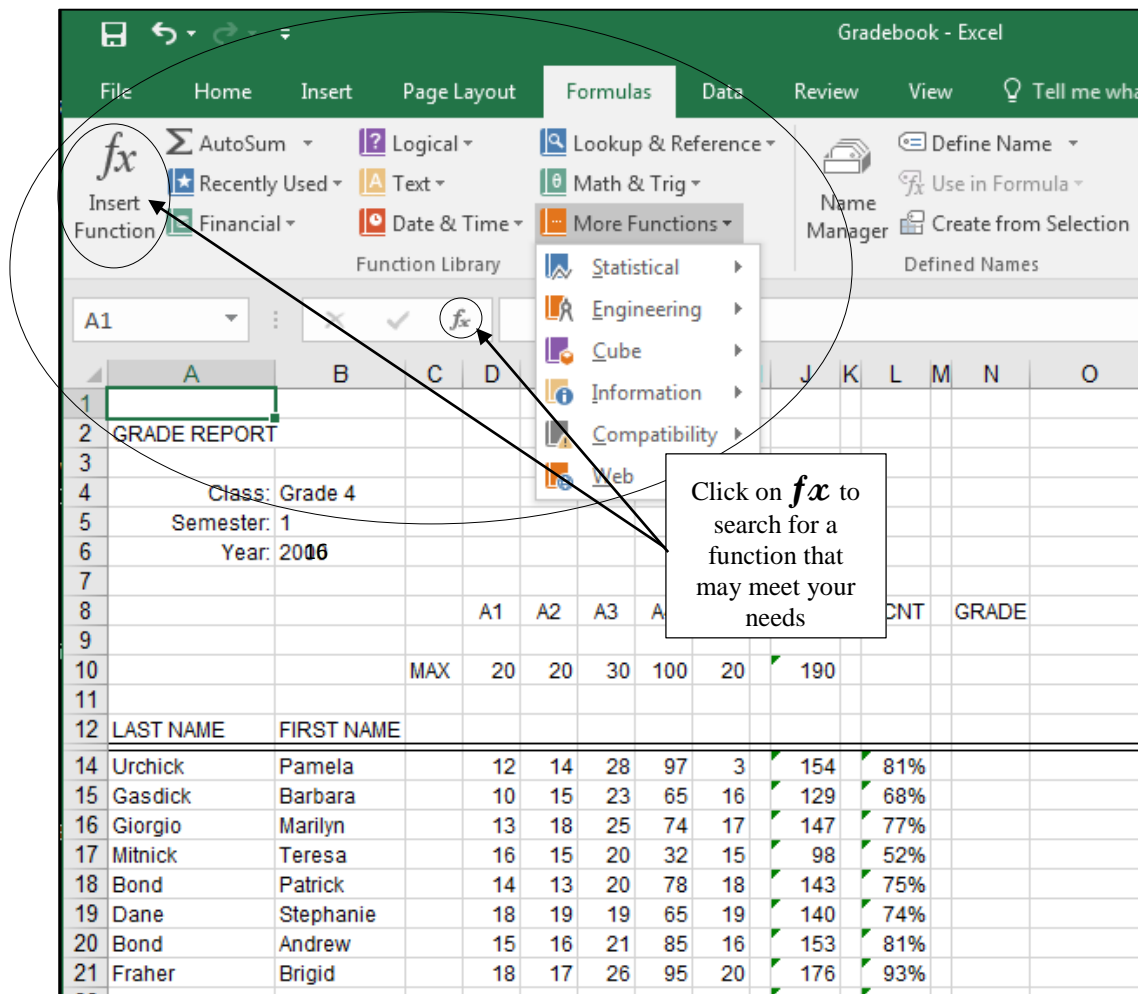


Fig. 5.5 The various sets of Functions in the *Excel* Function Library

With the cursor waiting in the **Entry bar** (Fig. 5.6), click on the **Insert Function (fx)** icon to take a look (by selecting a category and then scrolling) at the **complete set of Excel categories of logical/mathematical functions** that you can use

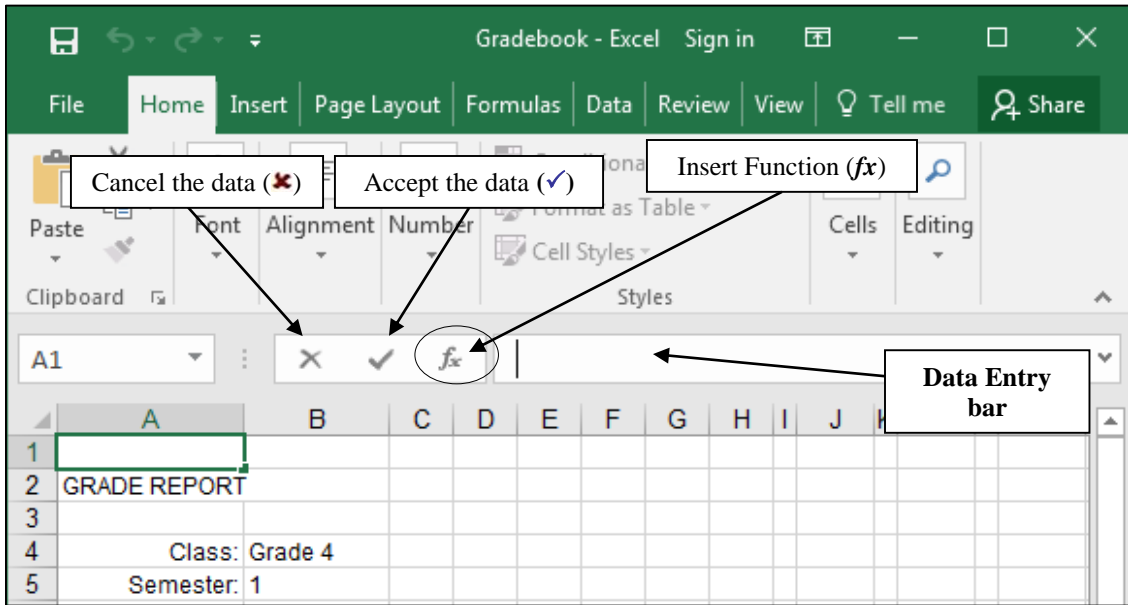


Fig. 5.6 The Insert Function (fx) icon

When you click on the **Insert Function (fx)** icon, *Excel* displays a dialog box showing a listing of functions, starting with the Financial category (Fig. 5.8).

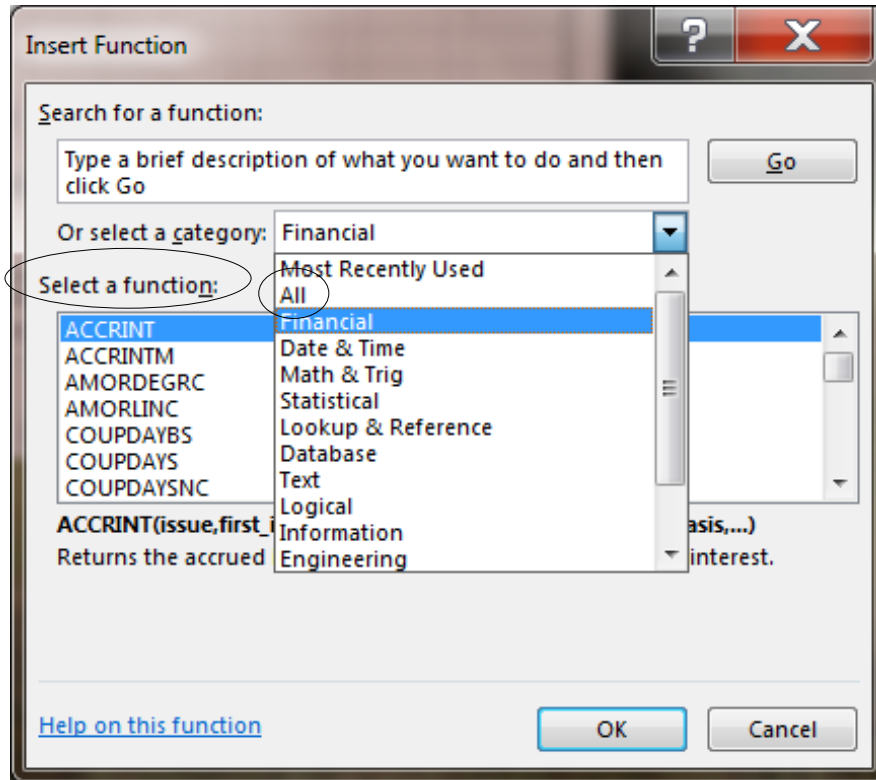


Fig. 5.8 The Insert Function dialog box

Click on the **down arrow** to drop down the **menu of categories** (Fig. 5.8 above), then select the **All** option in the menu (Fig. 5.8 above)

While you have the dialog box open, scan through the list of hundreds of built-in functions in the **Select a Function** scroll box

Depending on your math, computing, statistics, or accounting background, you might recognize many, some, a few, or maybe even none of these built-in Excel functions. If you're feeling overwhelmed, relax. Complete the exercises that follow and you'll start to get the hang of using functions such as this.

Click on the **Cancel** button to close the **Insert Function** dialog box

Experience is the best way to learn how some of these functions work. In Lesson 4 you already learned to use the *Sum* function, and also you created your own formula to calculate the *Percentage* for each student. Now let's see how to create a function to calculate the average score for a set of student scores.

Calculating an average for each of the grade columns

You are going to add three new functions to the Gradebook document: the *Average*, the *Max*, and the *Min* functions.

Let's start with the *Average* function. You want the value representing the average of the scores in each of columns D-H to appear in a cell in Row 25 at the bottom of those columns (Fig. 5.7).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2	GRADE REPORT													
3														
4	Class: Grade 4													
5	Semester: 1													
6	Year: 2016													
7														
8				A1	A2	A3	A4	A5	TOTAL	PCNT	GRADE			
9														
10			MAX	20	20	30	100	20	190					
11														
12	LAST NAME	FIRST NAME												
14	Urchick	Pamela		12	14	28	97	3	154	81%				
15	Gasdick	Barbara		10	15	23	65	16	129	68%				
16	Giorgio	Marilyn		13	18	25	74	17	147	77%				
17	Mitnick	Teresa		16	15	20	32	15	98	52%				
18	Bond	Patrick		14	13	20	78	18	143	75%				
19	Dane	Stephanie		18	19	19	65	19	140	74%				
20	Bond	Andrew		15	16	21	85	16	153	81%				
21	Fraher	Brigid		18	17	26	95	20	176	93%				
22	Brown	Lyn		20	15	19	73	15	142	75%				
23	Potochar	Charlene		16	20	20	91	13	160	84%				
25		Average		15.2	16.2	22.1	75.5	15.2						

Fig. 5.7 Average scores for each column

Notice in Fig. 5.7 that the first cell after the names in the column of first names has the row label *Average*. You need to put that cell entry in your Gradebook document.

Select cell **B25**, type the label **Average**, and press **Tab twice** to move to cell **D25**

A word about automatic calculation

When **Automatic Calculation** is switched on, *Excel* immediately updates any calculations when you make any changes to the data in the spreadsheet. With automatic calculation, you don't have to remember to do this yourself. Whenever your spreadsheet is small (like the Gradebook document) you will hardly be aware that *Excel* is working for you like this. If Automatic Calculation is not already on by default, it will be good to turn it on, so here's how you do it.

In the **Formulas Ribbon > Calculation Group** select **Calculation Options**, then, in the **drop down menu**, make sure the option for **Automatic Calculation** is checked (Fig. 5.8)

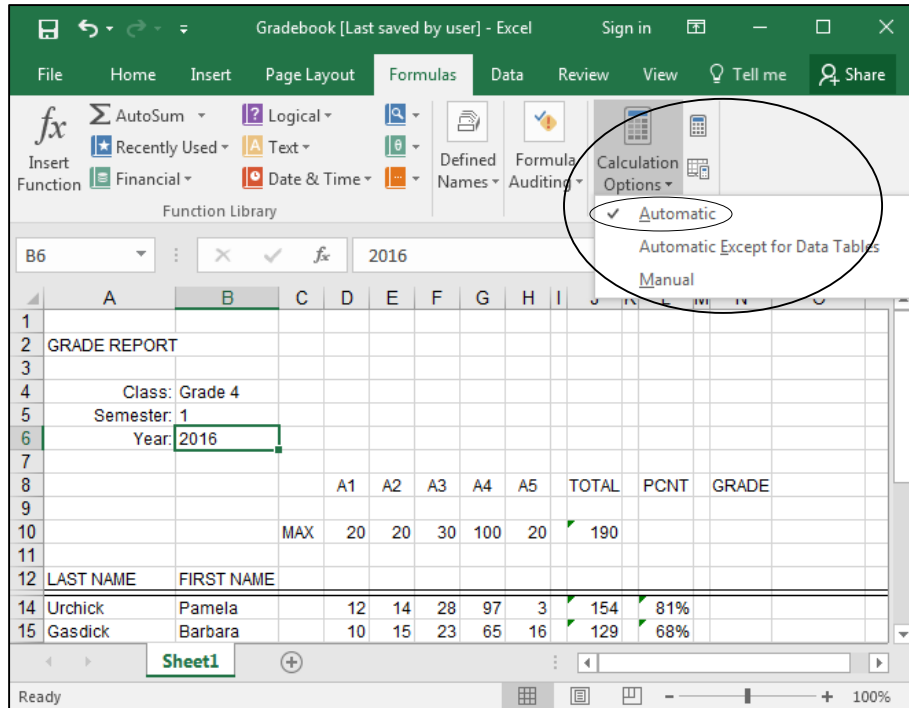


Fig. 5.8 Automatic Calculation

Back to the task at hand

An average is computed by adding (SUMming) the set of scores for an assignment or test, and then dividing the total by the number of scores in the set. You *could* put together this formula yourself, of course. If you know what the formula would be for the first column of scores, write it in the box below. Remember, a function or formula always begins with the equals (=) sign.

Check the footnote below to see if you got the answer right.¹ But since *Excel* has a built in Average function, you may as well use it. Here are the steps to include the Average function in your spreadsheet.

Make sure cell **D25** is still selected (the cell under the first column of scores)

¹ What you wrote should look something like this: =SUM(D14:D23)/10.

Click on the **Insert Function (fx)** icon in the **data entry** bar to bring up the **Insert Function dialog box**, then, from the list of **Categories**, select the **Statistical** category (Fig. 5.9)

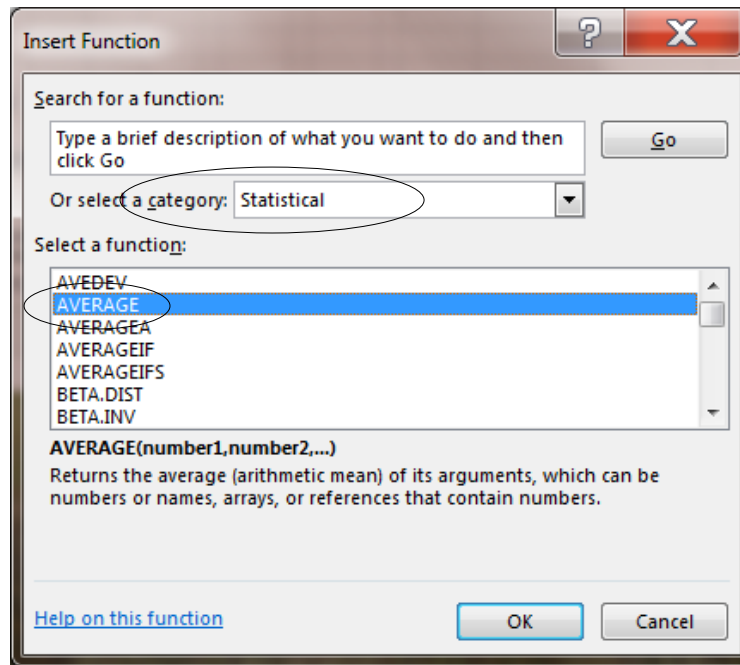


Fig. 5.9 The Insert Function dialog box showing the Statistical category of Functions
From the list of **Statistical functions**, click on the **AVERAGE** function to select it, then click **OK**

Excel pastes the function into the data entry bar and automatically selects the cells in the column above the cell in which you want to put the Average function. It also presents a new dialog box (Fig. 5.10) in which you can indicate the specific range of cells you want included in the function if they differ from the range selected automatically by *Excel*.

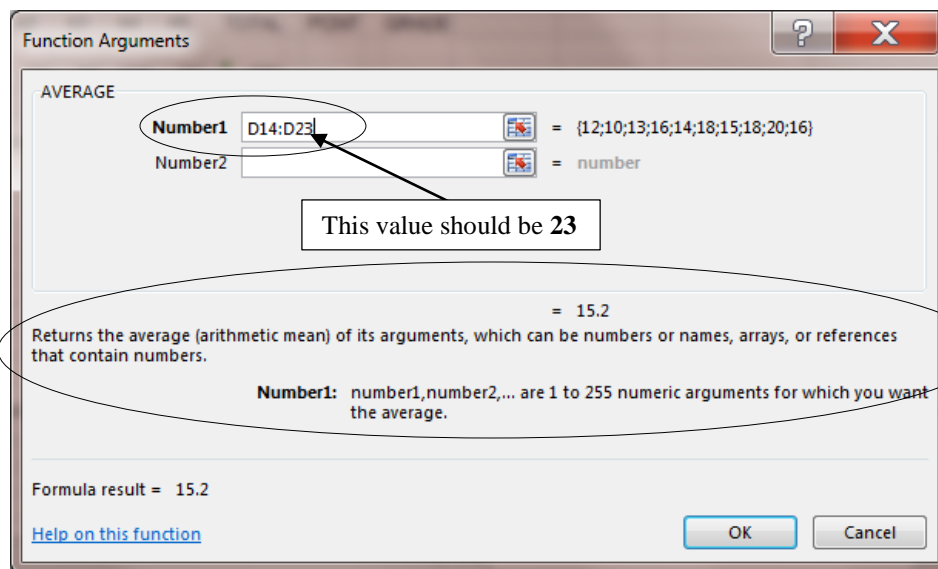


Fig. 5.10 The Function Arguments dialog box

In the **Number1** box the set described by default is **D14:D24**, but it should be **D14:D23**, so change the value from 24 to **23**

The *Function Arguments* dialog box automatically selects the set of cells immediately above the cell which contains the new formula. It also explains what the *Average* function does, and asks you to confirm the formula by clicking OK.

The formula in the Data Entry bar towards the top of the spreadsheet window should read =AVERAGE(D14:D23). Is this the exact wording of the formula in the data entry box on your spreadsheet?

If it is, click **OK**; if it is not, correct it, then click **OK**

Now look at cell **D25**. It should contain the average for the scores in Column D. At this stage there are three problems that can occur:

1. If you see a series of pound signs (#####...), this indicates that there's not enough room in the column to show the value, so you need to *widen* the column a little to make enough space for the average score to appear. If this is the case (where you see ##### instead of an average score), make the column wider. You learned how to change the width of rows and columns in Lesson 4 and again in this Lesson in Section 5.3.
2. If a Bad Formula prompt pops up on the screen, check the formula in the entry bar again, compare it to the correct Average formula =AVERAGE(D14:D23), and make any corrections.
3. It is always possible that the values being averaged yields a result that turns out to be a whole number (no fractions). But it would be useful to show at least one decimal place, regardless of the outcome of the Average calculation. If the average displayed in your Gradebook is rounded to a whole number (no decimal places), here are the steps to change the precision of the Average value to 1 decimal place.

Right click on cell D25 and, in the **context menu**, select **Format Cells...**

This brings up the Format Cells dialog box (Fig. 5.11).

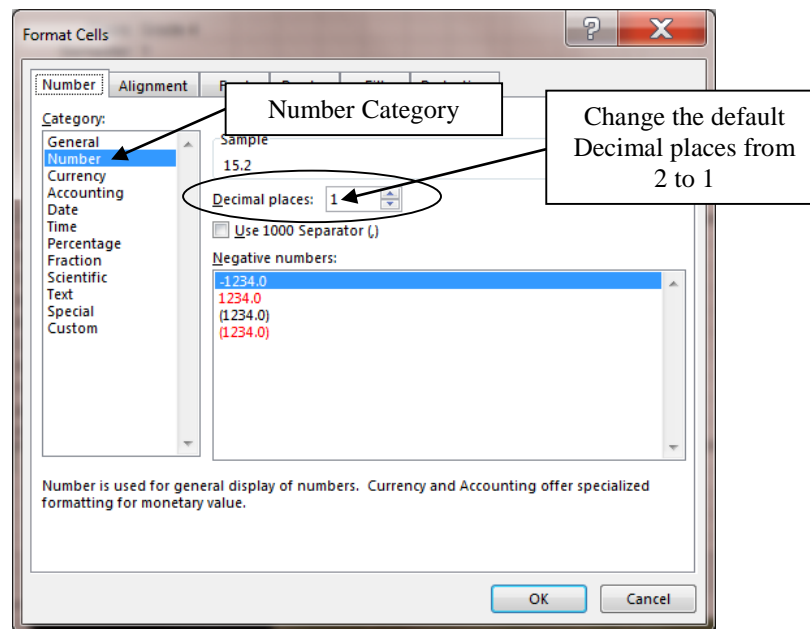


Fig. 5.11 Format Cells dialog box

In the **Format Cells** dialog box (Fig. 5.11 above) select the **Number** category, and set the number of **Decimal places** (also called **precision**) to **1**, then click on **OK**

Assuming all is well, your next task will be to copy this Average formula into the cells immediately to the right of cell D25, so that you have an average score under the other columns of scores (cells E25 through H25).

Cell **D25** should still be selected (click on it if it is not selected)

Fig. 5.12 shows you that you're going to use the mouse to grab hold of the handle in the lower right corner of cell **D25** (you practiced doing this in Lesson 4)

		A1	A2	A3	A4	A5	TOTAL	PCNT	GRADE
	MAX	20	20	30	100	20	190		
LAST NAME	FIRST NAME								
Urchick	Pamela	12	14	28	97	3	154	81%	
Gasdick	Barbara	10	15	23	65	16	129	68%	
Giorgio	Marilyn	13	18	25	74	17	147	77%	
Mitnick	Teresa	16	15	20	32	15	98	52%	
Bond	Patrick	14	13	20	78	18	143	75%	
Dane	Stephanie	18	19	19	65	19	140	74%	
Bond	Andrew	15	16	21	85	16	153	81%	
Fraher	Brigid	18	17	26	95	20	176	93%	
Brown	Lyn	20	15	19	73	15	142	75%	
Potochar	Charlene	16	20						%
	Average	15.2	16.2						

Drag this handle **to the right** to copy the cell's formula into cells **E25-H25**

Fig. 5.12 Cell copy handle

Use the mouse to point at the **handle** in the **lower right** corner of cell **D25** (Fig. 5.12 above), and drag the handle across to **Column H**—so that the formula is copied across to cells **E25, F25, G25, and H25**, which will all now have the correct Average score for their respective columns

That's all there is to it. If necessary (though it shouldn't be the case with this exercise) increase the column widths if you see pound signs (####) in any cell where you should see average scores.

Time to save your work (**Ctrl+s**)

Displaying the Highest (MAX) and Lowest (MIN) scores for each column of scores

Now that you know how to use the Insert Function icon (*fx*) next to the Data Entry bar, and in particular since you just used it to put the Average function in your spreadsheet, you should be able to complete the exercise that follows without much help.

In cell **B26** put the heading **Max score** and in cell **B27** put the heading **Min score**

Click to select cell **D26**, then in the **Insert Function** dialog box > **Statistical** category, scroll to select **Max**—this function is used to find the *highest* score for each set of scores (in this case in column D)

If necessary, grab hold of the **Function Arguments dialog box** and slide it **out of the way** so that you can see **cell D26** in the spreadsheet

With **cell D26** still selected, **drag down** with the mouse to select cells **D14 through D23**—the cells you want included as arguments in the Max function (**D14:D23**), and click **OK**

Now you need to copy the MAX Function across to the other cells in rows 26.

With **cell D26** still selected, grab hold of the **handle** in the **lower right corner** of the cell and **drag across** with the mouse to select cells **E26 through H26**—the cells in which you want to include the **Max** function, and click **OK**

Click to select cell **D27**, then in the **Insert Function** dialog box > **Statistical** category, scroll to select **Min**—this function is used to find the *lowest* score for each set of scores

With **cell D27** still selected, **drag down** with the mouse to select cells **D14 through D23**—the cells you want included as arguments in the Min function (**D14:D23**), and click **OK**

Now you need to copy the MIN Function across to the other cells in rows 27.

With **cell D27** still selected, grab hold of the **handle** in the **lower right corner** of the cell and **drag across** with the mouse to select cells **E27 through H27**—the cells in which you want to include the **Min** function, and click **OK**

When you're done, your spreadsheet should resemble Fig. 5.13.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
2	GRADE REPORT													
3														
4	Class: Grade 4													
5	Semester: 1													
6	Year: 2016													
7														
8				A1	A2	A3	A4	A5	TOTAL	PCNT	GRADE			
9														
10			MAX	20	20	30	100	20	190					
11														
12	LAST NAME	FIRST NAME												
14	Urchick	Pamela		12	14	28	97	3	154	81%				
15	Gasdick	Barbara		10	15	23	65	16	129	68%				
16	Giorgio	Marilyn		13	18	25	74	17	147	77%				
17	Mitnick	Teresa		16	15	20	32	15	98	52%				
18	Bond	Patrick		14	13	20	78	18	143	75%				
19	Dane	Stephanie		18	19	19	65	19	140	74%				
20	Bond	Andrew		15	16	21	85	16	153	81%				
21	Fraher	Brigid		18	17	26	95	20	176	93%				
22	Brown	Lyn		20	15	19	73	15	142	75%				
23	Potochar	Charlene		16	20	20	91	13	160	84%				
25		Average		15.2	16.2	22.1	75.5	15.2						
26		Max		20	20	28	97	20						
27		Min		10	13	19	32	3						

Fig. 5.13 The Gradebook document after adding the functions (your data will be different)

Protecting important cells

Excel allows you to protect the contents of a cell or cells. This means that neither you nor anyone else will be able to change the contents unless you remove the protection. This feature is useful to prevent accidental loss of data, and will also help prevent others from interfering with the data you have collected. This is especially important when you might be sharing a spreadsheet with colleagues and you don't want them messing with the data you've so carefully gathered together.

Since all the data in a Grade book are important, it would be a good idea to protect everything. The process to do this is the same as if you were protecting a single cell, or a few cells, except that you select every cell.

Click on the **triangle shape** in the **top left corner** to **Select All** the cells in the spreadsheet (Fig. 5.14)

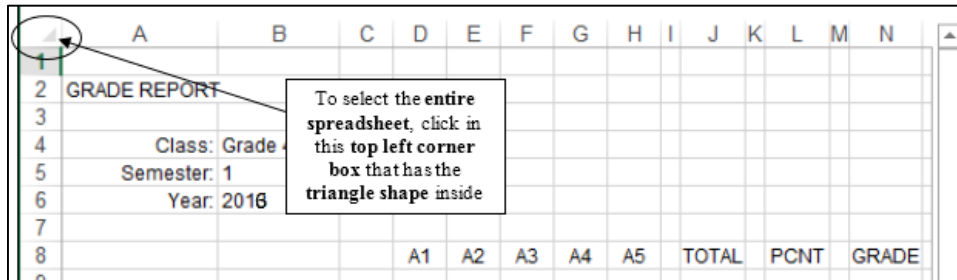


Fig. 5.14 selecting all the cells in the spreadsheet

From the **Home Ribbon > Cells Group** select **Format** and, in the **Protection Section** towards the bottom of the **Format Menu**, click on **Protect Sheet...**

This brings up the Protect Sheet dialog box (Fig. 5.15).

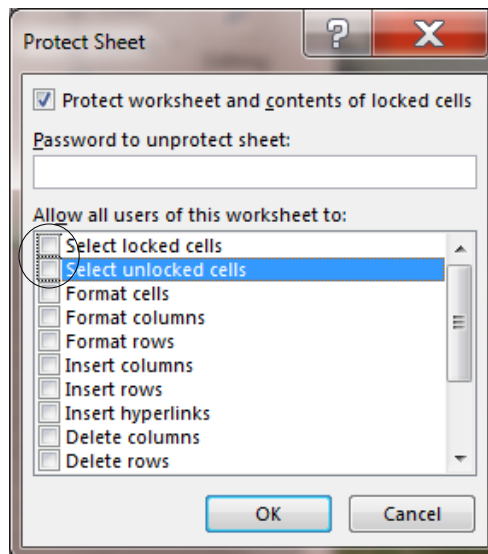


Fig. 5.15 Protect Sheet dialog box

In the Protect Sheet dialog box (Fig. 5.15 above) you need to remove the *check marks* next to *Select locked cells* and *Select unlocked cells*. You don't want any users changing anything at all.

So, if necessary, click to **remove** the **check mark** next to **Select locked cells** and **Select unlocked cells**, then click on **OK**

Notice now that even if you try to click on a cell, the system won't let you. Every cell in the spreadsheet is protected against attack.

Of course, someone who knows how to use *Excel* will know how to unlock the protection—unless it's protected by a password. So if you really want to prevent someone else from interfering with the data in the spreadsheet, you may need to take advantage of the option to include a password.

Passwords provide protection against unauthorized access. You should choose a password that would be difficult to guess, of course, but also one that you would be sure to remember! The weirder, the less guessable, the password the better. It should include upper and lower case letters as well as numbers and special characters such as the @ symbol or whatever. Remember, the weirder your password, the better—as long as you can remember it.

However, having said that, there's no need to use a password in this exercise—unless you want to, of course. Just make sure you remember the password you decide on so that you can unprotect the worksheet when you need to make changes.

Click on **OK** in the **Protect Sheet** dialog box

Now all the cells in the Gradebook spreadsheet are unable to be changed unless you select *Unprotect Sheet* from the Format Cells... menu. If you wanted to lock just certain cells you would first select the cell or cells and turn on the Protection tool for just that cell or those cells.

Time to **Save** the changes to your **Gradebook** document (**Ctrl+s**)

Using Split Screen to divide the spreadsheet into panes

Often a spreadsheet, or an *Office Word 2016* document for that matter, will be too long or too wide to view all at once on the screen. For this purpose, *Excel* has a feature called *panes* (Fig. 5.16).

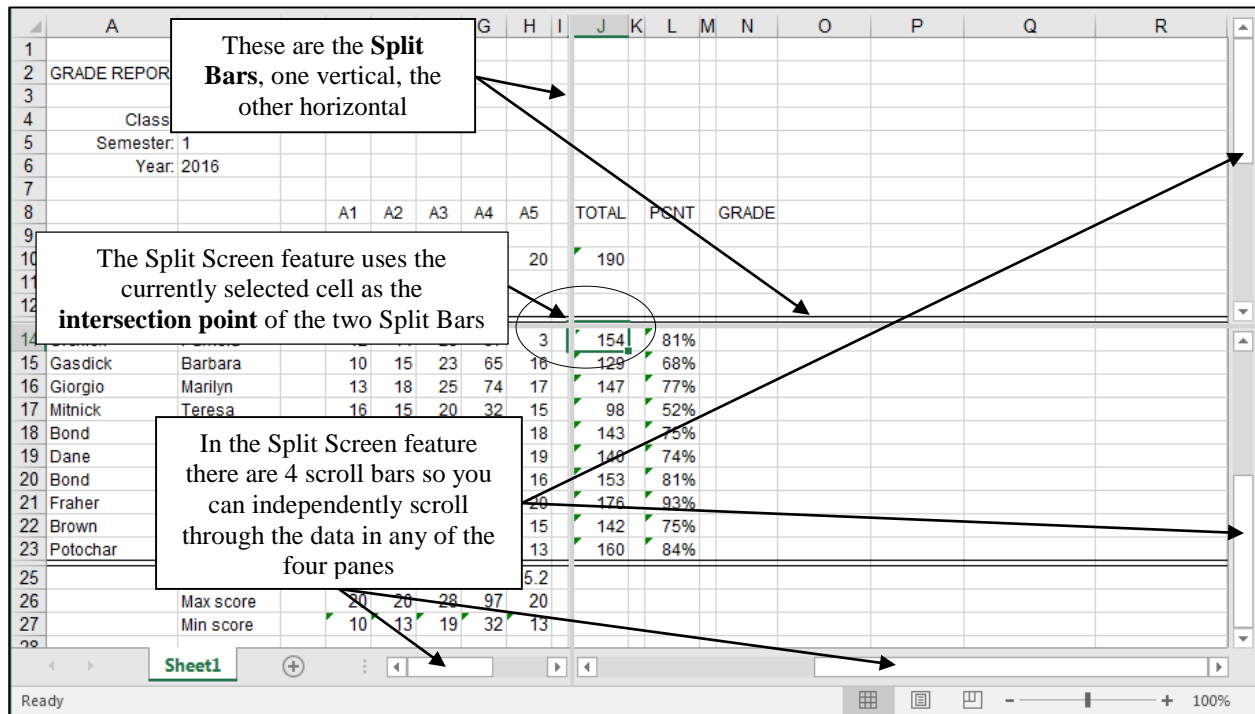


Fig. 5.16 *Excel's* vertical and horizontal Split Bars divide the spreadsheet into panes

You can split any window horizontally or vertically into sections (or Panes—like window panes). This allows you, while working or scrolling in one section, to keep other section(s) fixed in place. This applies whether the spreadsheet is protected or not.

To see how this works, click in the **View Ribbon > Window Group** select **Split**

Excel immediately divides up the worksheet into four sections, using a vertical and a horizontal split bar (Fig. 5.16 previous page). The split bars are grey so intentionally not too obvious, especially with other cell lines all over the place; but look carefully and you'll see them well enough.

The vertical and horizontal split occurs at the point in the spreadsheet where you have a cell selected. You can change the position of the split bars by positioning the mouse arrow on a split bar and dragging across or down the screen. Try this for practice

Position the mouse arrow on either the **vertical** or **horizontal split bar** (you'll get a **cross-hair cursor**) and drag across or down the screen

Now grab each of the **scroll bars** and check out the data in the four panes

Notice how easy it is to compare different parts of a spreadsheet in this way. The Split screen feature is available in *Word*, too, but you probably will find that you use it most frequently while working with spreadsheets, especially large ones.

Removing panes

This is easy enough to do.

In the **View Ribbon > Window Group** select **Split** again to turn off this option

Your spreadsheet should now be restored to its original format.

5.4 MAKING MORE CHANGES TO THE LOOK OF THE SPREADSHEET

In Lesson 4 you learned how to change the width of columns and the height of rows. You also practiced doing this earlier in this lesson. Now you are going to learn how to put borders around selected cells and how to remove the grid lines and Column and Row headings.

Putting a border around a cell or set of cells

Before you can make any changes, you need to Unprotect the worksheet. Let's do that before proceeding with the tutorial.

From the **Home Ribbon > Cells Group** select **Format** and, in the **Protection Section** towards the bottom of the **Format Menu**, select the option to **Unprotect Sheet...**

Now let's make some more changes to the Gradebook document. For example, you may want to put a box around certain sections of your spreadsheet, such as the Class info in cells A4 through B6. This will make the information stand out in a report. Try this now.

Drag across the six cells **A4 through B6** to select the set of **Class info**

In the **Home Ribbon > Font Group** click on the arrow next to the **Border** tool to show the menu of border options (Fig. 5.17)

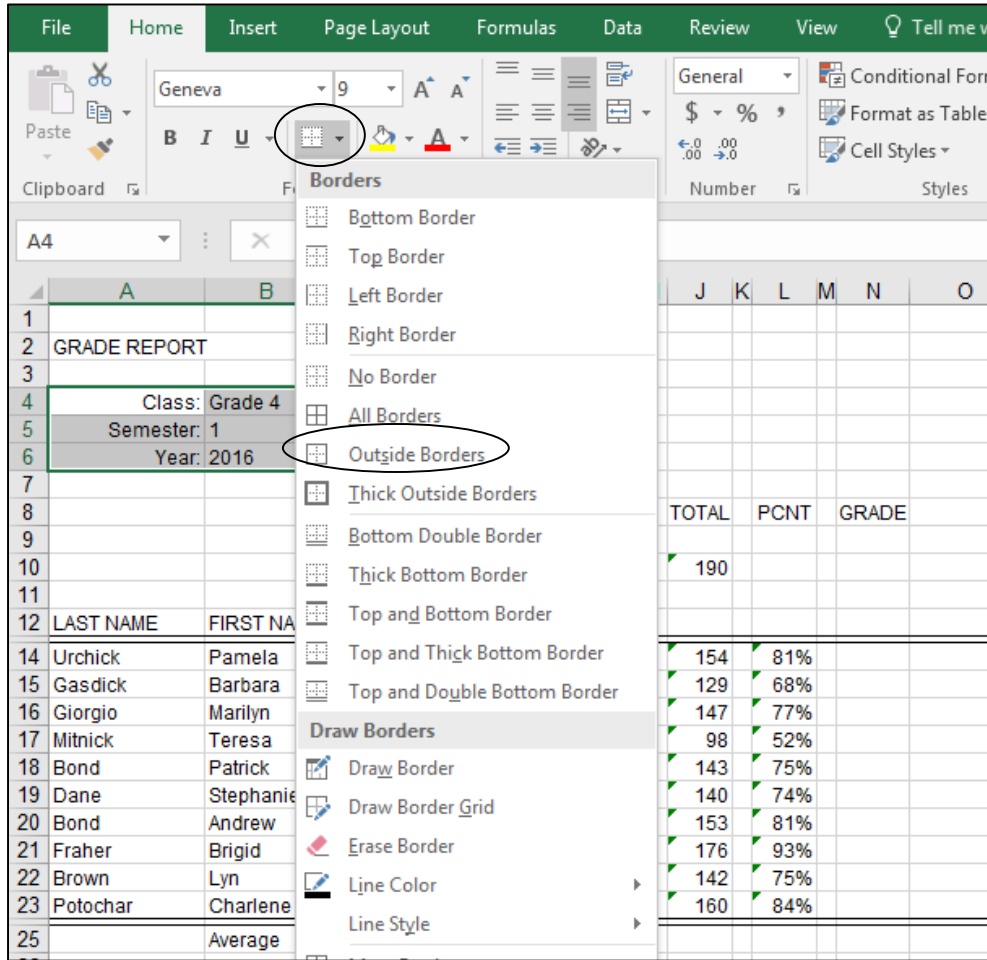


Fig. 5.17 Excel's Borders options for cells or groups of cells

As you can see, the Borders menu gives you various options.

In the menu, click on the **Outline Borders** option and click on **OK**

The Class Info now has a border around it, setting it off from the rest of the data in the document (Fig. 5.18).

	A	B	C	D
1				
2	GRADE REPORT			
3				
4	Class: Grade 4			
5	Semester: 1			
6	Year: 2016			
7				
8				A1
9				
10			MAX	20
11				

Fig. 5.18 Spreadsheet cell with border

Removing grid lines and column and row headings

Grid lines and column and row headings are essential when developing a spreadsheet or when one is updating the data. But for reporting purposes it may look better, perhaps even easier to read, if they are removed. You may recall doing this in Lesson 4. Try this again now for reinforcement.

In the **View Ribbon > Show Group** remove the **check mark** from the box next to **Gridlines** and the box next to **Headings**

The spreadsheet now looks quite different, as you can see (Fig. 5.19).

GRADE REPORT									
Class: Grade 4 Semester: 1 Year: 2016									
		A1	A2	A3	A4	A5	TOTAL	PCNT	GRADE
MAX		20	20	30	100	20	190		
LAST NAME	FIRST NAME								
Urchick	Pamela	12	14	28	97	3	154	81%	
Gasdick	Barbara	10	15	23	65	16	129	68%	
Giorgio	Marilyn	13	18	25	74	17	147	77%	
Mitnick	Teresa	16	15	20	32	15	98	52%	
Bond	Patrick	14	13	20	78	18	143	75%	
Dane	Stephanie	18	19	19	65	19	140	74%	
Bond	Andrew	15	16	21	85	16	153	81%	
Fraher	Brigid	18	17	26	95	20	176	93%	
Brown	Lyn	20	15	19	73	15	142	75%	
Potochar	Charlene	16	20	20	91	13	160	84%	
Average		15.2	16.2	22.1	75.5	15.2			
Max score		20	20	28	97	20			
Min score		10	13	19	32	13			

Fig. 5.19 Removing gridlines and column & row headings from a spreadsheet

For the next exercise, however, it will be best to have the Gridlines and Headers showing in the Gradebook document.

In the **View Ribbon > Show Group** put back the **check mark** in the box next to **Gridlines** and the box next to **Headings**

Updating the Grades Template spreadsheet

You are now going to make the same changes to the Grades template that you just made to the Gradebook document. To do this, it will be easiest if you have both spreadsheets side-by-side on your screen.

Click on **File > Open**, then navigate to your **USB drive > Work Files for Office 2016 > Miscellaneous Files > Templates** folder and open the **Grades Template** document

Now you should have both the Gradebook document and the Gradebook Template document open on your screen. But for the next exercise, you need to arrange the spreadsheets side-by-side.

In the **View Ribbon > Window Group**, click on the tool to **Arrange All**, then, in the **Arrange Windows** dialog box, click on the **radio button** next **Vertical** (Fig. 5.20), then click on **OK**

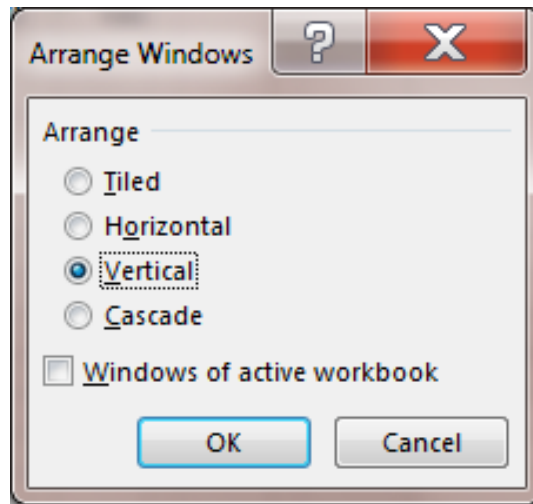


Fig. 5.20 The Arrange Windows dialog box

Now you can see both spreadsheets side by side on your screen, as illustrated in Fig. 5.21

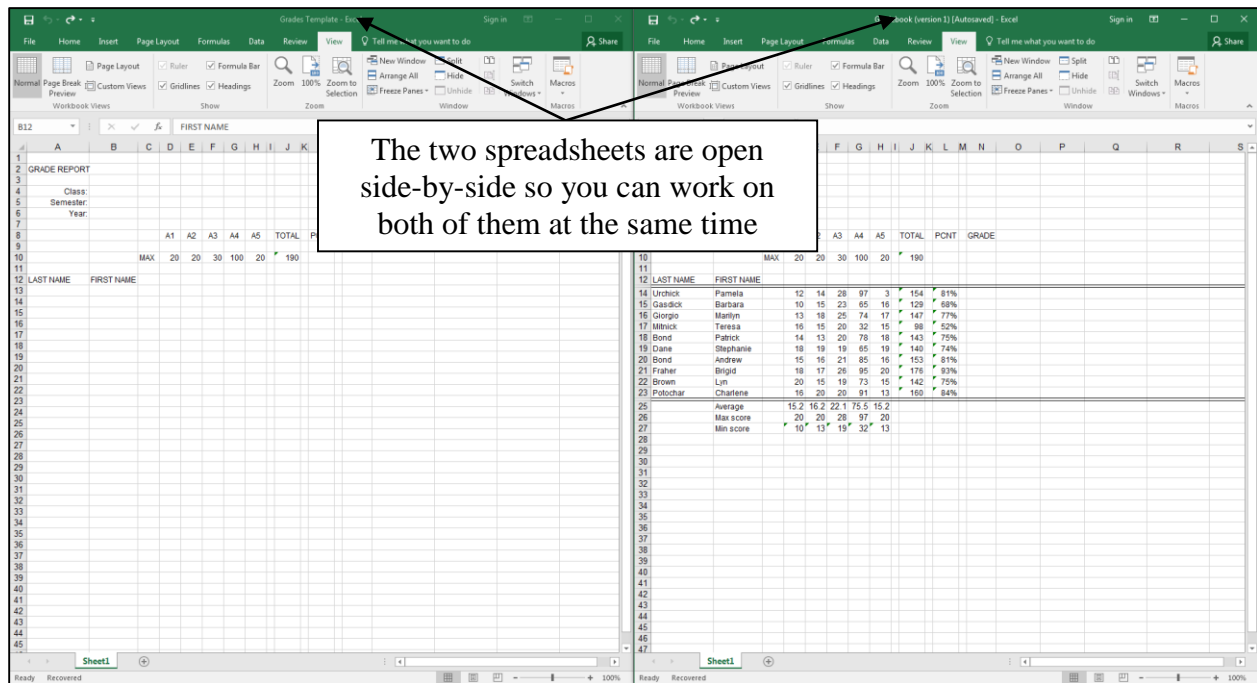


Fig. 5.21 Worksheets arranged side-by-side

What you're going to do now is update the *Grades Template* spreadsheet with the same format and functions as the *Gradebook* spreadsheet, so that you can use the template with other classes you may have in the future.

Hint: Use *Copy* and *Paste* to complete many of the tasks. DON'T transfer any of the *actual student data* from the *Gradebook* to the *Grades Template*—transfer *only* the functions and other formatting features you added to the *Gradebook* document.

Fig. 5.22 illustrates what you need to do—read the directions carefully before you proceed.

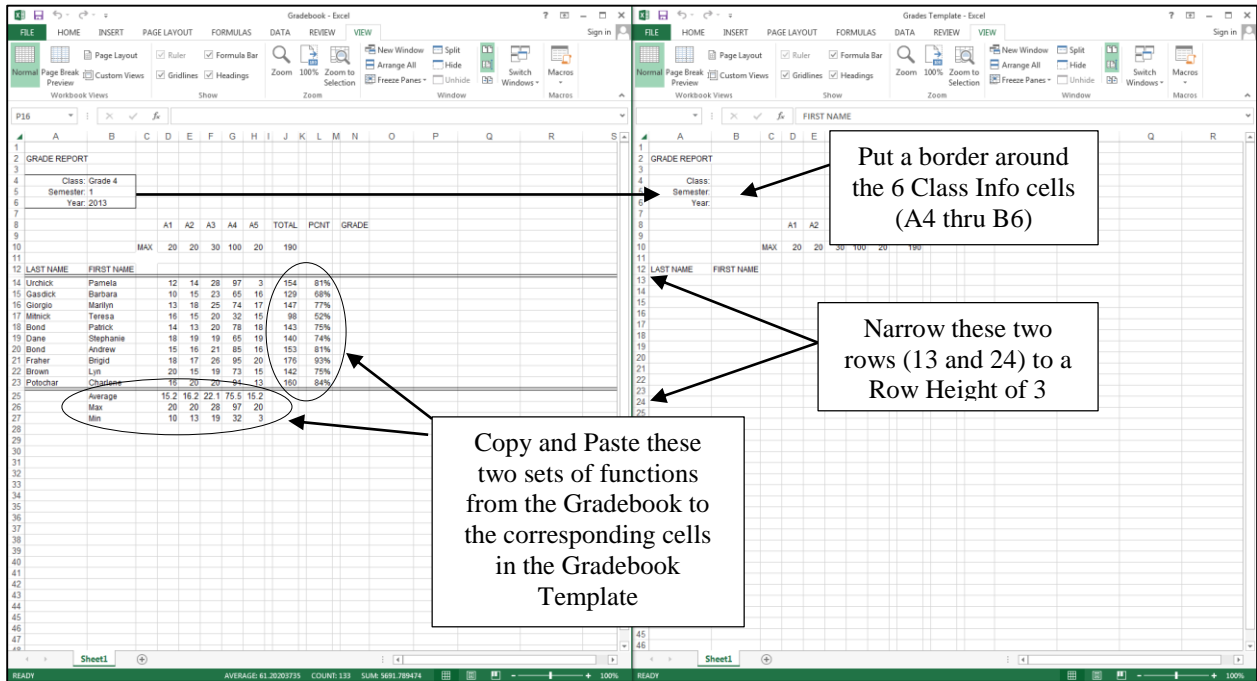


Fig. 5.22 Making updates to the Template

Go ahead now and update the **Grades Template** by putting a **box** around the **6 Class info** cells (A4 thru B6), then **Copy and Paste** the **TOTAL** and **PERCENT** formulas (ignore the “#####” signs in row 25)

When you are done, your Gradebook Template spreadsheet will look like Fig. 5.23.

2	GRADE REPORT										
3											
4	Class:										
5	Semester:										
6	Year:										
7											
8			A1	A2	A3	A4	A5	TOTAL	PCNT	GRADE	
9											
10			MAX	20	20	30	100	20	190		
11											
12	LAST NAME	FIRST NAME									
13											
14								0	0%		
15								0	0%		
16								0	0%		
17								0	0%		
18								0	0%		
19								0	0%		
20								0	0%		
21								0	0%		
22								0	0%		
23								0	0%		
24											
25	Average		#####	#####	#####	#####	#####	#####			
26	Max		0	0	0	0	0	0			
27	Min		0	0	0	0	0	0			
28											

Fig. 5.23 Gradebook Template spreadsheet after updates

Save the **Grades Template** when you have finished making the changes

Your next task is to once again protect the cells in the Gradebook spreadsheet. First you must make the Gradebook the active document on the screen.

In the **View Ribbon > Window Group**, click on the tool to **Switch Windows** and select the document **Gradebook** so as to make this the current spreadsheet on the Desktop

Now you can go ahead and protect the Gradebook spreadsheet.

Click in any empty cell to the **right** or **below** the area where any student data appears in the Gradebook spreadsheet (**cell A30, for example**), then press **Ctrl+a** to **Select All** the cells in the spreadsheet (this is the quickest way to select all the cells in the spreadsheet, but you can also click on the small **triangle shape** in the small box **top left** of the row and column headings)

From the **Home Ribbon > Cells Group** select **Format** and, in the **Protection Section** towards the bottom of the **Format Menu**, select the option to **Protect Sheet...**

In the **Protect Sheet dialog box** that pops up, remove any check marks that might be in the list of items users are allowed to do, click on **OK**, then **Save** your work

It might be a good idea to take a break at this point in the tutorial. In the next section, you'll learn about the *Excel* Lookup function. The spreadsheet Lookup function is a little tricky to understand, so stand up, step back from the keyboard for a while and stretch some of those muscles that are stiff from sitting through the first part of this tutorial. When you are ready, proceed directly to the next section, Section 5.5, on the next page.

TIME FOR A BREAK?

FEEL FREE TO TAKE ONE...

THIS MIGHT BE ENOUGH FOR ONE DAY!

5.5 USING THE LOOKUP FUNCTION

The concept of the LOOKUP function

Take some time to read quietly through this section to understand how the LOOKUP function works.

The LOOKUP function is a simple logic tool that you can use to automatically assign grades to your students based on the numbers in the Percentage column of your spreadsheet (column L).

You are probably aware by now that if you have the automatic calculation option selected, *Excel* carries out function-based calculations as you make changes in a spreadsheet. Thus, once you have programmed *Excel* to LOOKUP the grades, the system will automatically update each student's Letter Grade, along with Totals and Percentages, even as you enter new scores for assignments, homework, tests, and so forth.

Thus, with no effort on your part, you will be able to keep students informed at any time during the semester as to exactly what grade they currently carry for the class.

Such information is invaluable. *Knowledge is power*. When a student is aware of an inadequate grade early on, extra effort can be applied to improve the situation before it is too late. It is surprising how often students are unaware of how they stand with regard to their progress through a course. The teacher who fails to provide adequate feedback when directing students in their pursuit of academic objectives deserves at least some of the blame if students do not progress as well as they should. When students are kept apprised at all times of where they stand, they tend to take more responsibility for the outcomes of their efforts—or lack of them.

Fig. 5.24 illustrates the LOOKUP Table that will be the outcome of this exercise.

Row headings →

O	P
Range (%)	Grade (A-E)
0%	E
60%	D
70%	C
80%	B
90%	A
100%	A

Fig. 5.24 LOOKUP table

You are going to tell *Excel* to compare a student's percentage score with the *range of values* in the first column of the table. These are control percentages. *Excel* will search through this first column, looking for the highest value (percentage) that is *less than or equal to* the student's percentage. Once that value is located in the first column, the function will assign the student the *letter grade* that is adjacent to it in the second column.

Does that make sense? An example will help. Suppose the student's percentage is 87%. Well, in the table above, the *highest* value in the first column that is still *less than or equal to* 87% is 80%, is it not? 70%, 60%, and 0% are less than or equal to 87%, but they are not the *highest* value that is less than or equal to 87%. So 80% is the value that *Excel* will select from the Range column

in its LOOKUP of the table. The letter grade from the corresponding cell in the second column-- in this case a "B"--will then be posted to the **GRADE** column of the Gradebook document proper.

Once you understand the concept of "the highest value less than or equal to another number", the rest is easy. Here are a few student percentages to try for yourself. Complete the exercise that follows.

From Fig. 5.19, column 1,

what is the highest value less than or equal to 45%, and what is the resulting letter grade? _____

what is the highest value less than or equal to 67%, and what is the resulting letter grade? _____

what is the highest value less than or equal to 59%, and what is the resulting letter grade? _____

what is the highest value less than or equal to 100%, and what's the resulting letter grade? _____

The answers are in the footnote at the bottom of the page.¹

There are two parts to incorporating the *Excel* LOOKUP function into your Gradebook document. First you must build the LOOKUP Table into the spreadsheet. Second you must enter into the appropriate cells the LOOKUP function that will instruct *Excel* to carry out the LOOKUP operation.

You'll need both the **Gradebook document** (which you saved in the **Other** folder in the **Miscellaneous Files** folder) and the **Grades Template** (which you saved in the **Templates** folder in your **Miscellaneous Files** folder) to complete the remainder of this tutorial, so if these documents are not already open, open them both from your **Work Files for Office 2016** folder before proceeding

Next, in the **View Ribbon > Window Group > Switch Windows** icon, select the **Gradebook** document, if it is not already the active window on the screen

Since all the cells are protected in the Gradebook document, you'll need to unlock them first in order to make changes.

From the **Home Ribbon > Cells Group** select **Format** and, in the **Protection Section** towards the bottom of the **Format Menu**, select the option to **Unprotect Sheet...**

Building the LOOKUP Table

O	P
Range (%)	Grade (A-E)
0%	E
60%	D
70%	C
80%	B
90%	A
100%	A

Fig. 5.25 The Lookup table you are about to create

Now, let's build the Lookup table that's illustrated in Fig. 5.25.

¹ 0% (E); 60% (D); 0% (E); 100% (A)

The first column of the LOOKUP Table (the lookup vector) has a set of numbers which *Excel* calls the *lookup_vector*.

A vector is just another name for a single column of numbers. The *lookup_vector* contains the set of values against which *Excel* compares the data from a selected cell in the Gradebook document.

Let's create this column (vector) of the LOOKUP table first. As you work your way through this exercise, be sure to hit the *number* 0, NOT the *letter* O; they are so close together on the keyboard that some students hit the wrong character by mistake.

Select cell **O1** and type the column header **Range (%)** then press **Enter** to move down to cell **O2**

Type **0** (the number zero (0) that is) in cell **O2** and press **Enter** to move down to cell **O3**

Type **0.6** (this is equivalent to 60% in mathematical terms) and press **Enter** again to select cell **O4**

Type **0.7** and press **Enter** to make **O5** the current cell

Type **0.8** and press **Enter** once more

Type **0.9** in cell **O6** and press **Enter** again to make **O7** the current cell

Finally type **1** (this is equivalent to 100% in mathematical terms) and click on the **Accept** (✓) button

Now you must change the cell attributes of this first column of the table so as to display the numbers in percent form (with the percent (%) symbol). You did this before in Lesson 4, so the following is just a reminder of how to do this.

Drag down to highlight **all 6** of the scale values from cell **O2** to cell **O7**

In the **Home Ribbon > Number Group** click on the **% (Percent)** symbol to change the format of the decimal numbers to percentages

That completes the first column of the table. Now for the second column with the letter grades-- what *Excel* calls the *result vector*. The *result vector* contains the values which *Excel* returns to the Gradebook cell which contains the formula which calls on the LOOKUP function.

Select cell **P1** and type the header **Grade (A-E)**, then press **Enter** to move down to cell **P2**

Type the letter **E** (or whatever you would use for a failing grade) and press **Enter** to go to cell **P3**

Type a **D** and move down to cell **P4**, then type a **C** and move down to cell **P5**

Type a **B** and move on down to cell **P6**, then type an **A** and move down to cell **P7**

Finally type an **A** again in cell **P7** and click on the **Accept** (✓) button

The table is now almost ready for use. A couple of cosmetic adjustments will improve its appearance.

Select columns **O** and **P** by dragging across the letters **O** and **P** at the top of the columns

In the **Home Ribbon > Alignment Group** select **Center** alignment, then in the **Cells Group** click on **Format** and, in the drop down menu, select **Column Width...** and make the width **10**

Your LOOKUP Table should now look like Fig. 5.25 on page 194.

Save all your hard work before proceeding with the tutorial

Using the clipboard to copy cells from one document to another

Now that you have completed the task of building the LOOKUP Table in the Gradebook document you need to update the Grades Template along the same lines. As before, the easiest way to do this is to copy the relevant cells from the Gradebook document into the Grades Template document using Copy and Paste.

First you must copy the relevant cells (those used for the LOOKUP Table) from the Gradebook document to the clipboard.

Select cell **O1** and drag down diagonally across the **LOOKUP Table** to cell **P7**

Press **Ctrl+c** to copy the **LOOKUP Table** to the clipboard

Now, in the **View Ribbon > Window Group** click on **Switch Windows** or, more simply, just click anywhere in the **Grades Template** window

In the **Grades Template**, click on cell **O1** to make it the current cell, then hit **Ctrl+v** to paste the **LOOKUP Table** from the clipboard to the **Grades Template**

The width of columns O and P in the *Grades Template* spreadsheet is still 13, which is the default width when you first open a new spreadsheet. This is wider than you need for the LOOKUP table; the width you need is 10.

In the **Grades Template**, click on the **column header** for **column O**, hold down the **Shift key**, and click on the **column header** for **column P** to select **both columns**

Right click anywhere in either of the highlighted columns and, in the **context menu**, select **Column Width...**, then change the width of columns **O** and **P** to **10**, and save your work (**Ctrl+s**) once more

Entering the LOOKUP function into the Grade column of the spreadsheet

Take a moment to understand the next step in using the LOOKUP table. Recall that the LOOKUP function instructs *Excel* to look up a table that you have built and come back with a corresponding result to store in the spreadsheet proper. Still confused? Maybe the following will help you figure it out.

The LOOKUP function has the following parts to it:

=LOOKUP (lookup_value,lookup_vector,result_vector)

Let's examine each part of this function in order to understand how it works.

- The "=" symbol at the start of the function simply tells *Excel* that a function or formula is to follow, as opposed to ordinary data such as numbers or labels.
- **LOOKUP** tells *Excel* what task it has to carry out (**look** something **up** in a list).

- **lookup_value**, **lookup_vector**, and **result_vector** are variables (control values) that *Excel* uses when it is looking up the table:
 - the **lookup_value** is either a number or text (such as a person's name); this **value** will be the "key" that *Excel* will use as it searches through the cells in the **lookup_vector** or column;
 - the **lookup_vector** is the column of cells that *Excel* has to check in its lookup of the table (column O in Fig. 5.25 on page 194);
 - the **result_vector** is the column of cells in which *Excel* will find the result of the LOOKUP operation (Column P in Fig. 5. 25 on page 194).

Still confused? Don't feel bad; this is definitely tricky stuff. Maybe an example will help you understand how the Lookup function works. It will be easiest for you to follow the next exercise if you have an actual grade book to work with.

The **Grades Template** and **Gradebook** spreadsheets should still be side-by-side on your screen, so begin by switching back to the **Gradebook document** (use the **View Ribbon > Window Group > Switch Windows** icon for this or click on any cell in the **Gradebook** document)

As you follow along, make sure you have at least the LOOKUP Table (columns **O** and **P**) showing on the screen, as well as the last three columns of the Gradebook document (columns **L** thru **N**) containing the PCNT and GRADE data.

Scroll over if necessary and make sure you have columns **L through P** showing on the screen, with the **LOOKUP Table** at the **top** of the screen (Fig. 5.26)

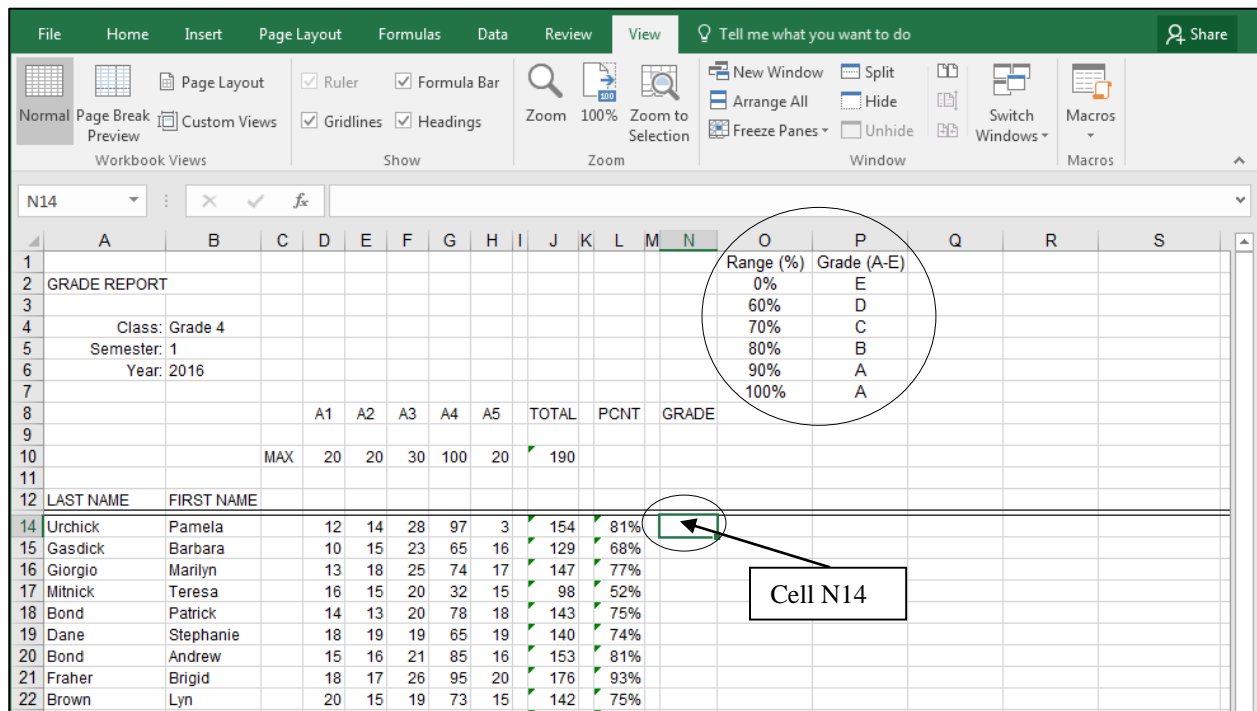


Fig. 5.26 Spreadsheet showing the Lookup Table

Select cell **N14** (Fig. 5.26 above)

This is the first cell in the GRADE column. You want *Excel* to use the LOOKUP function to figure out the letter grade for each student and display it in this column (Column N). So the LOOKUP function must go in each cell of Column N.

Click on the **Insert Function** icon (*fx*) in the **data entry** bar towards the top of the spreadsheet window and, in the **Insert Function** dialog box, select the category **Lookup & Reference** (Fig. 5.27)

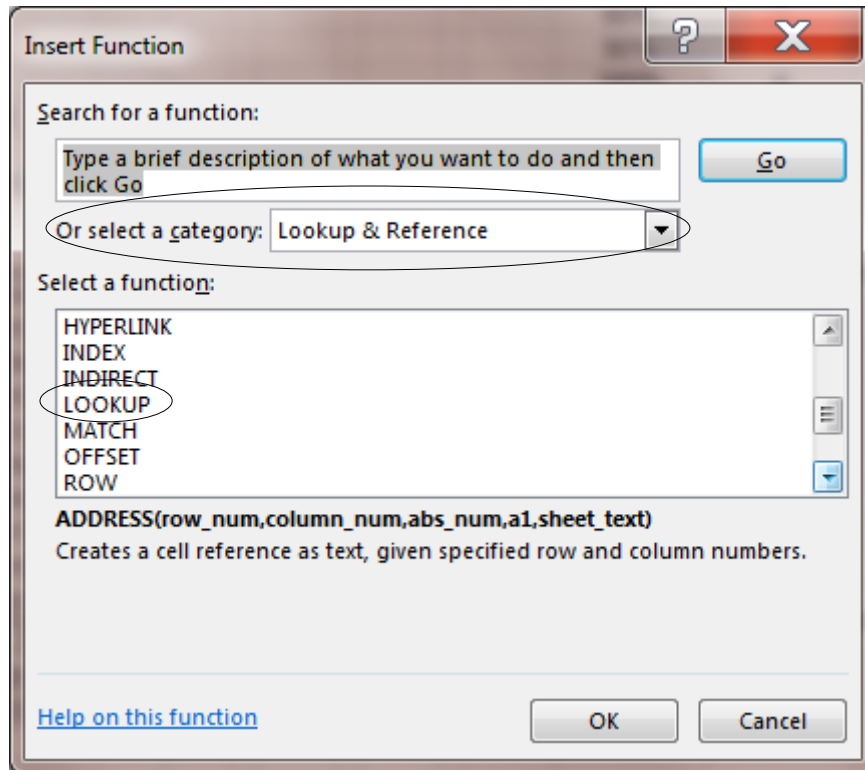


Fig. 5.27 Insert Function dialog box showing Lookup & Reference category

In the **Select a function: scroll box**, scroll to locate the function **LOOKUP**, then click on **OK**

This brings up the *Select Arguments* dialog box (Fig. 5.28).

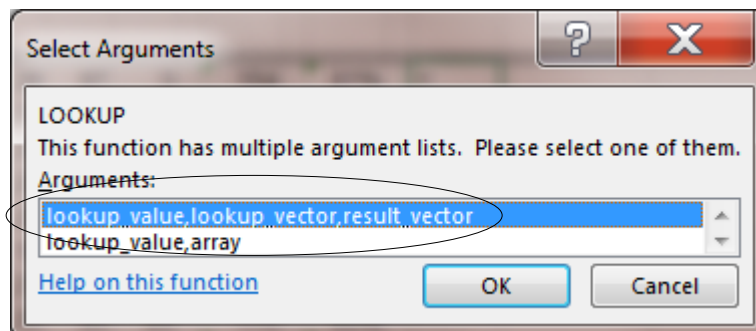


Fig. 5.28 The Select Arguments dialog box

The first set of arguments (**lookup_value, lookup_vector, result_vector**) are what we want, and they are already selected by default, so click on **OK**

If you look in the entry bar at the top of the spreadsheet, you'll see that it now contains the basic LOOKUP function, ready for you to add the three (3) arguments for the LOOKUP function—the lookup_value, the lookup_vector, and the result_vector.

Excel also presents a dialog box for you to enter these arguments (Fig. 5.29).

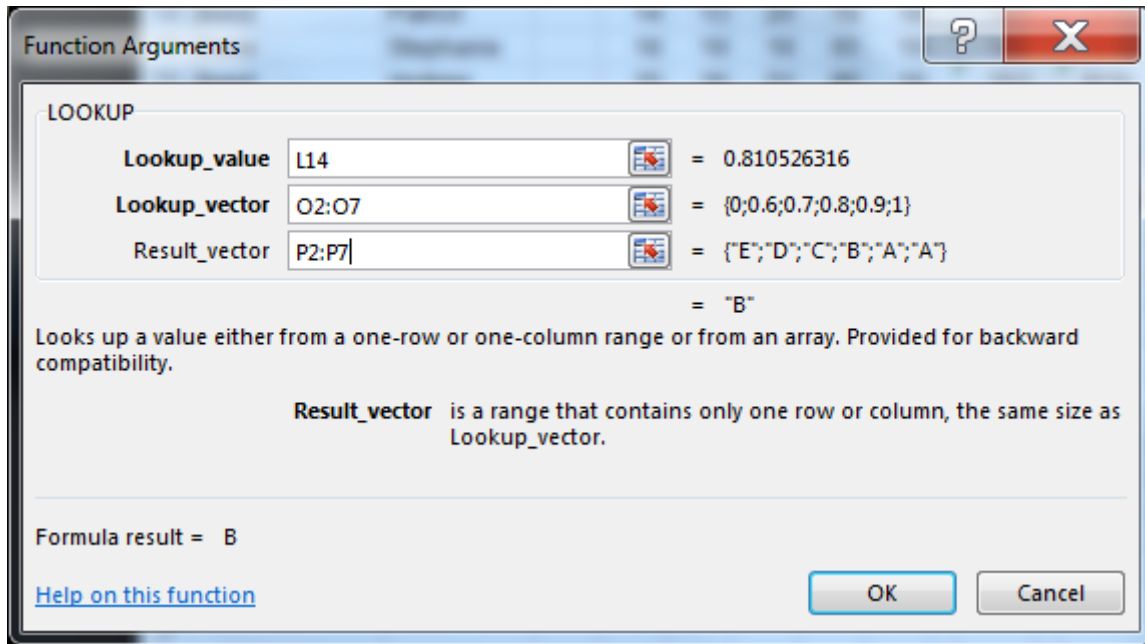


Fig. 5.29 The Function Arguments dialog box for the LOOKUP function

If the **Function Arguments dialog box** is covering **column L** and the **Lookup Table** in **columns O and P**, slide the **Function Arguments dialog box** down and off to the right or left on the screen so that the dialog box doesn't hide the cells you need to work with

Entering the lookup_value in the dialog box

Notice that the cursor is positioned in the first data entry box for you to enter the first parameter of the LOOKUP function—the lookup_value. You must enter here the coordinates of the cell that contains this lookup_value, namely the first student's Percentage (Cell L14).

In the **Gradebook** spreadsheet, click on cell **L14**

Excel enters this cell's coordinates as the first of the LOOKUP parameters, the *lookup_value*. You are telling *Excel* that it must use this first student's percentage as the value to check against the first column of the LOOKUP Table (O2 through O7).

Entering in the lookup_vector

Cells O2 through O7 are the lookup_vector for the LOOKUP Table.

Click in the **second** data entry box in the **Function Arguments dialog box**, so that you can enter the cells which contain the **lookup_vector**

Now, in the **Gradebook** spreadsheet, use the mouse to drag down from cell **O2 to cell O7** (remember, it's the **letter "O"** not the **number "0"**)

Notice that *Excel* fills in the second of the LOOKUP parameters for the LOOKUP function, namely the *lookup_vector*. Check this in the Data entry bar, too.

Entering the result_vector

Cells P2 through P7 are the result_vector for the LOOKUP Table.

Click in the **third** data entry box in the **Function Arguments dialog box**, so you can enter the cells that contain the **result_vector**

Now, in the **Gradebook** spreadsheet, drag down from **cell P2 to cell P7**

Notice, once again, that *Excel* fills in the third of the LOOKUP parameters, the result_vector.

Check the **data entry bar** to see that the LOOKUP function is now complete— at this stage it should read **=LOOKUP(L14,O2:O7,P2:P7)**

Finally, click on **OK** and take a look in cell N14

Applying the function

Excel will look for "the highest value in cells O2 through O7 that is less than or equal to the student's percentage".

Take a look at cell **N14** now and **verify** that it contains the correct **letter grade (B)** according to the value in cell **L14** (the percentage for this first student)

As you see, once the LOOKUP function has located the correct cell in column 1 of the Lookup Table (the Range column), all that remains is for *Excel* to make a note of the letter grade that is in the corresponding cell in column 2 of the table (the Grade column), and copy that grade into cell N14.

Don't feel bad if your eyes are starting to glaze over; this is kinda nerdy stuff. But hang in there, we're nearly done.

Copying the LOOKUP function into the rest of the GRADE column

The first student's grade is taken care of. The next task is to copy this function from cell N14 down to the other cells in the GRADE column (column N), but this is not as simple as it seems because we have to consider the problem of *Absolute* and *Relative* cell references..

If you want to try and do this on your own (you will need to understand the concept of Absolute and Relative references!), go ahead. If you are successful you can skip the rest of this sub-section and go to the *Practice makes perfect* section on the next page.

If you need help completing the LOOKUP function, read on to follow the steps to *correctly* fill down the LOOKUP function to the remaining cells in column N.

First you must make a small change to the function itself. You also need to put your thinking cap on, because if this is the first time you've used a LOOKUP function, it can get mighty confusing.

You may recall learning about Relative and Absolute cell references in Lesson 4. The function **=LOOKUP(L14,O2:O7,P2:P7)** will work fine for the first student, but if you copy it to the other cells as is, *Excel* will assume that *all* the cell references in the function are relative to the cell into which they are being copied, and will adjust them accordingly, resulting in the wrong letter grades. If you enjoy math or logic, you'll be enjoying this; but if not, bear with us, OK?

What you have to bear in mind is that the references to the LOOKUP Table (cells O2:O7 and P2:P7) must be *absolute* references—which means any references to those cells *must not* change—because the data for the LOOKUP Table will *always* be found in these specific cells.

So you need to tell *Excel* to leave these LOOKUP Table references unchanged when copying the LOOKUP function into the other cells in column N. You do this by surrounding the LOOKUP Table's cell coordinates with \$ (dollar) signs. Like this:

=LOOKUP(L14,\$O\$2:\$O\$7,\$P\$2:\$P\$7)

You did this in Lesson 4 when you were creating the formula for the cells in the Percentage column (Column L).

The reference to the lookup value (cell L14 for the first student) is *relative*, and will be different for each student (L15, L16, and so on), so it doesn't need to have dollar signs around it. But the references to the lookup_vector and to the result_vector are *absolute*—fixed because they refer to the LOOKUP table in columns O and P.

Here is a reminder of the steps to tell *Excel* to treat references as Absolute References when referring to the LOOKUP Table.

Click on cell **N14**

Take a look at the Data Entry bar at the top of the screen and you'll see that the LOOKUP function is spelled out in full (Fig. 5.30).

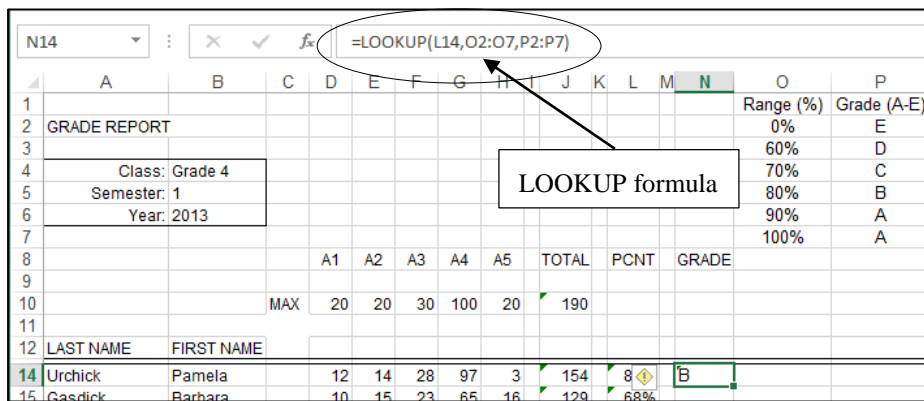


Fig. 5.30 LOOKUP function for cell N14

In the **Data entry bar** (Fig. 5.30), in the **LOOKUP formula**, click to put the cursor immediately before the reference to **cell O2**

Now put a dollar (\$) sign in front of every coordinate (row *and* column) for the LOOKUP Table (**8 \$ signs** in all) as illustrated in Fig. 5.31

This will ensure that this part of the function will remain unchanged ("absolute") when you copy it shortly into the other cells in column N.

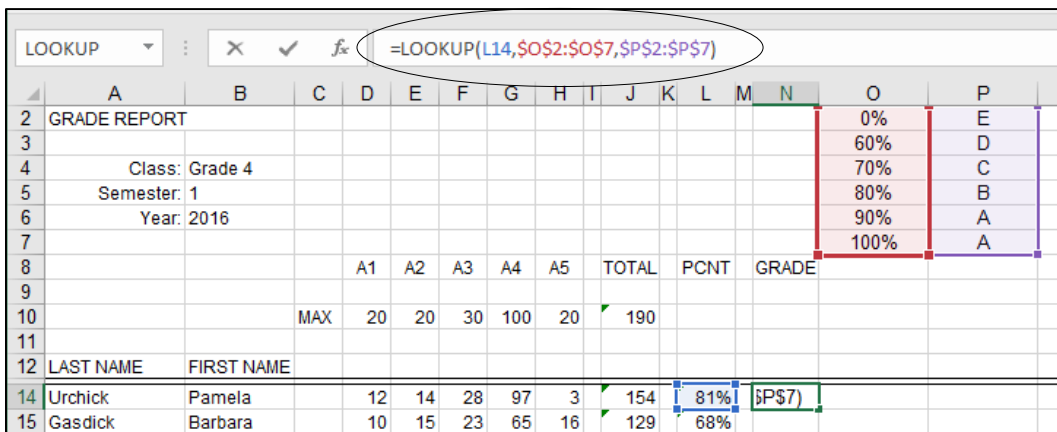


Fig. 5.31 Absolute references are preceded by dollar (\$) signs

Notice, in Fig. 5.31, that the entries are color-coordinated to help you see which parts of the LOOKUP function relate to the cells in the spreadsheet itself: **Green** for the Lookup Value, **Red** for the Lookup Vector, and **Purple** for the Result Vector.

Click the **Accept button** (✓) to accept the LOOKUP function into cell **N14**

Here now are the steps to copy the function from cell N14 into the remaining cells of the GRADE column (Column N).

Make sure the current cell is still cell **N14**

Grab hold of the small **Fill handle** in the **lower right** corner of **cell N14**, drag down to **cell N23** and let go of the mouse button (or take your finger tip off the screen if you're using touch commands)

You now should see the correct letter grade for each student in column N.

While you have the cells in **column N** highlighted, **center** the grades in the column (**Home Ribbon > Alignment Group > Center** icon)

Save the changes you have made to the Gradebook spreadsheet

If you need to think about the LOOKUP function a little more, go carefully back over what you have just done. Once you have a clear idea of how the LOOKUP function works, you and your students will be able to apply it in myriad situations when you build spreadsheets of your own.

Practice makes perfect

Your task now is to switch to the Grades Template document again, and add the LOOKUP function there, too. You do not have any data in the template (or at least you shouldn't have!), so your LOOKUP function will produce a column of meaningless grades (all E's!) in the GRADE column, just as was the case when you built a function into the PCNT column of the template document when you were working on Lesson 4. This is no problem, because the data will be relevant and correct when you use the spreadsheet with an *actual class of your own* and enter *meaningful* sets of scores, as is the case in the Gradebook document itself.

You either can add the functions to the Grades Template document the long way, by repeating all the steps you just carried out for the Gradebook document, or you can use the Copy (Ctrl+c) function as you did a short while ago to copy the LOOKUP Table from the one document to the other.

Don't forget, when you're done, to **Save** the changes you will have made to the **Grades Template** spreadsheet, then close the **Grades Template** document

Finally, in this exercise you must protect the Gradebook worksheet so that no one can make unauthorized changes to the data in the cells.

Click on any cell below or to the right of any data in the **Gradebook** worksheet, hit **Ctrl+a**, then, from the **Home Ribbon > Cells Group** select **Format** and, in the **Protection Section** towards the bottom of the **Format Menu**, select the option to **Protect Sheet...**

In the **Protect Sheet dialog box** click on **OK**, then **Save** your work

There is no need to protect the Grades Template document because there is, as yet, no student data in there.

5.6 CREATING CHARTS BASED ON THE SPREADSHEET DATA

The *Excel* charting capability

Today we are in danger of being overwhelmed by a superabundance of data, the raw material of information. We need all the help we can get to make sense of this superabundance and, above all, make decisions based on it.

Charts—graphic, colorful, eye-catching, mind-enriching—have, for thousands of years, been a powerful way to convey what would otherwise be complex information. *Office Excel 2016* makes it easy to create dozens of different types of charts. You can create a chart from information gathered in most any spreadsheet. It is not an exaggeration to say that your ability to use Excel's charting capability will make you a more effective teacher.

A spreadsheet user can take advantage of charts based on the numbers stored in its rows and columns of cells. The numbers on their own may not provide much information. Charts based on those numbers, on the other hand, may enable the user to *visualize* the data. "A picture," as they say, "is worth a thousand words."

A well-designed chart can help you make sense of a thousand numbers. Charts are also useful when you need to increase the impact of any oral or written presentation. Think of the many charts that you now see presented on TV and other media; their purpose is to help you make sense of all the data out there, whether it's business data, weather data, data related to politics, and so on.

Charts that are well-designed will help your students understand what they need to know. More to the point, if you teach your students how to create charts themselves, they will be able to include them in assignments related to every subject area under the sun.

Creating a Column chart

For this exercise you'll open a new spreadsheet document so you can practice creating charts.

Navigate to your **USB Drive > Work Files for Office 2016 > Miscellaneous Files > Other Documents** folder and open the **Charts** spreadsheet

Your Charts spreadsheet should look like Fig. 5.32.

The screenshot shows the Microsoft Excel interface. The ribbon is set to 'Home' and includes options for File, Home, Insert, Page Layout, Formulas, Data, Review, and View. The font is Geneva, size 10. The spreadsheet has a title bar 'Class Grades' and a formula bar. The data table is as follows:

	A	B	C	D	E	F	G	H	I
1	Class Grades	A	B	C	D	E			
2	Students in Range	1	4	4	1	0			
3									
4									

Fig. 5.32 The Charts spreadsheet

The values represented in a chart are called a *data series* or a *data set*. In the chart you are about to create, the number of students in the various grade ranges (A, B, C, etc.) will be represented by bars. The chart will have a title and a legend with names descriptive of the data series.

Most charts, except pie charts, have *axes*, which are the perpendicular lines along which the data are plotted or displayed. The Y axis is the *vertical axis* (running from top to bottom). The X axis is the *horizontal axis* (running from left to right).

To create a chart in *Excel*, you must first designate the set of cells in the spreadsheet that you want included in the chart. This is called the *chart range*. Let's select the Chart Range now.

Select, by dragging and highlighting, cells **A1** through **F2**

Now, let's first check out each of the 7 categories of charts.

In the **Insert Ribbon > Charts Group**, click on the **Column charts** icon (Fig. 5.33) and look at the many different types of Column Charts you can make

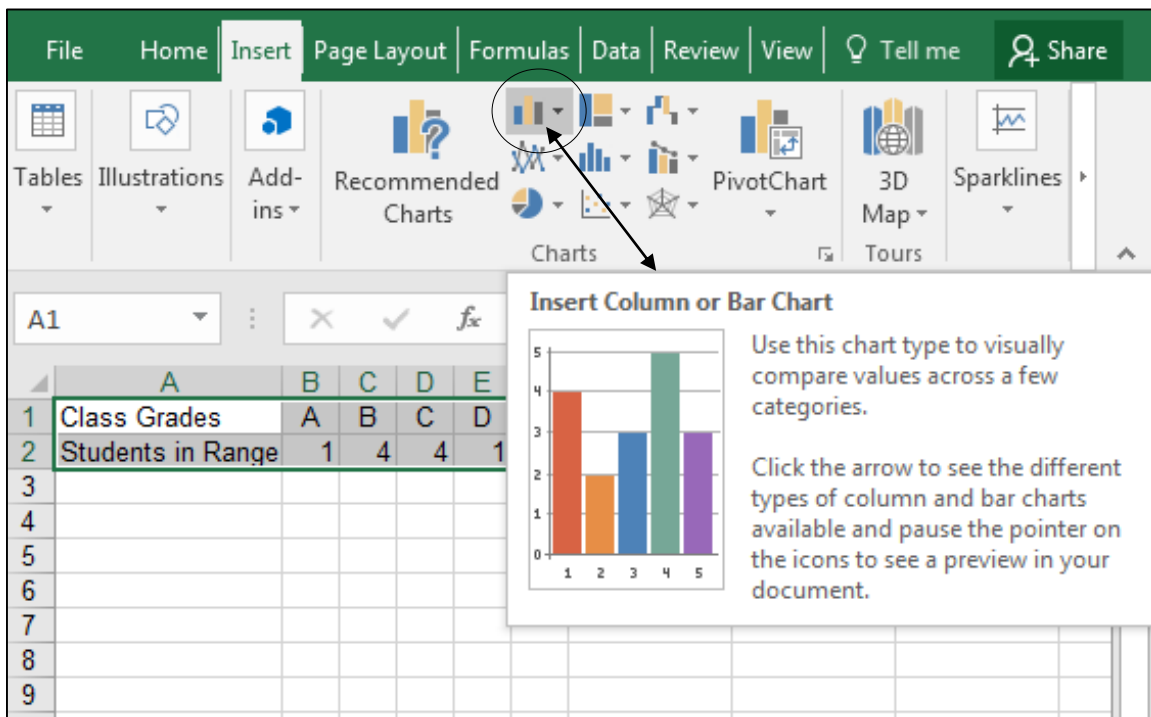


Fig. 5.33 Column Chart tool

Click on the **Line charts** icon and look at the different types of Line Charts

Click on the **Pie charts** icon and look at the different types of Pie Charts

Click on the **Bar charts** icon and look at the different types of Bar Charts

Click on the **Area charts** icon and look at the different types of Area Charts

Click on the **Scatter charts** icon and look at the different types of Scatter Charts

Click on the icons for **various Other charts** and look at the different types of Charts you can make

After you have checked out the various chart types, in the **Insert Ribbon > Charts Group**, click on the **Column or Bar charts** icon

In the **Column or Bar Charts** menu, click on the icon for a **3-D clustered Column** chart—that’s the **first of the 3-D Column Charts** (Fig. 5.34)

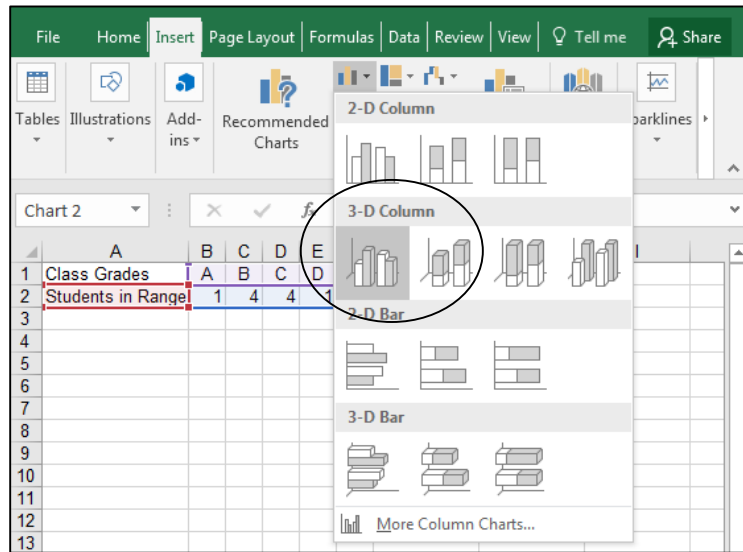


Fig. 5.34 The Column Charts menu

Immediately *Excel* creates the chart and displays it on the screen (Fig. 5.35). Notice that Excel has automatically put the grades along the (*horizontal*) *X* axis and the scale indicating the number of students “in Range”—i.e. the number of students with each grade—along the (*vertical*) *Y* axis.

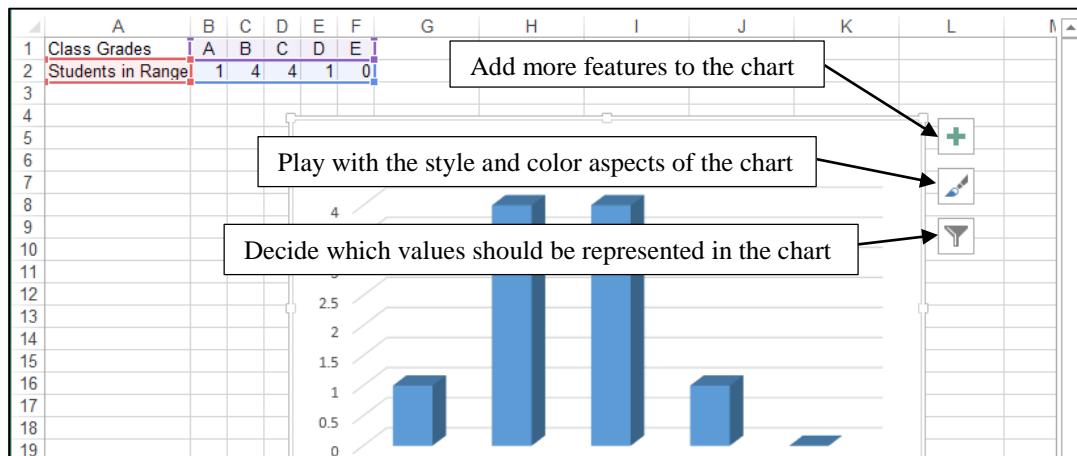


Fig. 5.35 3-D Clustered Column chart

To the right of the chart you see three icons (Fig. 5.35 above), which you can click on to *add more features* to the chart, or *play with the style and color aspects* of the chart, or *decide which values should be represented* in the chart.

The only change you need to make right now is to the chart title. It should say something like “Class Grades Distribution.”

Click once on the Title of the chart—**Students in Range**—then **Triple click** on the **Title text** to highlight the whole title, and in its place type **Class Grades Distribution**

You can easily make any other changes to the chart. You have literally dozens of options.

Right click on any piece of the chart (such as the title, any other text, the bars, the chart background, the gridlines, the chart area as a whole, the legend, the axis numbers or letters) and notice that you get a **context menu** which offers options for what to do with whatever you are **right clicking on**

Notice the handles that immediately appear around the object(s) you've selected. Also notice that each part of the chart has different options in its pop up context menu.

Select the **Format...** option from whichever **context menu** pops up (depending on where you are pointing) and interact with the dialog box to change whichever features are appropriate for the object you've selected (the chart area as a whole, the chart title, a particular data series, the walls at back of the chart, the plot area, and so forth)

Try variations on the look and feel of the chart; undo anything you don't like

Notice that when you have the chart selected two new Ribbons appear at the top of the *Excel* window—the *Chart Tools > Design Ribbon* and the *Chart Tools > Format Ribbon* (Fig. 5.36).

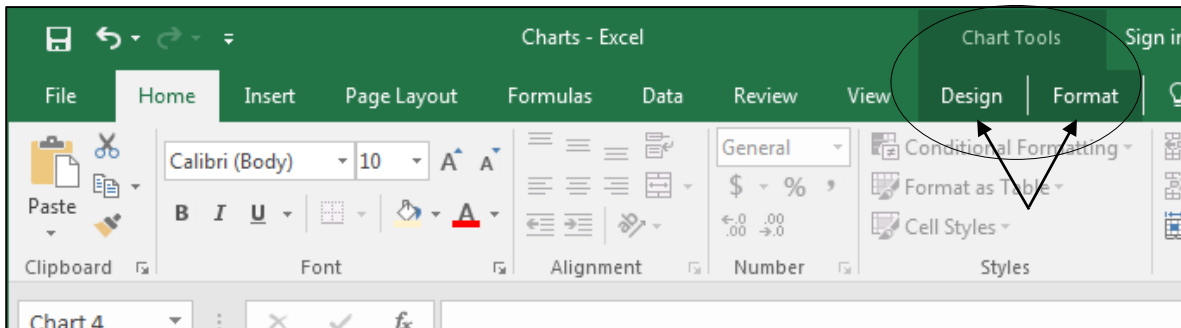


Fig. 5.36 the Two Chart Tools Ribbons

In the **Chart Tools > Design Ribbon > Chart Styles Group**, **Live Preview** some of the different preset styles

There are several preset styles that are actually quite interesting (Fig. 5.37).

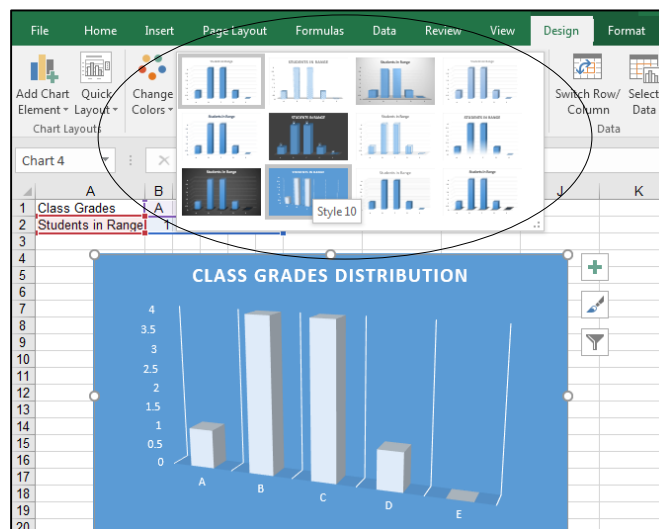


Fig. 5.37 There are a dozen preset chart styles to choose from

When you're done trying things out, go to **File menu > Save As...** and, in your **USB Drive > Work Files for Office 2016 > Data Files > Spreadsheet Documents** folder, save the chart with the name **Column Chart**

That's all you want to do with the Column Chart, so you might as well remove it from the spreadsheet window before the next exercise.

Left click on the **border** of the **Column chart** to select the **whole chart** (and not some piece of the chart's contents), then hit the **Del(ete)** key

Creating a pie chart

Creating a pie chart is straightforward if you just successfully completed the bar chart. You will use the same set of data for the exercise that follows.

Drag to select cells **A1** through **F2**, then in the **Insert Ribbon > Charts Group**, click on the **Pie or Donut Chart** icon

In the **Pie Charts** menu, click on the icon for a **3-D Pie** chart, and then, in the **Design Ribbon > Chart Styles Group**, select the **Style** option **Style9** or click on the Style icon and select Style 9 in the Style pop up menu (Fig. 5.38)

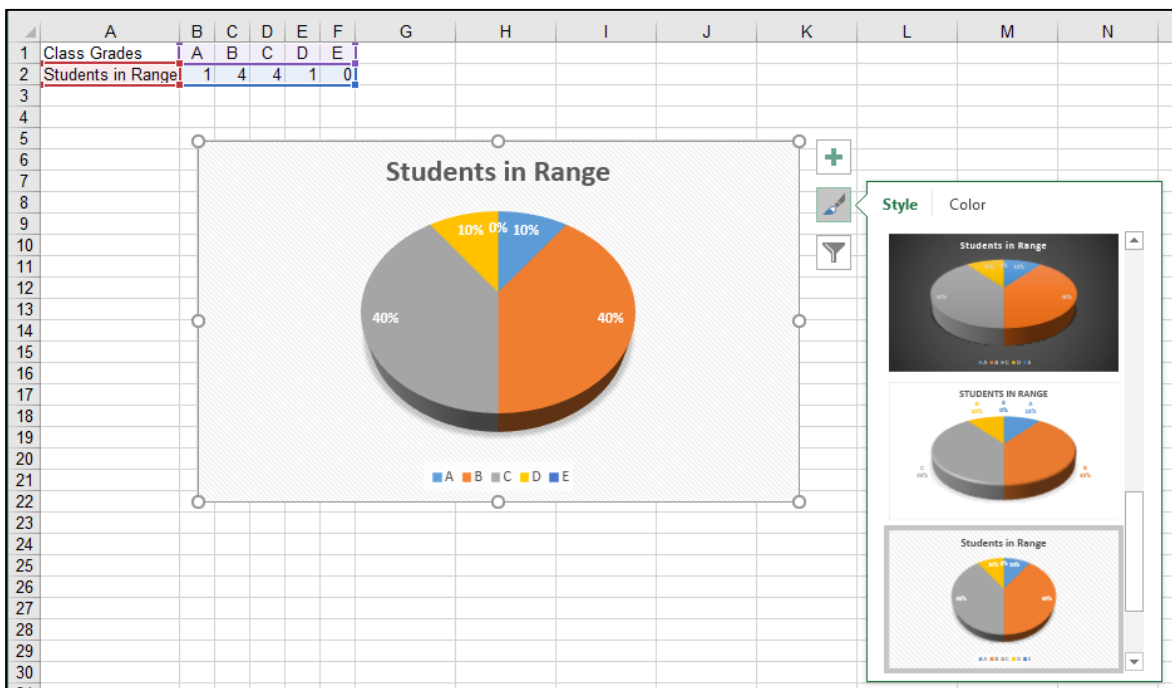


Fig. 5.38 Pie Chart

Change the **Chart Title** to **Class Grades Distribution** as you did for the Column Chart

Right click on any piece of the chart (title, slices of the pie, plot area, chart area, legend)

Notice the handles that immediately appear around the object you've selected. Also notice that each part of the chart that you select has a set of different options in its pop up context menu.

Select the **Format option** from any of the **context menus** and interact with the dialog box to change fonts, colors and so forth—try variations on the look and feel of the chart; undo anything you don't like

When you're done trying things out, go to **File > Save As...** and, in your **Work Files for Office 2016 > Data Files > Spreadsheet Documents** folder, save the chart with the name **Pie Chart**

That's all you want to do with the pie chart.

Left click on the border of the **Pie chart** to select the **whole chart** and not some piece of the chart's contents, then hit the **Del(ete)** key

If necessary, drag again to select cells **A1** through **F2**, then in the **Insert Ribbon > Charts Group**, select the **3D Clustered Bar Chart** icon

Go ahead and create a **3D Clustered Bar Chart** with your choice of **preset chart style**, change the **Chart Title** to **Class Grades Distribution** and **save** the chart in your **Data Files > Spreadsheet Documents** folder with the name **Bar Chart**

Do the same to create a **Donut style Pie Chart**, and **save** the chart in your **Data Files > Spreadsheet Documents** folder with the name **Donut Chart**

You are done with the **Charts** document that you have been using to create various types of charts, so **close** the spreadsheet

You should now have only the *Gradebook* document open on your screen.

5.7 PRINTING THE UPDATED SPREADSHEET

Selecting a section of the spreadsheet for printing

You're going to print out the Gradebook document twice.

When you first print out your Gradebook document, you do not want the LOOKUP Table to appear on the printed report. You want to print only that block of cells that contains the data pertaining to student grades for the semester. This includes columns A through N and Rows 1 through 27.

The steps that follow will show you how to select just this block of cells for printing. First you must select (highlight) the range of cells that you want to print.

Drag down diagonally from cell **A1** to cell **N27** (this will include the **Average**, **Max Score**, and **Min Score** summary lines at the bottom of the Gradebook document, but **not** the cells with the LOOKUP table)

In the **Page Layout Ribbon > Page Setup > Print Area** menu, select the option to **Set Print Area**

It is usually best to print a spreadsheet in landscape (sideways) orientation.

In the **Page Layout Ribbon > Page Setup Group** click on the **Orientation** icon and make sure that **Landscape** is selected

You need to take care of one more detail before clicking on the Print button. The printed spreadsheet will look better if you remove *column and row headings* as well as the *cell gridlines*.

In the **Page Layout Ribbon > Page Setup Group** click on the **small arrow** in the **lower right corner** of the group section in order to bring up the **Page Setup dialog box** (Fig. 5.39)

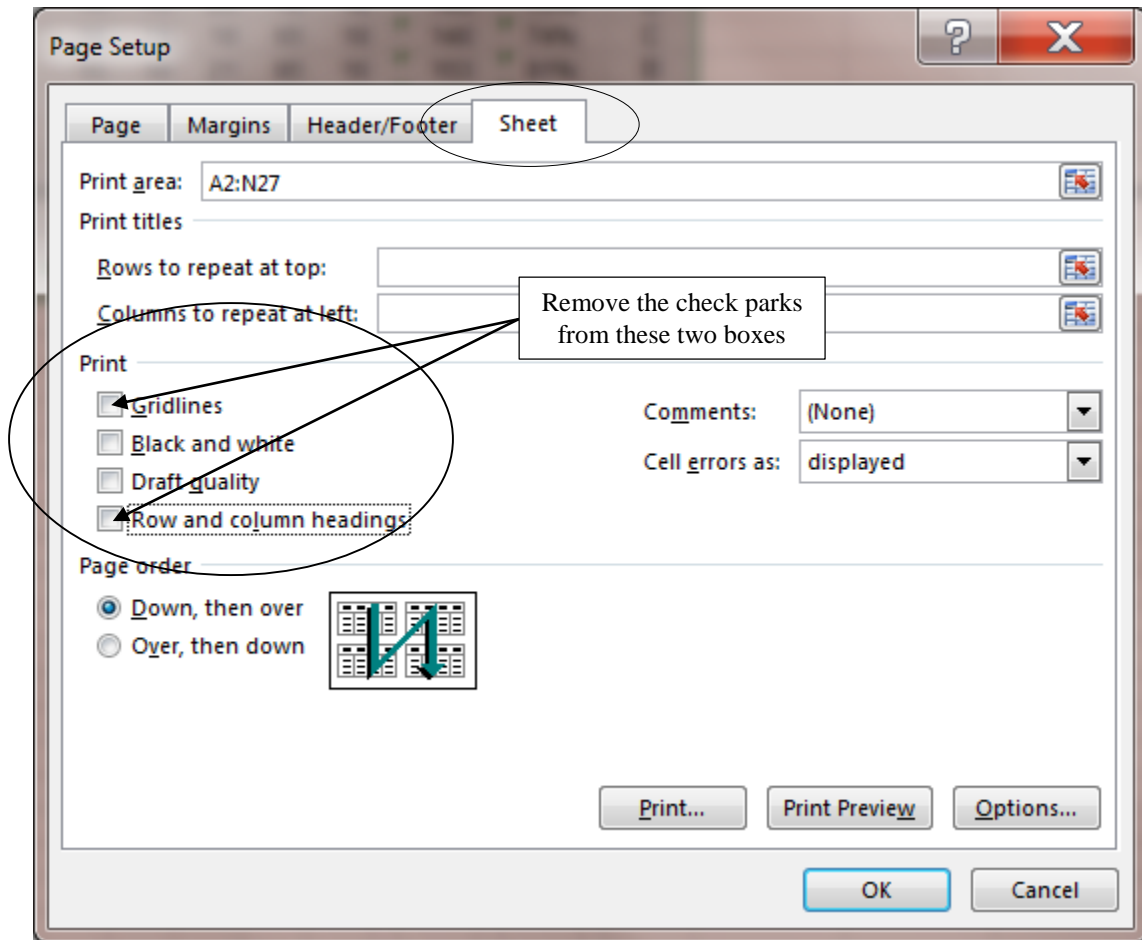


Fig. 5.39 Removing Gridlines and Row and Column headings

In the **Page Setup dialog box**, click on the **Sheet tab** and then click to **remove** the **check mark** from the boxes next to **Gridlines** and **Row and column headings** (Fig. 5.39 above), then click on **OK**

From the **File menu** select **Print**

This will bring up the Print dialog box. Your spreadsheet has just one page. If you wanted to check how many pages there are in a spreadsheet before printing, you would find the answer at the bottom of the Print dialog box (it reads 1 of 1 for this spreadsheet). Notice also that in the Print dialog box you have a Preview of the worksheet before printing.

Check out how the spreadsheet looks in the **Preview window**, then click on the **Print button top left** of the **Print dialog box** to print out a hardcopy of the **Gradebook**

Now you are going to print a second copy of the Gradebook document, but this time you will include the LOOKUP table.

Drag down diagonally from cell **A1** to cell **P27** (this will include the **LOOKUP table** in columns O and P)

In the **Page Layout Ribbon > Page Setup > Print Area** menu, select the option to **Set Print Area**

In the **Page Layout Ribbon > Page Setup Group** click on the **small arrow** in the **lower right corner** of the group section in order to bring up the **Page Setup dialog box**

In the **Page Setup dialog box**, click on the **Sheet tab** and then click to **put back** the **check mark** in the boxes next to **Gridlines** and **Row and column headings**, then click on **OK**

Once more, from the **File menu** select **Print**

If you are completing the lesson for a class at school, hand in **both hardcopies** of the spreadsheet to your instructor

5.8 MAKING A BACKUP COPY OF YOUR DOCUMENTS

Your last task before completing this session at the computer is to make a backup of your document on the backup disk. The Gradebook is still open in *Excel*. It is also saved in the *Data Files > Spreadsheet Documents* folder, which is in your *Work Files for Office 2016* folder.

From the **File menu** select **Save As**, and in the **Save As** dialog box change the file name to **Gradebook Backup**, then navigate to your **USB drive > Work Files for Office 2016 > Data Files > Spreadsheet Documents** folder and click on **Save**, then close *Excel*

LOOKING BACK

Most people take advantage of only a fraction of the functionality of computer software. This tutorial, and the others that you have worked your way through thus far, have introduced you to a wider range of features of *Excel* than most *Excel* users are even aware of, let alone use. However, you still cannot consider yourself an expert, even though you are becoming a more sophisticated user.

To become an expert, you must first of all *use* the software a great deal, taking advantage of the features you have learned so that you don't forget them. You also might study the User's Guide that Microsoft provides along with the *Excel* software.

Having said that, you should always bear in mind that expertise like this is ephemeral. "Use it, or lose it," as they say. It's not like riding a bike, where once you've learned how, you can do it forever. You have to practice; you have to *use* the software so that you become more and more proficient.

LOOKING FORWARD

Lessons 6 will help you learn to use the *Access* database application. This will be a pre-requisite to helping you learn how to use the mail merge feature of the word processor. Mail merge will be the subject of Lesson 7.

If you have completed all the tutorials in this book up to this point, you have spent a considerable amount of time at the computer. This is the only way to master the machine. Yet it is not enough. You must be prepared to strike out on your own, creating documents using the productivity tools you are learning in these tutorials to meet your needs both in and out of the classroom.

Deep, assimilated learning takes place only once you are working independently, because to do this you have to show that you have *understood* everything you have learned. Understanding leads to transference and acquisition of skills.

Tutorials will open the doors to knowledge, and hold your hand while you make those first steps toward the acquisition of specific skills. But you must have the desire to let go of the hand that guides you. *Without* this desire, the exercises that you are following will be wasted and yield no fruit. *With* this desire, you will be motivated to *understand* what you are learning so that you can apply it to new situations in your own professional experience.

SKILL CONSOLIDATION

Complete these exercises to reinforce what you have learned in Lesson 5.

1. List at least 5 applications, other than those presented in these tutorials, for which you think you would use the *Excel* spreadsheet in a classroom environment.
2. Either alone, or with a group, develop templates for each of the five spreadsheets identified in exercise 1. This could be an excellent class project. Each team would develop a different set of templates. Then all groups would present their results for review by everyone else in the class, and the complete set of templates could be made available on disk for everyone to take away from the course.
3. Load the Gradebook document to the Desktop.
 - Add the function to calculate the average score for each of the tests, quizzes, homework, etc. The system will add up all the scores and divide by the number of cells that contain scores to arrive at the average. You should use the copy function to duplicate the functions across the spreadsheet.
 - Save the updated document
 - Print out only the columns that contain the student names and the final totals and percentages (so you will need to temporarily delete the columns in between--don't save this document!)
4. Load the Gradebook document onto the Desktop.
 - Add a new column for another set of scores
 - Add a new row for another student
 - Update the functions where necessary
 - Sort the student records based on the First and Last Name columns
 - Save the updated document
5. Create a line chart based on a set of values for populations in several cities in the U.S. Generate a Bar chart from the data. Research the populations on the web at <http://www.census.gov/popest/states/NST-ann-est.html>
6. Create a pie chart based on a set of values for the amount of rainfall for each of any ten cities worldwide. Research the rainfall data at this web address: <http://www.worldclimate.com>